

**DEVELOPMENT OF A SYSTEMS MODEL
FACILITATING ACTION RESEARCH WITH
RESOURCE-POOR FARMERS FOR SUSTAINABLE
MANAGEMENT OF NATURAL RESOURCES**

HJ SMITH

**Development of a systems model facilitating
action research with resource-poor farmers for
sustainable management of natural resources**

by

Hendrik Johannes Smith

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for the PhD degree in Sustainable Agriculture
in the faculty of Biological and Agricultural Sciences,
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University of the Free State,
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DECLARATION

I declare that the dissertation hereby submitted by me for the PhD degree in Sustainable Agriculture at the Faculty of Biological and Agricultural Sciences, Centre for Sustainable Agriculture, University of the Free State is my own independent work and has not been submitted by me at another university / faculty. I furthermore cede copyright of the dissertation in favour of the University of the Free State.

Signature:

Date:

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Development of a Systems Model Facilitating Action Research with Resource-Poor Farmers for Sustainable Management of Natural Resources

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ABSTRACT

The focus of this research is a localised action research framework, or more specifically, the development of action-research theories based on experiences in a South African Landcare project. The Bergville Landcare project, implemented from 2000 to 2005, was aimed at developing conservation agriculture (CA) practices in a community of resource-poor farmers. These attempts culminated in the development of a soft-system platform on which participatory action research methodologies and techniques could be based in order to facilitate adult and action learning. The following six strategies were identified for the development of such a platform: awareness, local institution building, training-of-trainers, farmer-to-farmer extension, on-farm experimentation and partnerships. The main action-research methodology used to manage these strategies is monitoring and evaluation (M&E).

The approach selected for this research is one in which multiple methodologies are deemed the most appropriate for developing theories within the paradigm of constructivism and interactive agricultural science, i.e. a combination of grounded theory, action research and soft-systems methodology (SSM). The design of the research process resulted in effectively using and analysing the different data sources within the following four phases: a) theory as an initial guide to design and data collection; b) application of initial theories in a Landcare project; c) theory as part of an iterative process of data collection and analysis; and d) gaining theoretical and practical insights into the focal research problems.

A number of theories relating to action research were seen as critical in the formulation of the process which was applied in the Bergville project. Action research, experiential learning and

action learning formed the foundation of the action research approach which was conducted with resource-poor farmers in the Bergville project. In a practical sense, action research was seen as the “umbrella methodology”, applied in harmony with other methodologies, such as SSM, the Farming Systems Approach (FSA), Farmer Participatory Research (FPR), Farmer Field School (FFS) and M&E.

The “action research process” applied in the Bergville project was used as the so called ‘Acting’ phase, and was the primary data-source for the research process. The various documents and data used, i.e. project reports, a personal research diary, significant changes and M&E findings, are described comprehensively. A convergent interviewing process was used to obtain an indication of how sustainable the activities and results of the project were.

The multi-methodological data analysis and theory development process proved to be successful in establishing local theories for practical application. Cognitive maps were used in combination with a general SSM framework to stimulate data analyses, reflection, learning and ultimately theorising. Three cognitive maps were developed in which local theories for on-farm experimentation, training-of-trainers, farmer-to-farmer extension, local institutionalisation and M&E are explicated. Since the cognitive map is a structuring (conceptualisation) of a complex situation, they were discussed in detail in an attempt to improve their understanding.

The most suitable approach for a synthesis of the theorising results appeared to be the integration of the results into an improved theoretical framework addressing the main research questions of this study. This improved framework proved to be that of a systems model which included the major phases of the action-research cycle, and this was used to describe the proposed methodologies and techniques. The proposed six phases of this model are: a) Stakeholder analysis, b) Diagnosis (Situation analysis), c) Planning strategically, d) Implementing and managing, e) Learning and adapting, and f) Exit strategy. This model provides a means of creating a culture of learning that would allow people to be innovative and interactive in the management of natural resources and to collectively care for and manage these resources in a sustainable manner.

Keywords: sustainable agriculture, conservation agriculture, constructivism, grounded theory, soft systems methodology, monitoring and evaluation, multi-stakeholder processes, cognitive mapping, on-farm experimentation, training-of-trainers, farmer-to-farmer extension, local institutionalisation.

**Die Ontwikkeling van 'n Stelselmodel vir Aksienavorsing oor die Volhoubare Bestuur van
Natuurlike Hulpbronne in Suid-Afrika**

deur

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OPSOMMING

In hierdie tesis word aksienavorsingsteorieë ontwikkel en uitgebrei op grond van die insigte bekom uit 'n Suid-Afrikaanse Landcare-projek. Die Bergville Landcare-projek, wat van 2000 tot 2005 geduur het, het die ontwikkeling van bewaringspraktyke saam met hulpbronarmoere ten doel gehad. Een van hierdie praktyke is 'n "sagtstelsel-platform" wat as basis kan dien vir die metodiek vir deelnemende aksienavorsing sowel as tegnieke waarvolgens volwassenes kennis kan inwin en aksie-leer kan plaasvind. Die volgende ses strategieë vir die ontwikkeling van so 'n platform is geïdentifiseer: bewusmaking, opbou van plaaslike instellings, opleiding van opleiers, boer-tot-boer-voorligting, op-die-plaas-eksperimentering en vennootskappe. Die hoof aksienavorsingsmetode wat gebruik is om hierdie strategieë te bestuur, is monitering-en-evaluering (M&E).

In die benadering wat in hierdie navorsing gevolg is, word klem gelê op die gebruik van 'n veelvuldige metodiek, oftewel 'n kombinasie van "grondteorie" (*grounded theory*), aksienavorsing en sagtstelsel-metodes (SSM). Dit word gesien as die mees toepaslike metodiek vir die ontwikkeling van teorieë binne die paradigma van die konstruktivistiese en interaktiewe landbouwetenskappe. Die ontwerp van die navorsingsproses was gerig op die effektiewe gebruik en analise van die verskillende databronne in die volgende vier fases: a) bestaande teorieë as 'n gids tot prosesontwerp en die versameling van data; b) toepassing van hierdie teorieë in 'n Landcare-projek; c) 'n teoreties gefundeerde, iteratiewe proses van dataversameling en -analise; en d) verkryging van teoretiese en praktiese insigte in die navorsingsprobleme.

'n Aantal teorieë verwant aan aksienavorsing is as bepalend beskou vir die ontwerp van die proses wat in die Bergville-projek toegepas is. Aksienavorsing, leer deur eksperimentering en aksieleer was die basis van die aksienavorsingsbenadering wat saam met die hulpbronarm boere in die Bergville-projek onderneem is. Uit praktiese oorwegings is aksienavorsing gesien as die "oorhoofse metodiek" wat saam met ander benaderings soos SSM, *Farming Systems Approach (FSA)*, *Farmer Participatory Research (FPR)*, *Farmer Field School (FFS)* en M&E toegepas is.

Die aksienavorsing wat in die Bergville-projek gedoen is, is as die "aksie"-fase en primêre bron van data vir die navorsingsbevindings gebruik. Die verskillende dokumente en data wat gebruik is, naamlik projekverslae, 'n persoonlike navorsingsdagboek, "betekenisvolle veranderinge" en M&E-bevindinge, word uitvoerig beskryf. Konvergerende onderhoudvoering (*convergent interviewing*) is gebruik om 'n aanduiding van die volhoubaarheid van die projek-aktiwiteite en -resultate te kry.

Die data-analise en teorie-ontwikkeling volgens 'n veelvuldige metodiek het effektief bygedra tot die konstruering van prakties toepaslike plaaslike teorieë. Kognitiewe kaarte (*cognitive maps*) is saam met 'n algemene SSM-raamwerk gebruik om data-analise, reflektoring, leer en uiteindelijke teoretisering te stimuleer. Drie kognitiewe kaarte is ontwikkel waarin plaaslike teorieë uiteengesit word vir grondvlakinstellings, opleiding van opleiers, boer-tot-boer-voorligting, op-die-plaas-eksperimentering en M&E. Omdat die kognitiewe kaart 'n strukturering (konseptualisering) van 'n komplekse situasie is, is hulle vir beter begrip in fyn besonderhede bespreek.

Die mees geskikte benadering vir 'n sintese van die teoretiseringsresultate was om dit te integreer in 'n verbeterde teoretiese raamwerk wat gerig is op die vernaamste navorsingsvrae. Die voorgestelde metodiek en tegnieke is daarom beskryf volgens 'n iteratiewe stelsel-model waarin die hoof fases van die aksienavorsingsiklus ingesluit is. Die voorgestelde ses fases van die model is: a) rolspeler-analise; b) diagnose; c) strategiese beplanning; d) implementering en bestuur; e) leer en aanpassing; en f) uittasering-strategie. Die verwagte uitkomst van hierdie model is dat dit 'n strategie bied vir die kweek van 'n leerkultuur wat mense in staat sal stel om innoverend en interaktief te wees in die benutting en bestuur van natuurlike hulpbronne en om hierdie bestuur kollektief en op 'n volhoubare wyse te doen.

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CHAPTER 1. INTRODUCTION AND BACKGROUND TO STUDY

1.1. INTRODUCTION

This Chapter outlines the introduction and background for this thesis. This includes the motivation for the study, the history and goals of the National Landcare Programme in Australia and the goals, principles, purposes and themes of the South African National Landcare Programme. Then the Bergville (Emmaus) Landcare project is introduced, followed by a discussion on conservation agriculture, a description of the physical environment of the Bergville study area, as well as its selection and location. Elements such as geology and parent material, soils, physiography and drainage features, climate and vegetation are discussed.

1.2. MOTIVATION FOR THE STUDY

The need for this study originated from my participation in a Landcare project in the Bergville district of the KwaZulu-Natal Province, South Africa. The project ran from 2000 to 2005 and is discussed in detail in **Chapter 4**. The aim of the project was to develop and diffuse Conservation Agriculture (CA) practices among resource-poor farmers living in the Emmaus study area. The challenges this task brought about is well-known to agricultural development practitioners around the world, since what I was essentially facing was introducing a complex technology into a complex and fuzzy situation. Furthermore, according to the outcomes, at the end all evidence had to indicate that the project induced permanent, positive changes and that the participants are empowered with enough new knowledge and skills to be self-reliant. This clearly demanded a special approach that uses a 'family of methodologies' to appraise and change a multitude of social and technical factors leading to more sustainable land management, higher production and food security.

The first dilemma facing researchers trained in natural sciences is the dearth of knowledge and skills they need to design, manage and facilitate such a process. In general, I can categorically state that natural scientists in South Africa are not trained in these aspects and when exposed to such situations, they feel totally left in the dark as to what is required for successfully completing a project. Furthermore, most of these researchers have very few mentors to guide and assist them through the process. The result is usually poorly executed projects not achieving most of the intended outcomes of good research and development projects. Another consequence illustrating the seriousness of the situation is that many researchers' careers have been totally

derailed by falling victim to such a situation; on some occasions even losing their jobs. Researchers facing these challenges are confronted with two choices. Firstly, they could pull out of it and return to their previous research environment and activities, probably dejected and disillusioned with their experiences in attempting to disseminate their new or improved technologies to farming communities dearly in need of it. The second option is to try and equip themselves with the appropriate skills to improve their performance in these situations, either by formal education or self-learning. Neither of these options is easy, since it usually pushes you through a deep self-reflection and re-orientation period leading either to a total withdrawal from these challenges, or a paradigm shift and a change in research practice. The first option could leave you with many disappointments in your own vision and abilities to 'change the world', but at least with the comfort of going back to 'safe and quite waters'. In the second option you are faced with the hard realities of persevering making a new paradigm part of your armament of skills. This includes a new family of methodologies, which would assist you in making a success of any attempt to bring other stakeholders, especially the end-users, into the research process.

My personal experiences that brought me to the point of writing this thesis were a good combination of formal education, research experience and self-learning. My formal B.Sc degree in agriculture was pure natural science and taught me little about rural development. After that I started working at the Agricultural Research Council – Institute for Soil, Climate and Water (ARC-ISCW) in South Africa, but also, on a part time basis, started with my Honours and Masters degrees in Land Use Planning and Rural development at the University of Pretoria. These two courses made me aware of the messy and complex situation to be changed. I learned, *inter alia*, how to apply general frameworks of land evaluation and land use planning, but I learned no more about rural development approaches and processes than a few general concepts and principles. During the same period, in my working environment, I became acutely aware of the inadequacy of the research community, including myself, to bring about change in the farming communities, especially among resource-poor farmers. It was this desire for a more suitable approach and my growing interest in this subject that motivated me to start with a self-learning process. In 1997, I was part of a South African delegation to Australia with the aim to learn more about their LandCare approach. This experience with a vibrant community-based initiative in sustainable use of natural resources was very inspirational, but I still had to learn much more about the nitty-gritty of the approach. In the late 1990s, I was given the opportunity to get involved with Landcare projects run by the ARC-ISCW and from that moment I realised I needed to be better equipped to perform this task successfully.

My choice to adopt a new research approach took me through a steep learning curve. Although this informal self-learning process could be viewed as part of the normal research activities, I view it as a critical part of building my own capacity to be able to follow a suitable approach. My new research approach indeed helped me, I believe, to change the situation, at least partly, that specific communities of resource-poor farmers faced. But at this stage my priorities have again shifted. In doing a formal PhD study, I would be able to transfer these experiences to other researchers and practitioners facing similar challenges around the world. I discovered, however, that I was yet again ill equipped for this task. I learned that this type of research for PhD purposes requires a specific approach and methodologies, which is even further removed from my educational background than the skills required for project design, implementation and management. It was now firstly necessary to equip myself with the basics and later more specific *qualitative and social research methodologies* that would put me in a position to design a sound methodology and then come to useful results and conclusions for my situation. Even though I could see and experience major difficulties developing this methodology, I saw no alternative in writing the thesis under this specific paradigm. This thesis was therefore an attempt to, through an academic research process, ground the development of new, or the improvement of used approaches (theories), on my above-mentioned experiences.

In contrast with our traditional (scientific) understanding, my thesis (writing) makes significant use of the first person, i.e. *I, me* and *we*. Learning from many other internationally acclaimed researchers (e.g. Argyris, 1983; Bawden, MacAdam and Valentine, 1984; Dick, 1993, 1997a, 1999a; McNiff, Whitehead and Lomax, 2003; Patton, 1990, 2002; Röling, 1997; Zuber-Skerritt, 2005), I want to assure the reader that writing in the first person is an acceptable practice, especially for qualitative, interpretive and case study research. This thesis falls within the 'paradigm of constructivism', using a combination of qualitative and social research methodologies such as action research. This assumes that the researcher and the researched object are linked as they interact, that the researcher is part of the investigation and has a significant influence – I have been both subject and object of my own research. From this perspective, my thesis is an expression of my thoughts and experiences and is, for the most part, written in the first-person.

1.3. LANDCARE

1.3.1. LANDCARE IN AUSTRALIA

1.3.1.1. HISTORY OF LANDCARE IN AUSTRALIA

Historically Landcare has its origins in Australia. According to Dames and Moore (1999), Landcare had its beginnings in north western Victoria, Australia, during the mid 1980s, where the community became actively involved in improving the delivery and adoption of soil conservation practices. Since then Landcare has grown into a national movement which engages one third of farmers and many other Australians in action to improve the management of their country's land, water and living resources.

Landcare became a national programme in 1992 when the Australian Soil Conservation Council released *The National Overview of the Decade of Landcare Plan*. The overview highlighted how community and government involvement up until that time had provided an effective foundation to further develop Landcare, through institutional frameworks that supported individuals and community efforts to improve land management performance. From thereon, Landcare policies and programmes were intended to help those with more direct responsibility to make better land management decisions. This included community groups and State, Territory and local governments. In particular, the National Landcare Programme (NLP) provided funding for opportunities to develop and test more effective techniques for sustainable natural resource management in the field (Dames and Moore, 1999).

Subsequently, with the establishment of the Australian National Heritage Trust (NHT) in 1996, the NLP became one of the programmes supported under the Trust. This was associated with an increase in emphasis towards on-ground action that will result in integrated and sustainable natural resource management at the farm, catchment and regional level. In particular, this was directed to development of community initiated and managed projects to address critical issues on public and private land for the public benefit (Dames and Moore, 1999).

1.3.1.2. GOALS OF THE NATIONAL LANDCARE PROGRAMME IN AUSTRALIA

The goal of the Australian NLP is to "develop and implement resource management practices which enhance Australia's soil, water and biological resources. These practices are to be efficient, sustainable, equitable and consistent with the principles of ecologically sustainable development." The NLP's objectives are:

- ❑ to assist in enhancing the long term productivity of natural resources in Australia;
- ❑ to promote community, industry and governmental partnerships in the management of natural resources in Australia;
- ❑ to assist in developing approaches to help resolve conflicts over access to natural resources;
- ❑ to assist in raising the natural resource and business management skills of landholders

Given the nature and philosophy of the NLP, people outputs and outcomes are relevant to all of these objectives. In order to achieve its objectives, the NLP encourages strategic activities that result in on-ground outcomes and increased community capacity for change. Those activities are directed towards: more integrated management of land, water and vegetation at farm, catchment and regional levels; promoting community and natural resource management involvement; and encouraging agricultural practices that are both environmentally sustainable as well as profitable (Dames and Moore, 1999).

1.3.2. LANDCARE IN SOUTH AFRICA

1.3.2.1. GOAL OF THE NATIONAL LANDCARE PROGRAMME

The goal of the National Landcare Programme (NLP) of South Africa is to optimize productivity and sustainability of natural resources resulting in greater productivity, food security, job creation and a better quality of life for all (DoA, 2005).

1.3.2.2. PRINCIPLES OF THE LANDCARE PROGRAMME

According to the Department of Agriculture (DoA, 2005), the principles that define and guide Landcare in South Africa must be explicitly incorporated within any initiative claiming to incorporate Landcare processes and to achieve Landcare outcomes. Philosophically, and at a policy level, Landcare in South Africa is concerned with the application of six indivisible Landcare Principles:

1. *Integrated Sustainable Natural Resource Management* embedded within a holistic policy and strategic framework where the primary causes of natural resource decline are recognised and addressed.
2. *Fostering group or community-based and -led* natural resource management within a participatory framework that includes all land users, both rural and urban, so that they can take ownership of the process and the outcomes.

3. The development of *sustainable livelihoods* for individuals, groups and communities utilising empowerment strategies.
4. Government, community and individual *capacity building* targeting training, education and support mechanisms.
5. The development of active and true *partnerships* between governments, Landcare groups and communities, non-government organisations and industry.
6. The blending together of appropriate upper level *policy processes* with *bottom-up feedback mechanisms*. Feedback mechanisms should utilise effective Landcare institutional frameworks to give voice to Landcare Programme beneficiaries and supporting participants.

1.3.2.3. PURPOSES OF THE SOUTH AFRICAN LANDCARE PROGRAMME

According to the South African Department of Agriculture (DoA, 2005), the NLP has the following purposes:

1. To facilitate the conservation of natural resources (community-based approach), which includes:
 - ❑ A national support system that recognises local support structures or institutions
 - ❑ Participatory legislation, policies, norms and standards implemented to support the wise use of natural resources
 - ❑ Community-based natural resource management
2. To enable sustainable improved productivity, which includes:
 - ❑ Adoption of management practices by all land users, resulting in increased productivity through the improvement of the natural resource base
3. To improve food security, which includes:
 - ❑ Protection of natural resources
 - ❑ Improved productivity of farming systems
 - ❑ Access to food, land and information
 - ❑ Safety and security of food
 - ❑ Quality of food
 - ❑ Off-farm income

4. Empowerment (social, economic and employment equity), which includes:

The purpose of empowerment in Landcare is to enhance economic capacity of land users to achieve self-sufficiency by utilising natural resources in order to:

- ❑ Improve the quality of life
- ❑ Create entrepreneurial skills
- ❑ Diversify income sources
- ❑ Improve infrastructure
- ❑ Invest in human resources

The above purposes of the South African NLP serve as a good 'framework' to initiate or focus any efforts to launch a specific project. My approach in dealing with it was to think holistically and outside the normal positivist and conventional research approaches that advocates a linear transfer of technology. A fresh and innovative approach is needed that promotes sound community-development and empowerment principles and practices.

1.3.2.4. THEMES OF THE LANDCARE PROGRAMME

Landcare themes are grouped into two main areas, namely Focused Investment (WaterCare, VeldCare, SoilCare, Eco-Agriculture Expanded Landcare, JuniorCare) and the Small Community Grants. However, according to the Department of Agriculture (DoA, 2005), it should be noted that strategy aims are not mutually exclusive to individual themes. Landcare project activities may be allocated to more than one theme.

Communities in the Eastern Cape, KwaZulu-Natal and Mpumalanga Provinces fall within the theme of Soilcare. According to DoA (2005), this theme will address the following issues:

- ❑ To build innovative structures to combat soil erosion;
- ❑ To reverse the depletion of soil fertility and reduce soil acidity;
- ❑ To introduce sustainable management of natural resources in a self-reliant manner, while addressing the causes of environmental and resource degradation rather than the symptoms.

In the context of the Soilcare theme of the NLP, various localities in these three provinces were identified as potential study areas where sustainable land management (SLM) practices could be promoted to improve and maintain soil productivity. These areas have relatively high rainfall

and high-potential soils but soil infertility, soil acidity and a lack of sustainable farming systems are major constraints to crop and vegetable production. Apart from addressing the needs and constraints of emerging commercial farmers, there are parts of these areas where thousands of resource-poor farmers rely only on scarce and limited resources to make a living. For the latter farmers constraints such as farm size (usually around 1 ha), land tenure, a lack of access to markets, inputs and credit facilities, a lack of knowledge and skills and limited access to information prevent them from being productive and profitable, or even achieving household food security status.

1.3.3. THE BERGVILLE (EMMAUS) LANDCARE PROJECT

In pursuit of finding land management solutions within the real-life situation characterised by the above-mentioned constraints, the Agricultural Research Council – Institute for Soil, Climate and Water (ARC-ISCW) in South Africa was funded under the SoilCare theme of the NLP to launch a project in the Bergville district, KwaZulu-Natal Province, in 2000. The aim of the Bergville (Emmaus ward) LandCare project was to generate and diffuse sustainable land management technologies for local farmers in order to address soil conservation, crop production and income generation problems. In collaboration with the KwaZulu-Natal - Department of Agriculture and Environmental Affairs (KZN-DAEA), the ARC-ISCW LandCare team started with the project in August 2000 through a step-wise implementation of various participatory processes and activities described by the Farming Systems Approach (FSA) (Smith, Agrella and Mbatani, 2001). According to Matata, Anandajayasekeram, Kiriro, Wandera and Dixon (2001), these steps are:

- a) Diagnosis;
- b) Planning and design;
- c) Implementation / Experimentation and
- d) Monitoring and Evaluation.

The diagnostic survey was conducted in August 2000, which was followed by the planning and design workshop in September 2000. These two phases set the scene for the implementation of planned interventions and activities. The *implementation* process followed a systems approach (Röling, 1997). In the context of the Bergville project, the approach consisted of the development of a soft system (social) platform, which was seen as essential for the management of natural resources (the hard system). The soft system platform involved the facilitation of human activities and the development of local capacity. It implied attention to participatory

methodologies, tools and techniques for the facilitation of adult and action learning; it developed capacity among stakeholders to *learn and adapt*, aiming towards the implementation of sustainable land management practices. Six 'pillars' or strategies were identified for successful soft system platform development during the implementation process of the Landcare project. These pillars were the following:

- ❑ **Awareness and communication** – organising information- and field days to inform various stakeholders of project activities, technologies and achievements.
- ❑ **Local institution building** – the development of vibrant, self-help farmer groups able to learn and adapt and gain access to credit, inputs and markets.
- ❑ **Training-of-trainers** – to develop local leadership through a series of appropriate training courses for leader farmers and extension staff.
- ❑ **Farmer-to-farmer learning** – to facilitate and focus the out- (lateral) scaling or adoption of technology through an effective farmer-to-farmer learning process.
- ❑ **On-farm experimentation using conservation agriculture principles** – to establish researcher- and farmer-managed experiments in order to develop, test and disseminate appropriate technology.
- ❑ **Partnerships** – to improve service delivery to the local community (e.g. training, experimentation and institution building) through the formation of key partnerships.

Various 'action research' methodologies, tools and techniques were used to develop, manage, integrate and improve these six strategies successfully. The main methodologies used were monitoring and evaluation (M&E), soft systems methodologies (SSM) and the farming systems approach (FSA). Some of the prominent tools and techniques were action planning, look-and-learn, focus groups, role play, brainstorming, learning-by-doing, etc. By October 2005 five seasons were completed and funding was terminated at the end of the 2005/2006 season. The duration of the funding cycle plays an important role in the achievement of some project activities and outcomes; new insights and ideas on this issue are discussed in **Chapters 4** and **5**.

1.3.4. CONSERVATION AGRICULTURE

The sustainable agricultural technologies promoted by the ARC-ISCW were primarily based on the principles defined under Conservation Agriculture (CA) Systems (FAO, 2001) and includes the following:

- ❑ **Minimum tillage using specialised implements:** Animal-drawn (140 units) and tractor-drawn (3 units) implements were introduced to the participating farming communities to plant their crops without ploughing.
- ❑ **Multiple-cropping:** Various cropping systems, introducing mostly legume [cover] crops through inter-cropping and rotations, were tested in researcher-managed trials and introduced to participating farmers through farmer-managed trials. The main summer cover (and rotational) crops were cowpeas, lab lab, soyabean and drybean, while the temperate (winter) cover crops were oats, radish and grazing vetch (used as a mixture).
- ❑ **Mulching:** Living or dead biomass [of food and cover crops] were seen as the main source of mulch protecting the soil surface against erosion and evaporation.

Other principles used in the design of sustainable agricultural practices in Bergville were:

- ❑ **Integrated soil fertility and acidity management:** Soil health and fertility were improved through the impact of the multiple cropping and mulching, reducing the need for high amounts of fertiliser. Lime was applied in strips [of about 30 cm on the plant row] on the soil surface, reducing high input costs and soil disturbance.
- ❑ **Integrated pest and weed management:** Multiple-cropping was seen as the main practice (principle) for improved and cost-effective management of pests and weeds. Agro-chemicals, mainly applied through a knapsack-sprayer, were introduced as alternative for the control of pest and weeds.

Conservation Agriculture (CA), understood in this way, provides a number of advantages on global, regional, local and farm level (FAO, 2004):

- ❑ It provides a truly sustainable production system, not only conserving but also enhancing the natural resources and increasing the variety of soil biota, fauna and flora (including wild life) in agricultural production systems without sacrificing yields.
- ❑ CA fields act as a sink for CO₂ and conservation farming applied on a global scale could provide a major contribution to control air pollution in general and global warming in particular. Farmers applying this technique could eventually qualify for CO₂ bonus points.

- ❑ Soil tillage is among all farming operations the single most energy consuming and thus, in mechanized agriculture, air-polluting operation. By not tilling the soil, farmers can save between 30 and 40% of time, labour and, in mechanized agriculture, fossil fuels as compared to conventional cropping.
- ❑ Soils under CA have very high water infiltration capacities reducing surface runoff and thus soil erosion significantly. This improves the quality of surface water reducing pollution from soil erosion, and enhances groundwater resources. In many areas it has been observed after some years of conservation farming that natural springs that had disappeared a long time ago started to flow again. The potential effect of a massive adoption of conservation farming on global water balances is not yet fully recognized.
- ❑ The system depends on biological processes to work and thus it enhances the biodiversity in an agricultural production system on a micro- as well as macro-level.
- ❑ Although CA helps to reduce the use of external inputs, it is by no means a low output agriculture and allows yields comparable with modern intensive agriculture but in a sustainable way. Yields tend to increase over the years with yield variations decreasing.
- ❑ For the farmer, CA is mostly attractive because it allows a reduction of the production costs, decrease in time and labour, particularly in peak times like planting; in mechanized systems it reduces the costs of investment and maintenance of machinery in the long term.

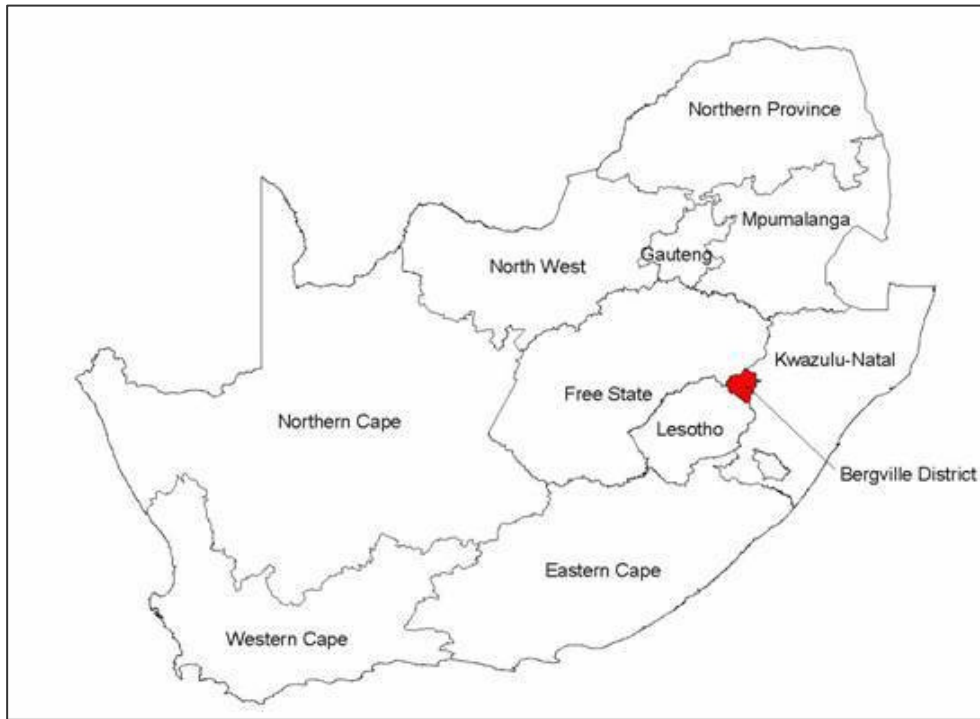
It is believed that a shift to CA would bring substantial economic, social and environmental benefits to farming communities over the short- and long-term. Evidence suggests that in the longer term (five to ten years) yields in CA will recover to target levels as farmers become more skilled and able to manage their new production systems. In the United States, for example, the top 25 % of CA farmers now have better gross margins and better yields than the top 25 % of their counterparts using conventional tillage systems. Widespread adoption of CA would have a significant redistributive effect on productive capacity. A significant finding is that farmers that at present produce only low and medium yields - the poorest - will benefit more in terms of increased food production than those already enjoying high yields.

1.4. DESCRIPTION OF PHYSICAL ENVIRONMENT OF THE BERGVILLE STUDY AREA

1.4.1. SELECTION AND LOCATION OF STUDY AREA

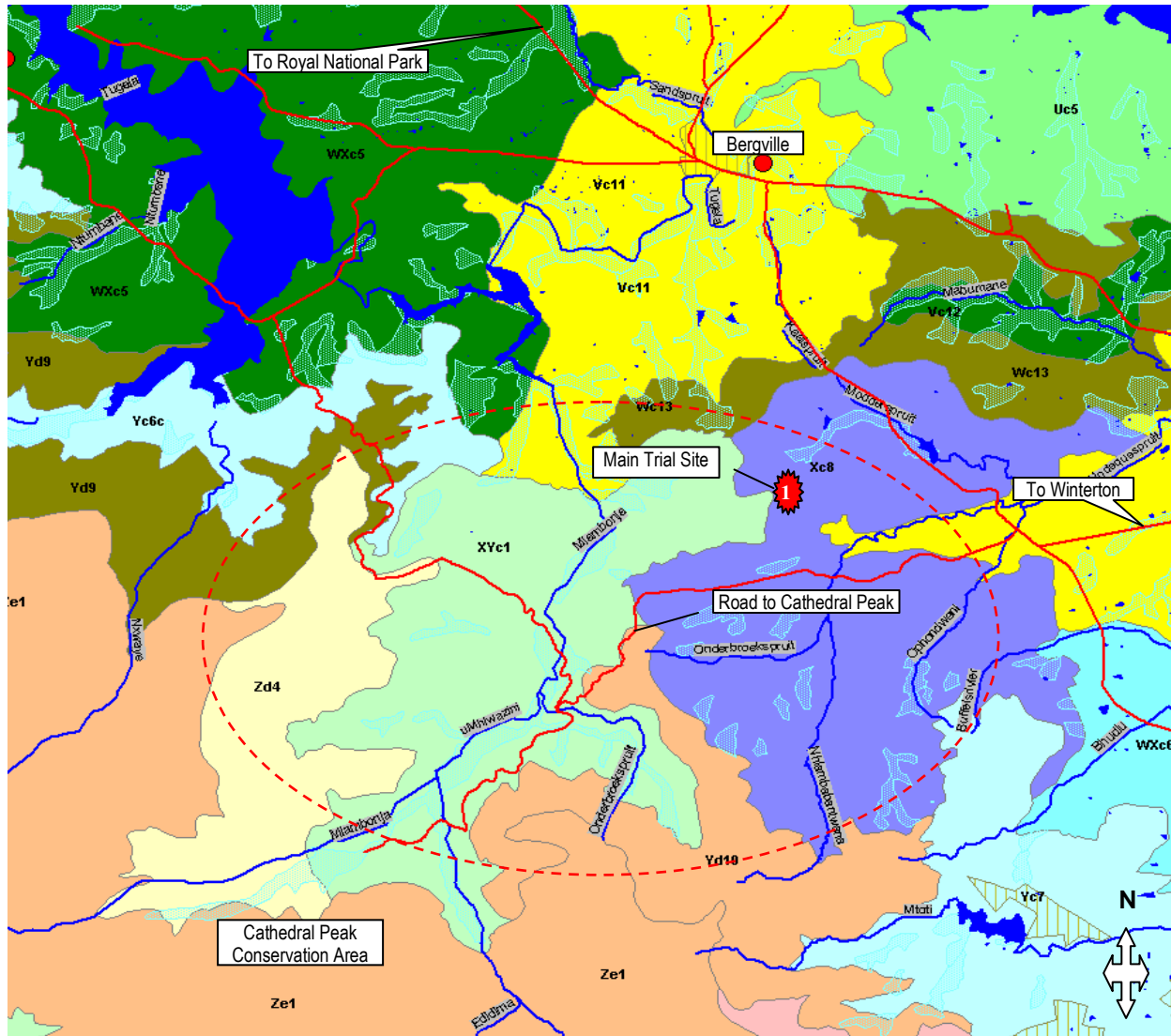
The ARC-ISCW went through the formal channels of the KwaZulu-Natal - Department of Agriculture and Environmental Affairs (KZN-DAEA) in mid-2000 to determine the selection of the project site in areas where problems with soil fertility and acidity prevail. Formal discussions were

conducted with stakeholders on Provincial (Cedara), Regional (Ladysmith) and district (Bergville) levels to get agreement and approval on the selection. Presentations and discussions of the project business plan took place through existing structures (meetings) on all these levels. During discussions with departmental staff on district level, which included the local extension officers, a decision was made to initiate the project in the Emmaus ward of the Bergville district, since similar projects were already launched in other parts of the district (See **Map 1.1** for a location of the study area). After successful discussions with the traditional authorities, a meeting was set up with farmers in the Potshini community when the extension officers identified it as a potential site for the main trial.



Map 1.1. Location of the study area in South Africa (Smith *et al.*, 2001)

The Emmaus area, in the south of the Bergville district, comprises communal farmland adjacent to the Emmaus / Cathedral Peak road stretching from east to west in the south-eastern part of the Bergville district. The area lies in the foothills of the Drakensberg where soil erosion, nutrient depletion, soil acidity and low soil organic matter are major soil productivity and agricultural production-limiting problems (See **Map 1.2** for a distribution of natural resources in the study area).



Map 1.2. The spatial distribution of Bioresource Units (BRUs) in the study area (Camp, 1995)

Map Legend:

- - - Rough boundary of study area
- Main tar road
- Rivers and streams
- BRU boundaries

Soils in major BRUs of study area:

Xc8 - 63.0% arable; 20.2% high potential; 30.7% shallow; 17.0% moderate to poor drainage soils.

XYc1 - 60.4% arable; 11.4% high potential. 25.4% shallow soils; 18.4% moderate to poor drainage soils.

There are also huge problems with human (i.e. skills, knowledge and health), physical (i.e. infrastructure), financial (i.e. money) and social (i.e. groups and networks) 'capital' among the communal farmers in the area. These farmers mostly use mixed-maize cropping systems on approximately 1 ha of arable land. Most farmers have some livestock, ranging from 3 to 30 cattle and possibly a number of sheep, which graze on the communal grazing land in the steeper mountainous areas. In the winter months the livestock graze the crop residues on the fallow croplands.

1.4.2. GEOLOGY AND PARENT MATERIAL

The target area is underlain by sandstone and mudstone of the Tarkastad Formation, Beaufort Group in the west and by shale and sandstone of the Estcourt Formation, Beaufort Group in the east. The Tarkastad Formation is described as comprising fine to medium grained yellow and grey sandstone and maroon (red) to green and blue mudstone (Geological Survey 1981a; Geological Survey 1981b; as quoted by Turner, 2000). The Estcourt Formation is described as comprising dark-grey shale (often carbonaceous), siltstone and fine and medium to coarse sandstone (Geological Survey, 1981a; Geological Survey, 1988b; Geological Survey, 1988c; as quoted by Turner, 2000).

1.4.3. SOILS

Camp (1995) defined Bioresource Units (BRUs) in KwaZulu-Natal as an ecological unit within which factors such as soil type, climate, altitude, terrain form and vegetation display a sufficient degree of homogeneity. Appropriate land use practices and production techniques can be defined for each unit. The dominant BRU in the study area is BRU XYc1, of which 60.4% of the BRU is arable. 11.4% of the arable land is high potential. Shallow soils occupy 25.4% of the BRU. Soils of moderate to poor drainage occupy 18.4%. The two other sub-dominant BRUs are BRU Xc8 and Yd10. **Map 1.2** display the spatial distribution of the BRUs in the study area. All BRUs in the study area have high production potentials for dryland crop production. The average yield one could expect on suitable soils for the following range of crops are: Maize = 5.9 ton ha⁻¹; Soyabean = 4.5 ton ha⁻¹; Oats = 4.1 ton ha⁻¹; Ryegrass = 9.9 ton ha⁻¹. The major soil patterns within the BRUs in the study area are described as follows:

Four major soil patterns are evident on the sandstone and mudstone of the Tarkastad Formation (Turner, 2000). Two of these soil patterns are comprised of soils with major agricultural importance

in terms of dryland crop production. The first pattern is a red and yellow-brown apedal soil pattern where dystrophic sandy loam and sandy clay loam soils are dominant. The red clay soils (Hutton Soil Form), while forming an integral part of this soil pattern, are probable derived from dolerite and as such should be read in association with the sandier soils developed from the sandstones and mudstones of the Tarkastad Formation. The second soil pattern, the plinthic soil pattern, is comprised dominantly of mesotrophic Avalon soils. Pinedene, Clovelly and Oakleaf soils are also present, with a proportion of dystrophic soils. The two remaining soil patterns, which are of less importance (or lower potential) in terms of dryland crop production, are the duplex soil pattern dominated by Valsrivier soils and the lithosolic soil pattern dominated by Glenrosa and Mispah soils (Turner, 2000).

Seven major soil patterns are evident in the soils derived from the dark grey shale, siltstone and sandstone of the Estcourt Formation (Turner, 2000). Two of these soil patterns comprise soils of major agricultural importance in terms of dryland crop production. The first is a red and yellow apedal soil pattern with Hutton, Griffon and Clovelly soils being dominant and with Katspruit, Mispah and Glenrosa soils subdominant. In the plinthic soil pattern Avalon, Glencoe, Longlands, Wasbank and Westleigh soils are present together with Mispah, Glenrosa, Cartref soils and rock land. A detailed soil and site description of the main trial site at Potshini is shown in **Appendix 1**.

1.4.4. PHYSIOGRAPHY AND DRAINAGE FEATURES

The physiography of the eastern part of the study area, where the Estcourt Formation is exposed, range from strongly undulating land to low mountains, with only limited areas of gentle slope. Undulating hills and lowlands and in places low mountains are encountered. The western part of the study area, which stretches into the foothills of the Drakensberg (Cathedral Peak area) have undulating hills and low mountains with only limited land of flatter slopes (Kruger, 1983; as quoted by Turner, 2000). Altitude ranges from 1000 m in the east to about 1700 m in the foothills of the Drakensberg. Drainage is mainly via the Mlambonja river and Lindeque spruit.

1.4.5. CLIMATE

The target area falls within the Highland Sourveld (Moist) Bioclimatic Region of KwaZulu-Natal. Mean annual rainfall ranges between 750 mm in the east to above 1000 mm near Cathedral Peak. The mean annual temperature ranges between 16 and 18 °C. Frost is severe to very severe in winter and hail is sporadically severe in summer (Webster, 1990; Guy and Smith, 1995).

According to Smith, Trytsman, Bloem, Everson and Mthethwa (2005), the Potshini area (i.e. the main trial site in Emmaus) has mainly summer rainfall with rain from August to May with the mean annual temperature (T_{ave}) around 17.4 °C. The average data for the past 28 years are presented in **Figure 1.1**.

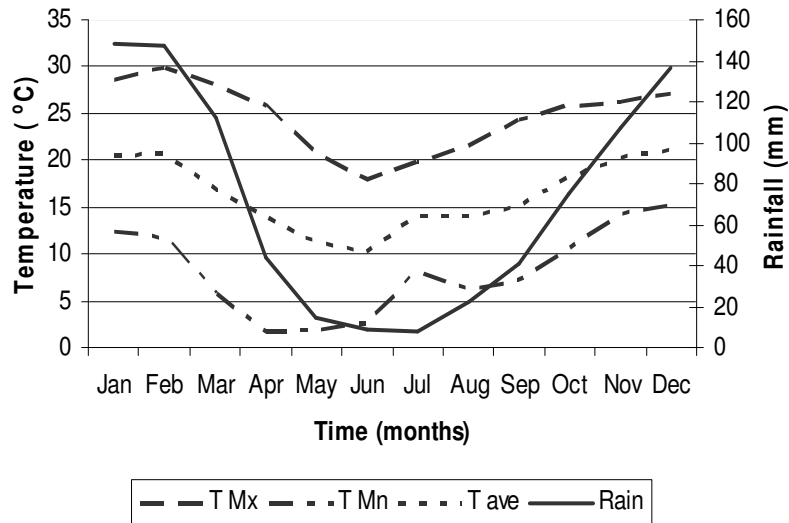


Figure 1.1. Long-term (28 years) climatic data for the Bergville district (Smith *et al.*, 2005)

Figures 1.2 and **1.3** show the distribution of rainfall at the pilot study area over four seasons compared to maize production. The total in-season rainfall (November to April) for the season 2000/2001 was 705 mm, 642 mm for the 2001/2002 season, 524 mm for the 2002/2003 and 582 mm for the 2003/2004 season. The lower yields of the second season (2001/02) can be explained by the rainfall distribution during the critical growth period (January to March) of the maize. A lack of sufficient rain during that period in season 2 (especially February and March), as shown in **Table 1.1**, placed the maize under a lot of stress, causing some plants to die, while others gave a lower biomass yield. The rainfall increased later in the season but by that time it was too late for the maize plants to recover, since the vegetative growth period was over. In season 3 there was a relatively dry period from February to March, although the severe drought in November led to poor emergence and replanting in December and consequently yield losses. In season 4 the lowest average yields were recorded (2.71 ton ha⁻¹), but not the lowest in-season rainfall (582 mm). However, two weeks after crop emergence on the 7th December, a serious hailstorm caused a lot of damage to the small maize and soyabean plants, illustrating the risk of hail damage to crops in the area. It would seem that soyabean recovered very well from the

damage and recorded the highest yields, but the damage to the maize had a negative effect on the yield. Another factor might have been the lower than normal average temperatures during the growing season (Table 1.1) which could have had an effect on the heat-units available.

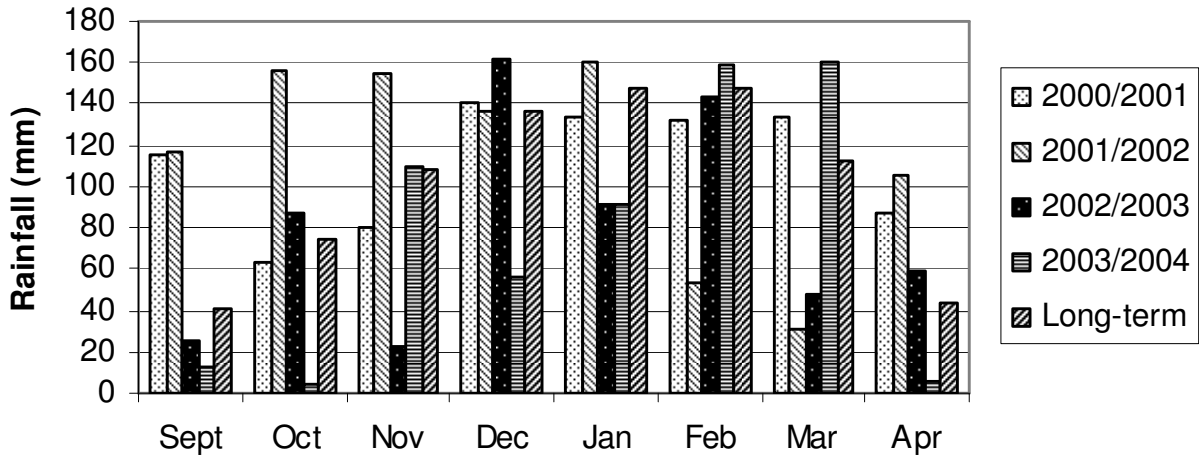


Figure 1.2. Long-term (n=28) rainfall distribution through the growing season compared to four seasons (2000 to 2004) at Potshini, Bergville district (Smith et al., 2005)

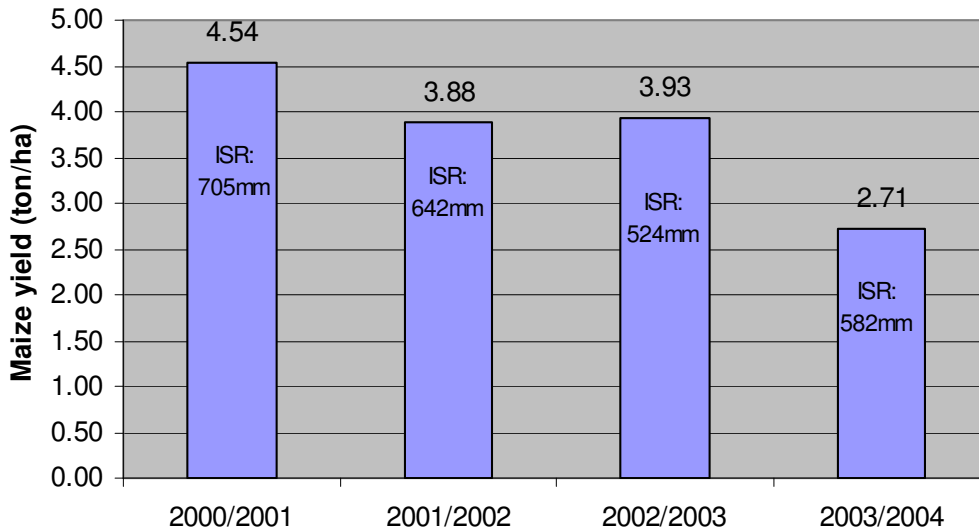


Figure 1.3. Average maize yields at the Potshini trial site compared with in-season rainfall over four years (ISR: In-season rainfall from November to April) (Smith et al., 2005)

Table 1.1. Maximum temperature and total rainfall for the 3 months during the critical growth period (Smith *et al.*, 2005)

	January		February		March	
	Temperature (°C)	Rainfall (mm)	Temperature (°C)	Rainfall (mm)	Temperature (°C)	Rainfall (mm)
2001	30.6	133.3	27.4	131.9	28.2	133.4
2002	30.0	160.0	27.4	54.1	29.5	30.9
2003	28.6	161.5	29.8	142.9	27.9	47.5
2004	26.9	91.8	26.9	158.9	24.8	160.4
Long-term	29.6	148.0	28.8	147.6	28.0	112.6

1.4.6. VEGETATION

Camp (1999) defined Bioresource Groups (BRGs) for KwaZulu-Natal as a specific vegetation type characterised by an interplay of climate, altitude and soil factors. The dominant BRG in the study area is 'Moist Transitional Tall Grassland' of which the growing season yield for veld is 2500 kg dry matter per hectare. This yield is usually produced over 250 days. The average grazing capacity, which will vary due to veld condition, is 2.0 ha/AU. In the west of the study area (closer to the Drakensberg escarpment) the vegetation is largely from the Montane Veld BRG (North-eastern Mountain Grassland) and Moist Highland (Upland) Grassland. In the east the vegetation is described as Moist Tall Grassland or Moist Cool Highland Grassland (Camp, 1999; Low and Rebelo, 1996). According to Webster (1990), the veld is sour, but has a good early-season growth and palatability, deteriorating rapidly after mid-summer. It has very little value in winter and some areas are severely degraded.

The most extensive plant association in the Moist Transitional Tall Grassveld is *Themeda-Hyparrhenia* grassland with *Hyparrhenia hirta* dominating much of the veld, particularly disturbed veld. Long-term overgrazing is indicated by a dominance of *Eragrostis curvula*, *Eragrostis plana* and *Sporobolus africanus*. Where selective overgrazing has occurred, particularly by sheep, *Elionurus muticus* has increased in relative abundance. On leached soils, particularly on south facing aspects, taller, sour grasses such as *Cymbopogon excavatus* is found and the palatability of these areas is low (Camp, 1999).

The characteristic feature of the Moist Tall Grassland is the abundance of thatch grass, *H. hirta*, and sparsely scattered paperback acacias, *Acacia sieberana*. *Themeda triandra* is the dominant grass on veld that has been well managed in the past. Many species common to the Moist Transitional Tall Grassveld and the Highland Sourveld are prominent, particularly in the moist upland areas. These include *Diheteropogon filifolius*, *Harpochloa falx* and *Trachypogon spicatus*. *Eragrostis racemosa* and *Microchloa caffra* are dominant on shallow soils. *Cymbopogon excavatus* and *C. validus* are found on south-facing aspects, often growing in clumps (Camp, 1999).

Overgrazed areas of veld become dominated by mtshiki species, *Eragrostis curvula*, *E. plana*, *Sporobolus africanus* and *S. pyramidalis*. These areas have a reduced grazing capacity and the grazing value deteriorates early in the season. *H. hirta* is a highly palatable grass in the spring, but loses its grazing value as the flowering culms develop. The characteristic feature of this BRG in the summer months is the tuftiness of the veld, with tall ungrazed tufts of *H. hirta* in short-grazed sward (Camp, 1999).

1.5. SUMMARY AND CONCLUSION

The need for this study originated from my participation in a Landcare project in the Bergville district of the KwaZulu-Natal Province, South Africa. As with most development projects, at the end all evidence was required to indicate that the project induced permanent, positive changes and that the participants are empowered with enough new knowledge and skills to be self-reliant. A key in achieving this outcome is to change to a new paradigm, which includes a family of methodologies that would assist in bringing other stakeholders, especially the end-users, into the research process. Through my personal experiences in formal education, research practice and self-learning, I became acutely aware of the inadequacy of the research community, including myself, to change the situation in the farming communities, especially among resource-poor farmers. This led to my choice of adopting a new research approach, which took me through a steep learning curve. However, it was firstly necessary to equip myself with the basics and later more specific *qualitative and social research methodologies* that would put me in a position to design a sound methodology and then come to useful results and conclusions for my thesis.

Historically Landcare had its beginnings in north western Victoria, Australia, during the mid 1980s, where the community became actively involved in improving the delivery and adoption of soil

conservation practices. Later, Landcare in Australia was associated with an increase in emphasis towards on-ground action that will result in integrated and sustainable natural resource management at the farm, catchment and regional level. In particular, this was directed to development of community initiated and managed projects to address critical issues on public and private land for the public benefit.

In the context of the Soilcare theme of the South African National Landcare Programme (NLP), the ARC-ISCW in South Africa was funded to launch a project in the Bergville district, KwaZulu-Natal Province, in 2000. In the context of the Bergville project, the approach consisted of the development of a soft system (social) platform, which was seen as essential for the management of natural resources (the hard system). Various 'action research' methodologies, tools and techniques have been used to develop, manage, integrate and improve the 'platform' successfully. The sustainable agricultural technologies promoted by the ARC-ISCW were primarily based on the principles defined under Conservation Agriculture (CA). It was believed that a shift to conservation agriculture would bring substantial economic, social and environmental benefits to farming communities over the short- to long-term.

Most arable soils in the study area have high production potentials for dryland crop production. The physiography of the study area ranges from strongly undulating land and low mountains to limited land of flatter slopes. Drainage is mainly via the Mlambonja river and Lindeque spruit. The study area falls within the Highland Sourveld (Moist) Bioclimatic Region of KwaZulu-Natal. Mean annual rainfall ranges between 750 mm in the east to above 1000 mm near Cathedral Peak. The mean annual temperature ranges between 16 and 18 °C. The dominant BRG in the study area is 'Moist Transitional Tall Grassland'.

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CHAPTER 2. RESEARCH APPROACH, METHODOLOGY AND PROCESS

2.1. INTRODUCTION

This Chapter outlines the research methodology and process used to investigate the two sub-problems (See **Section 2.2.**), which would lead to the facilitation of action research among resource-poor farmers for sustainable management of natural resources. The goal of the study, rationale for the research approach, the research approach itself and the methodologies used, the research process and the strategy to improve the quality of the research process are discussed.

Given the nature of action research, the methodological design in this study can not be fully detailed in advance and then rigorously and inflexibly implemented. The research design has been emergent, meaning it developed progressively, influenced by the progressive analysis that were made (Allen, 2000). This means that one typically initiates such an investigation with an ill-structured problem, and that this ill-structured problem is developed in the course of inquiry (Haig, 1995). So one of the basic tasks of the scientific inquiry in this thesis was to better structure the research problems by building in the various required constraints as the research process proceeded.

2.2. GOAL OF STUDY

To develop or improve theories that would facilitate action research among resource-poor farmers for sustainable management of natural resources in South Africa.

2.2.1. SUB-PROBLEM 1:

How can appropriate concepts and methodologies be integrated and designed to facilitate action research with resource-poor farmers and other stakeholders?

2.2.2. SUB-PROBLEM 2:

How can action research methodologies and tools empower resource-poor farmers and other stakeholders in sustainable natural resource management?

2.3. RATIONALE FOR RESEARCH APPROACH

In the beginning of this research study, there was a great need to access the methodological literature. Without this, it would have been harder to offer sufficient justification for my choice of paradigm and methods. As Dick (1997b) suggested, there are two methodological literatures I had to investigate. One is directed towards bringing about change, e.g. among 'project' participants – this literature is briefly discussed in **Section 2.3.1, 2.3.2** and **2.5.1** and is described in more detail in **Chapter 3**. The other literature is about qualitative research methodologies which were selected as the most appropriate for this study. The purpose of the methodological literature described in **Section 2.4** is therefore to justify my choice of research approach, methodologies and framework, and to present my particular research process as suited to the situation in **Section 2.5**.

2.3.1. CONSTRUCTIVISM AND INTERACTIVE AGRICULTURAL SCIENCE

This section deals with the first question of "Have I taken into account the literature on bringing about change in the situation I am researching?" It also serves as an introduction and motivation why we need to use this 'family of methodologies' that brings about change. A thorough discussion of existing and relevant theories and models follows in **Chapter 3**.

Röling (1997) made the point that quantitative and quasi-casual studies carried out by social scientists are, in themselves, insufficient for understanding the human factor in sustainable land use. He stated that constructivism (vs positivism) is increasingly accepted as a description of the way we acquire knowledge, including the way natural scientists develop 'facts'. Guba (1990) stated that, unlike scientific methodologies, constructivist methodologies claim no special status for a particular way of investigation and rather than impose a general set of methodological principles on all forms of experience, the constructivist will adapt both design and method for investigation to the nature of the phenomenon at hand. For social scientists who tried to bring the human factor to bear on land use, a constructivist perspective is essential because people's activities can best be understood on the basis of how they construct reality, and not by some causal factors that a scientist 'reveals'. The lingering logics of causes and reasons, as well as a lingering positivist realism, are key problems in bringing the human factor into agricultural science.

“The epistemological basis of constructivism assumes that the researcher and the researched object are linked as they interact. The ‘findings’ are literally created as the investigation and learning process proceeds (Hamilton, 1995).

The methodology of constructivism is to elicit and refine individual constructions through interactions between and among the researcher and the respondents as they observe and interact with material phenomena. Conventional hermeneutical (i.e. interpretation) techniques are used to interpret the various constructions and these are compared and contrasted through dialectical debate. The final aim is to distil a more informed construction. This construction may be joined from others or done through consensus building” (Hamilton, 1995).

Hence, agricultural science must deal with human intentionality itself, instead of assuming it. According to Rölöing (1997), the findings of social science research can re-enter society ... which might change the very behaviour about which the scientific pronouncement was made. With social science one can certainly affect human behaviour, the key factor in the quest for a sustainable society. But, according to Rölöing (1997), the trillions of words social science has produced *about* humans have hardly affected society. Participatory approaches which involve people in constructing their own reality (possibly with the aid of models) and agreeing on their reasons for collective action promise to be much more powerful. As Guba (1990) put it: “to understand what is distinctly human in shared experience, the knower must participate in the known. Constructivist methodology sees this participation, this interaction if you will, as necessary to the acts of discovery and interpretation. Without such participation, there can be no truly constructivist or interpretive inquiry.”

Hamilton (1995) made a summary of the strengths, weaknesses, opportunities and constraints of constructivist approaches, which shed some light as to where constructivist approaches have the capacity to deliver the required outcomes, and hence, are a preferred approach to positivist realist approaches, such as transfer of technology (TOT) (see **Table 2.1**).

Table 2.1. Summary of the strengths, weaknesses, opportunities and constraints of constructivist approaches (Hamilton, 1995)

<p>Strengths:</p> <ul style="list-style-type: none"> ▪ Accommodates the complexity of the situations where it is applied ▪ Leads to new thinking about the problem situation ▪ Encourages multi-disciplinary thinking about the problem situation ▪ Enables participants to work without a 'sense of unease' – it expands the comfort zone ▪ Is an iterative and flexible approach rather than a prescriptive approach, and ▪ Is an experiential learning-in-process approach 	<p>Opportunities:</p> <ul style="list-style-type: none"> ▪ Capacity to refine ideas on an on-going basis ▪ Enables the use of hard systems approaches and reductionist methods where they are appropriate ▪ Gives rapid feedback ▪ Is able to be used by anyone, anywhere and is not dependent on the involvement of a 'highly educated' specialist, and ▪ Is better suited for qualitative data collection and sense making of the 'richness' of complex situations
<p>Weaknesses:</p> <ul style="list-style-type: none"> ▪ Does not allow for quick solutions ▪ Does not lead to a single or minimum number of solutions ▪ Does not lead to clear solutions ▪ The outcome is unknown and unknowable until it is arrived at 	<p>Constraints:</p> <ul style="list-style-type: none"> ▪ Requires freedom of expression ▪ Requires non-experts to work in experts domain of expertise ▪ Requires the recognition of the potential to fail ▪ Requires openness and modesty ▪ Requires a suitable work environment ▪ It is not restrictive to a particular domain of knowledge or area of interest

A radically different way to study reasoning and intentionality is, therefore, interaction, i.e. the active participation of those being researched in the construction of the 'findings' about themselves, a most curious procedure from a positivist causal point of view. Yet, it is a very powerful procedure. And we have little choice but to take it seriously if we want to change the collective impact of selfish human activities on the biosphere (Röling, 1997). Röling (1997) goes further by saying that neither causal reasoning, nor policy 'instruments', nor mass educational campaigns to educate the public, lead to change in activity. So what is left?

What is left is shared learning, negotiation, accommodation of conflicting goals, building rich pictures from multiple perspectives, consensual approaches to the resolution of distributive resources, covenants among stakeholders in natural resources, but above all agreement to do things differently and collective action based on shared learning at different levels of social aggregation. In other words, what is left are solutions which emerge from *interaction*. And with them comes a different portfolio of interventions, including mediation to resolve conflicts, facilitation of learning and participatory approaches that involve people in negotiating collective action. The future emerges from interaction (Röling, 1997).

What does this mean for agricultural science? According to Röling (1997) it means that research results and tools, such as computer-enhanced modelling and experimentation, become tools for interactive learning, i.e. they are not so much models for learning by scientists with some vague assumed impact on policy or public opinion, they are first and foremost tools for learning by land users themselves. Sustainable land management has to become an enthusiasm. There seems no other way to go. That is why Röling coined the phrase 'interactive agricultural science'.

2.3.2. METHODOLOGICAL PERSPECTIVE ON THESIS RESEARCH

Following from above, all approaches embedded in interaction and constructivism have one thing in common: they contain people interested in trying to take *purposeful action*. According to Checkland and Howell (1998), the idea of a set of activities linked together so that the whole set, as an entity, could pursue a purpose was taken to be a new kind of system concept, called a 'human activity system'. In building and investigating models of such systems, e.g. through research, it is necessary to declare the set of values and methodology appropriate for doing that. Many studies (e.g. Checkland and Howell, 1998; Checkland, 1981; Checkland and Scholes, 1990) have put such methodological approaches to tackling real-world problems firmly within a framework (paradigm) of *systems thinking* and *interpretive action research*. The nature of this methodology was well captured by Bülow (1989; as quoted by Checkland and Howell, 1998):

"... a methodology that aims to bring about improvements in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never ending."

Checkland and Howell (1998) described the essence of this methodology as a “continual construction and re-construction of social reality in dialogue and discourse among human beings, and in action which they take. Researching social reality then becomes an organised discovery of how human agents *make sense* of their perceived worlds, and how those perceptions change over time and differ from one person or group to another.” According to Walsham (1995), “interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors and that this applies equally to researchers. Thus there is no objective reality which can be discovered by researchers and replicated by others, in contrast to the assumptions of positivist science. Our theories concerning realities are ways of making sense of the world and shared meanings are a form of intersubjectivity rather than objectivity.”

According Checkland and Howell (1998), “the approach involves the researcher immersing himself or herself in a human problem situation and following it along whatever path it takes as it unfolds through time. Checkland and Howell (1998) stressed, however, the need for an intellectual framework of ideas, a framework which define and express what constitutes ‘knowledge’ (theories) about the situation researched. The research might lead to the framework being modified, or, in an extreme case, abandoned; but without a declared-in-advanced epistemological framework it is sometimes difficult to distinguish researching from novel writing”. Following from this methodological perspective, the research approach and methodologies used in this thesis for theory development in an interactive agricultural science context, will be discussed below.

2.4. RESEARCH METHODOLOGIES

2.4.1. COMBINING MULTIPLE METHODOLOGIES

There is a distinct tradition in the literature on social science research methods that advocates the use of multiple methods (e.g. Baskerville and Pries-Heje, 1999; Dick, 2006; Jick, 1979; Kock, 2002; Mingers, 2000; Wastell, 2001; Yoong and Pauleen, 2004). Many of these authors use a combination of action research, grounded theory and soft systems methodology (SSM) (These methodologies will be described in more detail later). For example: grounded theory analysis is often included within an action research study; the

action research is chosen for its support of action; the grounded theory is assumed to provide rigour. This form of research strategy is usually described as “one of convergent methodology, multi-methodology, convergent validation or triangulation” (Jick, 1979). Triangulation is broadly defined by Denzin (1978; as quoted by Jick, 1979) as “the combination of methodologies in the study of the same phenomenon”. The main intention to combine methodologies is “to add rigour and reliability to the theory development process” (Dick, 2006). According to Jick (1979) the effectiveness of triangulation (combination) rests on the premise that the weaknesses in each single method will be compensated by the counter-balancing strengths of another. That is, it is assumed that multiple and independent measures do not share the same weaknesses or potential for bias (Rohner, 1977; as quoted by Jick, 1979). In that respect the combination [of methodologies] can be very effective. The theory and the theory-building process are made evident and therefore more open to challenge. The apparent rigour of the research is enhanced in the eyes of some critics (Dick, 2006).

One of the problems that emerged from literature, however, is that “those who most strongly advocate triangulation fail to indicate how this triangulation is actually performed” (Jick, 1979). This problem is even more evident when it comes to theory building, especially using action research - many authors “talk about the importance of theory and practice, but few say how to do it” (Dick, 2006). Dick (2006) emphasised that “in much of the action research literature the theory building step isn't as evident”. Fortunately, there is a clear indication that theory building is a strong feature of action research (Baskerville and Wood-Harper, 1996), SSM (Checkland, 1981; Checkland and Howell, 1998) and, of course, grounded theory (Glaser and Strauss, 1967). Based on these insights, my hypothesis is that a combination of the above-mentioned methodologies, i.e. grounded theory, action research and SSM, would be the most appropriate combination for developing theories within the paradigm (practices and principles) advocated by constructivism and interactive agricultural science described above. The question was still how exactly I could combine these three methodologies in my specific situation in a sensible and effective manner. To start off, I investigated: a) the advantages that each of these methodologies could bring to my situation, and b) the application of each methodology within my research approach. As a result of this exercise I found the use of different methodologies most useful in different phases and processes. The following arguments were consequently used as motivation for using each methodology in the design of the research approach of this thesis:

- ❑ **To use grounded theory for theoretical understanding and data collection.** Firstly, I found the manner in which grounded theory treats literature and other data sources particularly useful to my situation. Secondly, although participation in action research activities is generally highly valued, doing the thesis research individually (i.e. non-participatory or alone) was unavoidable and was another grounded theory practice I viewed as useful for my thesis research (See discussion below).

- ❑ **To use the cyclic nature of action research.** In using repeatable reflection cycles (iteration) to ground the theory in experience formed the crux of the methodology for my thesis. The use of other methodologies complimentary to action research, e.g. monitoring and evaluation, assisted this process.

- ❑ **To include SSM in data analysis and theory building.** In contrast with the usual approach of using grounded theory to make data analysis and theory building more systematic and rigorous, I found a combination of action research, SSM and cognitive mapping more suitable to my situation. Since this study used multiple data sources that varies greatly in origin and nature, the use of 'coding' in grounded theory analysis would have certainly been very difficult to execute and would drastically slowed down the process.

I argued that grounded theory, action research and SSM have key similarities. One important feature is that they all develop theories grounded in data. In that sense I thought of them as interchangeable to some extent, at least in applying them in this thesis. A description of the characteristics and use of the three methodologies used in this research approach follows.

2.4.2. ACTION RESEARCH

According to Allen (2000), the term 'action research' can be regarded as an umbrella term that includes several traditions of theory and practice. It is broad enough to include, for instance, soft systems methodology (Checkland, 1981, 1985) and Guba and Lincoln's (1989) fourth-generation evaluation (or participatory monitoring and evaluation). Other terms including participatory research, action learning, praxis research, participatory inquiry, collaborative inquiry, action inquiry and cooperative inquiry are also used in the literature. Action research could therefore be defined as a family of research

methodologies which pursue action (or change) and research (or understanding) at the same time (Dick, 1997a). In general it does so by alternating action and critical reflection, or as described by Kemmis and McTaggart (1988), using a cycle of plan, act, observe and reflect. Theory and practice are integrated (Dick, 2001b). Dick (2003) explained that during critical reflection theory emerges in the form of an understanding of what happened, and how. The understanding helps in planning the next action. This is important since action research (and SSM) goes further than grounded theory in that it usually continues into action. According to Dick (2003), all action research shares a commitment to both theory development and actual change. The aim [of action research] is to achieve change while developing theoretical understanding.

Beilin and Boxelaar (2001) stated that within the emerging participatory approach to agricultural extension, many social researchers adopt an action research approach. Action research methods aim to integrate theory and practice by working *with* people rather than *for* people. Furthermore, action researchers have highlighted the need for social research to be focused on developing practical outcomes. This approach is a response to traditional academic research that emphasises the development of theory, yet seems unconcerned or unable to affect practical outcomes or change.

According to Baskerville and Wood-Harper (1996), action research is a fine theory discovery method. Dick (2006) stated that action research theorising is associated with reflection. While reflecting on what happened, the action researcher forms assumptions about what occurred and why, and then tests these assumptions by acting on them. Stringer (1999; as quoted by Dick, 2006), for example, explicitly equates such assumptions with theory. For the most part no process is given for doing this. One acts, and reflects on the action. From the reflection theory emerges. Beilin and Boxelaar (2001) also argued that this reflexivity is theory building. They view it as important because 'it builds theory and informs practice'. Beilin and Boxelaar (2001) furthermore described sense-making (theorising) as a retrospective process. We make sense of a lapsed experience or action to which many possible meanings could be attached, by selecting meanings, imposing coherence and framing things in a way that is congruent with our sense of self and our values and norms.

As seen above, in much of the action research literature the theory building step isn't as evident. There are a few examples, however, that indicate how action research was

used to develop theories. Dick (2006) discussed a study that uses the Kolb learning cycle (Kolb, 1984) as the process to guide reflection and theorising. The cycle consists of active experimentation, concrete experience, reflective observation, and *abstract conceptualisation*. In many respects action research and experiential learning cycles are similar. Some researchers (e.g. McKay and Marshall, 2005; Checkland and Howell, 1998) use *cognitive mapping* for theory building, implying that action research isn't otherwise up to the task [of theory building]. Cognitive maps are a graphic way 'of presenting the way in which an individual or group define and conceptualise a situation' and were then used in theory building as part of SSM (McKay and Marshall, 2005). Dick (2006) viewed the theory building process of Huxman (2003) as one of the few detailed descriptions of theory building found in the main-stream action research literature. Another action research approach used in theory building is 'theory of action' as described by Argyris and Schön (1974) and Patton (1997). A theory of action used for theory building is a set of reflective questions combined with a 'data engine', as Dick (2002, 2006) put it. This approach supports the integration of theory and action promoted above. A more detailed description of action research follows in **Chapter 3**.

2.4.3. GROUNDED THEORY

The second methodology used is that of **grounded theory** (Glaser and Strauss, 1967; Glaser, 1992; Strauss and Corbin, 1994), as applied by Hamilton (1995). Grounded theory was selected because what was needed for this study is "a qualitative research method that uses a systematized set of procedures to develop an inductively derived grounded theory about a phenomenon" (Strauss and Corbin, 1994). Glaser (1992) defined grounded theory as "a general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate an inductive theory about a substantive area". Glaser and Strauss (1967) defined it as "the discovery of theory from data systematically obtained from social research". According to Dick (2000a, 2001b), the emerging data is gradually compared to the theory emerging from the interpretation of the previous data.

Baskerville and Pries-Heje (1999) argued that the theory development component of action research can be made more rigorous by using theory development methodologies such as grounded theory. This combination of the two methods, known as grounded action research, is essentially an integration of certain grounded theory

techniques in the different stages of action research. Baskerville and Pries-Heje (1999) suggested that this integration could be done in two ways: a) using grounded theory notations, such as memos and diagrams, to illustrate the relationship between emergent theory and the raw data and b) utilising grounded theory coding techniques during 'the evaluating, learning and diagnosis phases of action research' (Baskerville and Pries-Heje, 1999). According to Dick (2003), it would be possible to use grounded theory as a theory development process within an action research cycle. Although Glaser (1998) argues that theorising can only be done by people who can conceptualise (e.g. researchers), Dick's (2003) own experience is that the development of a grounded theory as part of action research may not be beyond the reach of many participants, especially if someone skilled in facilitation guides them through the process. However, a more accessible and less demanding approach to theory development might be a useful addition to action research processes. Dick (2003) provided two illustrative examples where action research and grounded theory fit well together. One used action research as a meta-methodology within which grounded theory (or some other methodology) could be reviewed and refined. The other substituted a process derived from action research to improve the efficiency of data interpretation and theory building of a grounded theory study.

Generating a theory from data means that most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research. **Generating a theory involves a process of research** (Glaser and Strauss, 1967). The aim of the grounded theory research methodology used in this thesis (Glaser and Strauss, 1967; Glaser, 1992; Strauss and Corbin, 1994), is to assist in generating a descriptive (local) theory and recommendations for practical application of how action research can be facilitated among resource-poor farmers. Grounded theory has been effectively used in agricultural research in Australia (Hamilton, 1995) and was adopted as one of the most appealing research methodologies for my situation. This generative approach seemed particularly useful here, given that no such research has been done on resource-poor agriculture in South Africa to date. Many models (theories) of agricultural and / or community development do exist (e.g. Anandajayasekeram *et al.*, 1999; Arnon, 1989; Bembridge, 1984; Benor and Harrison, 1977; Chambers, 1990; Dick, 2001a; Farrington and Martin, 1988) that largely deal with research and technology transfer and focus extensively on aspects such as description, assessment and dissemination. What could add great value, however, is "an inductive, theory discovery

methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data" (Martin and Turner, 1986). I view this contribution of grounded theory as the most valuable to this study. According to Glaser and Strauss (1967), theory based on data can usually not be completely refuted by more data or replaced by another theory. Since it is too intimately linked to data, it is destined to last despite its inevitable modification and reformulation. They further stated that researchers can also carry into current studies any theory based on their previous research provided it seems relevant – but again the matching of theory against data must be rigorously carried out.

Strauss and Corbin (1994) asserted that formulating theoretical interpretations of data grounded in reality provides a powerful means both for understanding the world 'out there' and for developing action strategies that will allow some measure of control over it. This approach argues that multiple perspectives must be systematically sought during the research enquiry. The perspectives of those actors who sooner or later are judged to be significantly relevant must be incorporated in the emerging theory. Furthermore, according to Hutchinson (1988; as quoted by Kerlin, 1998), "grounded theory is qualitative in its philosophy of science, its data collection, its methods of analysis, and its final product offers a rich and complex explanatory schema of social phenomena [it] is a form of social criticism; it does make judgements about identified patterns of social interaction".

The most critical aspect of grounded theory which differentiates it from other qualitative research methods is its emphasis on theory development (Strauss and Corbin, 1994). Theory is said to be grounded when it emerges from and generates explanations of relationships and events that reflect the life experiences of those individuals, groups and processes we are attempting to understand. Denzin (1978; as quoted by Kerlin, 1998) described four functions that all data serve in contributing to theory development: research data initiate new theory or reformulate, or refocus or clarify existing theory. According to Haig (1995), however, it is typically phenomena, not data, that our theories are constructed to explain and predict. Thus, properly formulated, grounded theories should be taken as grounded in phenomena, not data. The importance of data lies in the fact that it serves as evidence for the phenomena under investigation. According to Strauss and Corbin (1994) it implies that grounded theories developed are not necessarily intended to stand alone, but could be related to existing theories within a field, thus

amplifying and extending the current understandings of the phenomena in question. Coutts (1994; as quoted by Hamilton, 1995) reported three important guidelines for researchers developing grounded theory:

- a) Periodically step back and ask 'what is going on here? Does what I think I see fit the reality of the data?'
- b) Maintain an attitude of scepticism; and
- c) Follow the research procedures – data collection and analytical procedures are designed to give rigour and break through the biases.

One of the key distinctions which Glaser (1998) makes is between 'hypothesis testing' and 'emergent methodologies'. He sees most sociological research as really being hypothesis-testing, even when researchers might not perceive them as such. He sees them as **forcing** the data to fit the existing theories. The alternative is to let the theory **emerge** from the data. This is what Glaser's form of grounded theory does. And it is one of the important features it shares with action research. Both are emergent methodologies.

2.4.3.1. GROUNDED THEORY VS ACTION RESEARCH

Dick (2001b and 2003) made an interesting comparison between action research and grounded theory, since the two approaches are so closely related. Both can learn from each other. Grounded theory and action research can both be used as emergent, data-driven methodologies. This allows them to be flexible and responsive to the situation. Action research can learn from grounded theory, particularly for thesis and dissertation research, by giving more attention to providing an audit trail. Grounded theory can capitalise on its cyclic process by importing ideas from action research, especially in ways of increasing efficiency and protecting the researcher against preconceptions. Important in this is a vigorous and constant search for disconfirming evidence. This enhances the data-driven qualities of the research, increasing its flexibility and responsiveness to the research situation. **Table 2.2** gives a comparison between grounded theory and action research.

Table 2.2. A comparison between grounded theory and action research (Dick, 2001b)

Grounded Theory is:	Action Research is:
More explicitly emergent	More explicitly cyclic or spiral
Clearer about the place and use of literature in emergent research	Change oriented
Able to use any information, including from the literature, as data	Treatment of the roles of researchers and participants is different
Able to provide an explicit audit trail	Pragmatic in philosophy
Can be individually done	Usually participative

2.4.4. SOFT SYSTEMS METHODOLOGY (SSM)

According to Orlikowski (1993), the methodology of grounded theory is iterative, requiring a steady movement between concept and data, as well as comparative, requiring a constant comparison across types of evidence to control the conceptual level and scope of the emerging theory. As Pettigrew (1992) noted, this "provides an opportunity to examine continuous processes in context in order to draw out the significance of various levels of analysis and thereby reveal the multiple sources of loops of causation and connectivity so crucial to identifying and explaining patterns in the process of change". According to Rose (2000), the starting point for consideration of SSM in theory generation and testing is Checkland's (1985) model of enquiry. To facilitate iteration and comparison in this research study, this *general research framework* that uses the concepts of SSM (as described by Checkland, 1981, 1985; Rose, 2000) and action research (as described by McKay and Marshall, 2005; Baskerville and Wood-Harper, 1996), was applied.

The use of SSM as one of my research methodologies was inspired by the PhD study of Hamilton (1995). According to Rose (2000), the potential application area of SSM is extremely wide – any purposeful human activity, in theory. These applications of SSM are well described by Davies and Ledington (1991) and Mingers (2000). There is very little that is prescriptive about SSM and a great deal of room for choice. Different analysts may use the methodology in different ways – this flexibility is seen as a strength not a weakness. Checkland and Howell (1998) claimed that SSM is a particularly relevant approach for

structuring action research. Although SSM shares key features with mainstream action research (Dick, 2006), it is acknowledged (Checkland, 1981, 1985) that SSM is not confined to a problem-solving, action research mode. It falls within the domain of normal social science activity, with a defensible ontology, epistemology and reasoning strategy and may also be used for theory generation and testing activities of more conventional programmes (Vickers, 1961, 1967, 1970, 1983). Checkland (1985) and Rose (2000) recommended a model of enquiry, depicted below with a simple illustration (see **Figure 2.1**), as a good starting point for consideration of SSM in theory generation and testing. The model holds equally well for most research activities. Checkland (1985) reminded us that all practical action is theory laden, in the sense that if we observe any apparently purposeful human action, we can always ask of it: "What intellectual framework would logically make this particular action meaningful?" However, Rose (2000) concluded that good research is affected, not by strong methodology alone, but by its conscientious, intelligent and self-reflective *application*. The general research model described below was therefore used as a framework for this research approach - to organise it and as a basis for analysis, interpretation and theory development.

According to Checkland (1985) in this general research framework (see **Figure 2.1**), F is the researcher's initial governing framework of ideas and concepts – it may contain values, beliefs, opinion, knowledge and understanding. It *must* contain sets of implicit and explicit theories about reality and how new understanding may be achieved. It *should*, but all too frequently doesn't contain explicit theories about M (the methodology – the way of applying these ideas and concepts). It *may* contain implicit or explicit theories about A (the application area). Checkland suggested that A is indicated without sharp boundaries to remind us that when A is about human affairs, the application of F through M lead us into byways not initially expected. For the SSM researcher, the main body of theory exploited – systems theory – governs M.

The application of M, the methodology, results in learning. This learning relates not just to A, the area of application, but also to F, the framework of ideas and concepts and M the methodology applied. This general research framework is conducted iteratively, with each sequence testing and providing insights into the framework of concepts and ideas, the methodology applied and the area of application, so that a new framework of ideas and concepts emerge, new methodologies appear to further the testing and new insights and perspectives on the complexity of the area of application emerge.

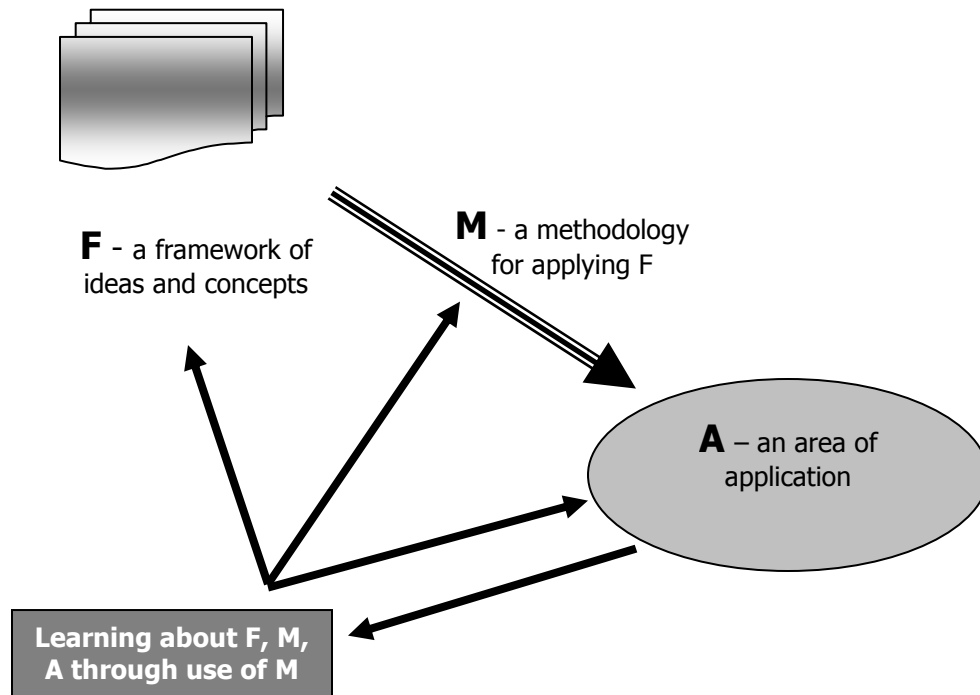


Figure 2.1. The general research framework (Checkland, 1985)

According to Dick (2000b), one can consider the emergent nature of action research and grounded theory as having three dimensions: epistemology, process and situation. Dick was thinking of these as equating respectively to Checkland's F, M and A. In applying this framework, he recommended trying to spell out your assumptions about all three before you act. You can check (reflect) your experience against those assumptions during and especially after action. As you accumulate experience you can seek out disconfirming evidence for assumptions under all three headings of the framework (See **Figure 2.1**): a) emergent understanding of philosophy; b) emergent understanding of research processes; c) emergent understanding of the situation. Dick (2005; personal communication) mentioned that if you apply Checkland's FMA, the framework probably has to be methodological (i.e. intended for use in research studies) rather than presumptuous (i.e. not intended for predictions) about what you'll find. (That may well have been Checkland's intent as sometimes his F seems to be epistemological.) The alternative is that you are reducing your ability to be fully flexible about the theory you build.

2.4.5. RELEVANT DATA SOURCES FOR RESEARCH APPROACH

2.4.5.1. "ALL IS DATA"

According to Glaser (2002), "All is Data" is a grounded theory statement. Data is discovered for conceptualization to be what it is - theory. The data is what it is and the researcher collects, codes and analyzes exactly what he has, whether baseline data, interpreted data or vague data. There is no such thing for grounded theory as bias data or subjective or objective data or misinterpreted data. It is what the researcher is receiving, as a pattern, and as a human being (which is inescapable). It just depends on the research. According to Glaser (1998, 2001), "All is Data" furthermore means that everything that gets in the researcher's way when studying a certain area is data. Anything can be grist to the mill, including the literature on the content area, any documentation available, the observations of the researcher, and the more formally collected information from interviews and the like. Not only interviews or observations but anything is data that helps the researcher generating concepts for the emerging theory. Field notes can come from informal interviews, lectures, seminars, expert group meetings, newspaper articles, Internet mail lists, even television shows and conversations with friends. Also included are the objections of those who critique a researcher's interpretations. The idea of 'triangulation' (Jick, 1979) supports this view, although in a slightly different way, by suggesting the incorporation of multiple viewpoints and approaches, e.g. both feelings and behaviours, direct and indirect reports, obtrusive and unobtrusive observation.

Jick (1979) recommended using quantitative data largely to supplement the qualitative data, rather than the reverse which is far more common in organisational research. Glaser and Strauss (1967) confirmed this statement that "qualitative research was to provide quantitative research with a few substantive categories and hypotheses. Then, of course, quantitative research would take over, explore further, discover facts and test current theory". However, their final position on this matter is as follows: "there is no fundamental clash between the purposes and capacities of qualitative and quantitative methods or data". They believed that each form of data is useful for both verification and generation of theory, whatever the primacy of emphasis. The choice of one form of data over the other depends only on the circumstance of research, on the interests and training of the researcher and on the kinds of material he needs for his theory. In many instances both forms of data are necessary – not quantitative used to test qualitative, but

both used as supplements, as mutual verification and, most important, as different forms of data on the same subject, which, when compared, will each generate theory". Glaser and Strauss (1967) suggested two criteria that would help researchers decide what sources of data to use in a given study, which are: a) accessibility; and b) effort, cost and speed of data gathering.

According to Glaser and Strauss (1967), a calculated assessment of two major kinds of qualitative data, field and documentary, is necessary in planning and carrying out specific research. Glaser (1998) suggested that it is even possible, and sometimes a good idea, for a researcher with much knowledge in the studied area to interview herself, treating that interview like any other data, coding and comparing it to other data and generating concepts from it. According to Glaser (1998) the above mentioned may sound silly since you don't have to interview yourself to know what you know, but you don't know it on the conceptual level - and grounded theory deals with conceptual level data. Glaser reminded us that grounded theory is a conceptual method, not a descriptive method, as we know. Thus descriptive critiques which are all about worrisome accuracy do not apply to grounded theory. Describing what is going on, does not explain conceptually what is going on as a fundamental pattern of process, typology, cutting point, binary, etc. In discovering theories, Glaser and Strauss (1967) emphasised that "one generates conceptual categories or their properties from evidence; then the evidence is used to illustrate the concept. The evidence may not be accurate beyond a doubt, but the concept is undoubtedly a relevant theoretical abstraction about what is going on in the area studied. Furthermore, the concept itself will not change, while even the most accurate facts change".

2.4.5.2. ROLE OF THEORY AS DATA

A key question for me concerned the role of theory, with an emphasis on literature, in my research. A key strand of grounded theory, as described by Glaser (1978), is an understanding, as a researcher, of my own 'theoretical sensitivity'. This term relates to the researcher's personal degree of sensitivity or bias depending upon previous literature and experience, relevant to the area of study. I learned that 'Grounded Theory literature' allows for a complex interleaving of various data types and literature when developing theories through incorporating various levels of abstraction. What is most important, though, is that grounded theory encourages the treatment of literature as data: as just

more data, with similar status to the data collected in other ways during a study. This insight helped me to provide additional justification for not engaging in a traditional literature review, as Dick (2000b) also advised. He explained that an action research (or grounded theory) project often rapidly develops a life of its own. It takes you in directions that you didn't predict, and perhaps couldn't have predicted. For each of these directions, there is likely to be relevant literature, which is only read at later stages (Dick, 1999a). Glaser and Strauss (1967) mentioned that researchers (e.g. sociologists) need to be as skilled and ingenious in using documentary materials as in doing field work. These materials are as potentially valuable for generating theory as our observations and interviews. They put it that the researcher "needs only to discover the voices in the library to release them for his analytic use". What they meant by 'discover' is, like field work, social research in the library must be directed with intelligence and ingenuity.

There are, however, different approaches to grounded theory with different opinions on the role that previous literature plays in the research process. Strauss and Corbin (1990, 1994) argued for a flexible approach to the use of literature in the identification of the research problem and support for emerging theory. Glaser, as well as Strauss, argued that this can bias the researcher and that the literature review should only be conducted in association with the emerging theory (Glaser, 1992; Glaser and Strauss, 1967). Glaser (1978) recommended starting off by reading widely while avoiding the literature most closely related to what you are researching. Dick (2000b) adds to this by saying that in some forms of research it does not make sense to read the relevant literature beforehand. Dick (1997b) also stated that you may have to access the content literature (the literature about your topic) continuously. If you start with a research question, you will have to identify and understand the literature most directly relevant to that research question. When you have begun to collect and interpret the data, you will find that more specialised literature is likely to become relevant. You then have to identify and understand it. It allows you to refine and further substantiate your conclusions.

Walsham (1995) argued that it is possible to access existing knowledge of theory in a particular subject without being trapped in the view that it represents final truth in that area. Layder (1993; as quoted by Walsham, 1995) argued that researchers can, and must, draw on general theories and employ them in their research. Ultimately it is important to understand and not to be governed by previous research but to be informed and critical of it. In conclusion, I would like to summarise the role of literature in

grounded theory research with the following two points. The first is that, in an emergent study, you probably won't know at the beginning which literature will later turn out to be relevant. This has implications both for the place of reading in your own research process and for inclusion in your report. The second is that the literature is not given a position of privilege when compared to the other data sources. It is treated as data, with the same status as other data.

2.5. RESEARCH PROCESS

My prime objective, however, was to build the methodologies described above into a pragmatic and useful research process, which would make optimal use of the available data sources in this situation. The following approaches were the most appealing. Firstly, Walsham (1995) identified three stages where theory is used as: a) an initial guide to design and data collection, b) part of an iterative process of data collection and analysis, and c) a final product of the research. Secondly, Dick (1999a) suggested treating the action research cycle of plan, act, observe and reflect of a whole project as the "act" component (phase) of an individual reflection cycle in the research process. My understanding of this approach was that I would treat the whole Bergville Landcare project, i.e. the "act" of doing it, with all its repeated cycles and activities, as one specific data source, which composed of different project documentation (e.g. annual progress reports) and experiences (e.g. researcher diaries). Thereafter, in the data analysis phase, I would then *reflect* on the initial theory and the "act" (Bergville project data) using an SSM and action research framework described above, together with a second study of [emerging] literature. I saw this as the most appropriate research process and use of the different data sources that would facilitate the development of new theories for practical application. I describe this process in more detail below, highlighting the use of the different data sources, as the methodological design of my research process illustrated in **Figure 2.2**.

2.5.1. INITIAL UNDERSTANDING OF THEORY AS GUIDE TO DATA ANALYSIS

According to Walsham (1995), the motivation for the use of theory in the earlier stages of interpretive case studies is to create an initial theoretical framework which takes account of previous knowledge, and which creates a sensible theoretical basis to inform the topics and approach of the early empirical work. From grounded theory (Strauss and Corbin, 1990) "one does not start with a theory and then prove it. Rather, one begins with

an area of study and what is relevant to that area of study is allowed to emerge". Beilin and Boxelaar (2001) argued that action research methodologies provide very little space to integrate theory in the early stages of research, emphasising theory that emerges from the particular practices that formed part of the research project.

This is problematic: as theory and practice are intertwined, theory is not something that just emerges from a particular research activity or practice. For example, extension practitioners are working within a particular paradigm. They do not just go out there and 'do extension', and then develop theories about their practices. Clearly, when a particular extension practitioner enters his/her practice, s/he will have ideas about how to conduct him/herself and these ideas are very much shaped by contemporary extension theory. Job descriptions, interview schedules and training will reflect prevailing notions of 'appropriate' extension practices. In other words, they are shaped by prevailing theories on extension. Checkland and Howell (1998) emphasized "very emphatically the importance of this principle of declaring the intellectual framework which will define the lessons learned"

Glaser (especially 1978) makes much of the prior background reading which provides the models to help make sense of the data. Glaser and Strauss (1967) argued that theories (from various documentary qualitative materials) may be used, especially in the early days of the research "to help the researcher understand the substantive area he has decided to study. They may help him formulate his earliest hypotheses". Dick (2005) motivated the point that no research is atheoretical. It seems to him to be self-evident that researchers take with them a variety of preconceptions from a variety of sources. For instance, my research about what should guide community development practice in the Bergville project has been influenced by several theories relating to action research and agricultural development. These theories-in-use (discussed in **Chapter 3**) are based in knowledge that is used daily to judge what actions to take in a particular context and situation. As Dick (1999a) recommended, at the start, I deliberately delved into content literature which seems likely to be relevant. As I made progress, I deliberately limited, or narrowed down my reading of the content literature to what was clearly and directly relevant, and avoided the rest.

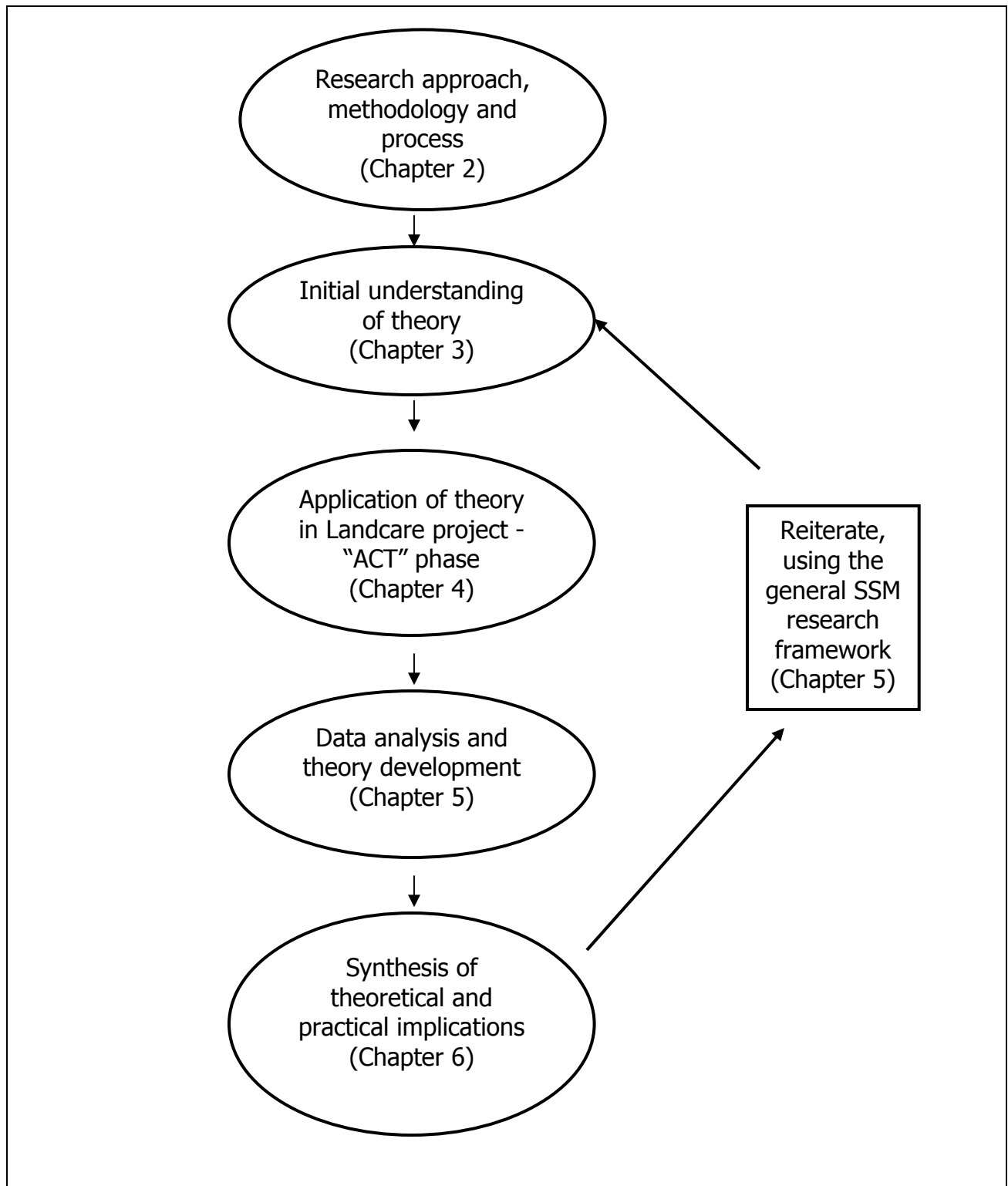


Figure 2.2. The iterative research process

2.5.2. APPLICATION OF INITIAL THEORIES IN A LANDCARE PROJECT

Another primary source of data used in this research process was the Bergville Landcare project, where the initial theories and models were applied. This is described in **Chapter 4**. As illustrated and described above (see **Figure 2.2** and **Section 2.4**), the whole Bergville project was treated as the "Act" component of the individual reflection cycle in the research process. This source of data, i.e. from the Landcare project, improved the quality and quantity of the data to a large extent, as it describes the 'real life experience' which would have a significant influence on any new theories or improvements on current theories. One should always keep in mind that an action research cycle, as it was used in the Bergville project, can also be regarded as a learning cycle (see Kolb, 1984) that include reflective observation and *abstract conceptualisation (theorising)*. The educator Schön (1983, 1987; as quoted by Dick, 1993) argued strongly that systematic reflection is an effective way for practitioners to learn and build theories. For instance, as Dick (1993) emphasised, when practitioners use action research it has the potential to increase the amount they learn consciously from their experience, and it is exactly those lessons that I aimed to make part of the research data and methodology of this thesis. The following data sources were used from the application of initial theories in the Bergville Landcare project:

a) Project documents

The first and largest source of data used in **Chapter 4** was the content of the various project documents, mainly from annual progress reports (Smith, Agrella and Mbatani, 2001; Smith, Trytsman, Agrella and Lentsoane, 2003.; Smith, Trytsman, Dlamini, Bloem and Agrella, 2004; Smith, Trytsman, Bloem, Everson and Mthethwa, 2005). All these documents are listed in **Table 4.1** and attached in **Annexure 1** on a Compact Disk (CD).

b) Personal experiences and reflections

Another source of data used in **Chapter 4**, which was integrated with project documentation, was my *personal experiences and reflections*. As Glaser and Strauss (1967) suggested, the researcher should use "a considerable armamentarium of standard devices", such as quoting from interviews or conversations, from dramatic segments of his/her on-the-spot field notes, describing events and acts and giving background descriptions of places and spaces. Sometimes he/she will even offer accounts of personal experience to show how events impinged upon him-/herself".

My personal experiences in the project were firstly documented in the form of a 'research diary' (as defined by Hughes, 1996), which is a record of my involvement in the project. The research diary was generated through my personal experiences and reflections during, but especially after, all the project activities that were employed in the pilot study. Glaser and Strauss (1967) recommended to "deliberately cultivate such reflections on personal experiences; ... looking at them as springboards to systematic theorizing". There is a difference between the content of the diary used as data and the other data used in this thesis, which yield information on the phenomena under study. Firstly, the way this type of data is captured in the thesis is in the form of excerpts from the diary, which contain information about the researcher (myself), when and what I did (events, activities), the significant events experienced and my reflections (insights) on it (see **Excerpt 2.1** as an example of my research diary).

Excerpt 2.1. Research diary - example

Date	Activities / events / incidents	People present	Critical reflection
24 August 2000	Diagnostic stage, dealing with survey data - no farmer input	Participants in diagnostic survey; no farmers present	We missed an early opportunity to give farmers ownership of data and process. How were those decisions taken? How can we resolve this problem?

The second approach of using and describing my personal experiences in the project as data was by using 'life stories' or specific 'significant changes' among participants in the pilot project. This approach used some concepts from the Most Significant Change approach (Davies and Dart, 2005), but different from its general application as a participatory evaluation tool. I was particularly interested to use it for the following reasons: a) to assess the effect of the intervention on people's lives; b) to include the words of non-professionals; and c) to identify and describe unexpected changes. I looked for significant changes in the following four domains:

- ❑ changes in the quality of people's lives
- ❑ changes in the nature of people's participation in development activities
- ❑ changes in the sustainability of community organisations and activities
- ❑ any other changes.

c) Monitoring and Evaluation data

The next important source of the data described in **Chapter 4** was generated from the monitoring and evaluation (M&E) framework and findings that were developed and implemented in the pilot project. M&E, as a key action research methodology, was implemented in the pilot study with the aim to support decision-making in view of improvement (see **Chapter 4** for a detailed discussion of M&E in the pilot study). Five M&E processes, which were linked to each other, were initiated. The first one was done with the aim to improve and manage the project (i.e. project or ward level) and involved the developing agents (researchers, extension officers and leader farmers) as primary intended users. The second M&E process involved leader farmers and aimed to focus the farmer-to-farmer extension process. The third process had two different, but related purposes. The first purpose was to facilitate learning and adaptive management among farmer groups on a daily/weekly basis, while the second purpose was to strengthen group management capabilities on an annual or bi-annual basis. The fourth process was aimed at collecting information from the participating farmers on the impact and sustainability of the project through a convergent interviewing process, while the fifth process was aimed to annually aggregate M&E information and indicators to judge the impact of the project in view of accountability. The M&E frameworks and findings were a primary source of data used for this study.

2.5.3. AN ITERATIVE PROCESS OF DATA ANALYSIS AND THEORY DEVELOPMENT

Grounded theorists use a series of techniques or procedures to analyse the data, which were not the most appropriate approach for this thesis. My choice of a data analysis and theory development methodology was Checkland's (1985) general SSM research framework, which shares key features with mainstream action research (Dick, 2006). In action research, in addition to 'answering' the research questions, a key component of the research outcomes (theories, in this case) is derived from *reflection* by the researcher on the efficacy of the theoretical framework underpinning the research, the methodological intervention and the outcomes achieved (Checkland, 1991). This results in specifying the *learning* that has occurred as a result of the action research study.

An illustration how the general SSM research framework (Checkland, 1985) was complemented with the action research philosophy is shown in **Figure 2.3**. This framework was recommended by Checkland (1991) and applied by Baskerville and Wood-Harper

(1996), as well as McKay and Marshall (2005). **Figure 2.3** depicts how this method (framework) cycles the research questions of F and M through A to generate action, reflection and ultimately learning. In principle, that learning may be expressed as theory (Rose, 2000).

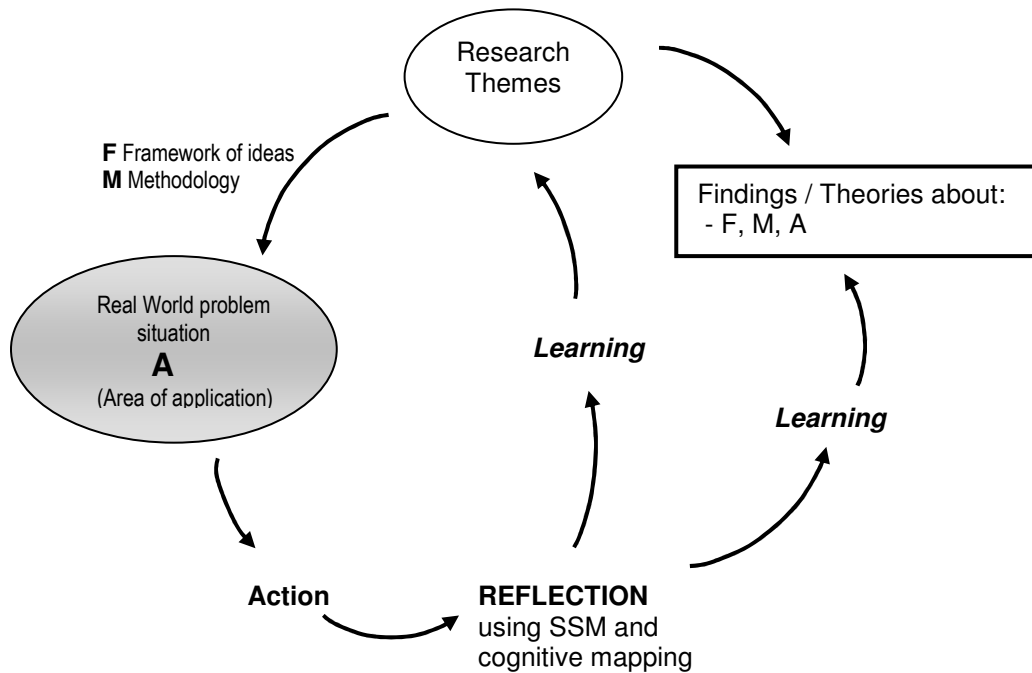


Figure 2.3. Iterative cycle of action research combined with SSM and cognitive mapping used to develop theories (adapted from Checkland, 1991)

As described above and in **Section 2.4.2**, action research theorising is associated with reflection. One acts and then reflects on the action. From the reflection theory arises. The challenge, however, is to make the theory building step evident and effective. My approach for theory building uses *cognitive mapping*, which was successfully used before as part of SSM and action research (McKay and Marshall, 2005; Checkland and Howell, 1998). From a theorising point of view, McKay and Marshall (2005) had the following remarks on cognitive mapping, which, according to them, proved to be “remarkable useful devices”:

- A cognitive map is typically a representation of beliefs about a particular situation, based on the knowledge, experience and value system of that individual.

- ❑ Learning about and understanding the mental models by which individuals make sense out of their environment and construct their social reality is an important function of this technique.
- ❑ They are a graphic way of “presenting the way in which an individual or group define and conceptualise a situation”.
- ❑ They “often seemed to spark new insights on an issue, and they also seemed to trigger memories of issues thus far overlooked”.

In this research process, I used cognitive maps in combination with the general SSM framework (described in **Section 2.4.4**) to stimulate data analyses, reflection, learning and ultimately theorising (See **Figure 2.3**). Cognitive mapping focuses on the [collaborative] creation of maps, which are not explicitly addressed in SSM. From grounded theory ‘categories’ are derived which are analogous to the constructs in cognitive mapping. Strauss and Corbin (1994) state that “theory consists of plausible relationships proposed among concepts and sets of concepts”. This seems very close to the spirit of cognitive mapping where the ‘cause map’ can be seen as a form of theory (Hughes, 2005). A key difference between cognitive mapping and grounded theory methodology seems to be the tendency of applying cognitive mapping in participation with the actors in a process. The aim is to identify constructs and their relationships with them, rather than treating this as a separate, private activity by the researcher. Below is a brief description of the procedure and steps used to apply cognitive mapping in this thesis.

2.5.3.1. COGNITIVE MAPPING PROCEDURE

Cognitive Mapping is a form of Causal Mapping popularised by Colin Eden and Fran Ackermann (Eden, 1988; Eden and Ackermann, 2001; Ackermann and Eden, 2001). Cognitive mapping is the process of building a system model from the perspective of how the people involved with it understand it, what their mental model of it is. Each of these people has an internal model of the system which guides his or her behaviour as a participant of that system (Eden, 1988). According to Ackermann, Eden and Cropper (1992), cognitive mapping is a technique which has been developed over a period of time and its application has demonstrated its use for operational researchers working on a variety of different tasks. These tasks include: a) providing help with structuring messy or complex data for problem solving; b) assisting the interview process by increasing

understanding and generating agendas, and c) managing large amounts of qualitative data from documents. Whilst cognitive mapping is often carried out with individuals on a one to one basis, it can be used with groups to support them in problem solving. The technique is founded on George Kelly's theory of personal constructs (Kelly, 1955; as quoted by Ackerman *et al.*, 1992), which suggests that we make sense of the world in order to predict how, all things being equal, the world will be in future, and to decide how we might act or intervene in order to achieve what we prefer within that world, thus a predict and control view of problem solving. According to McKay and Marshall (2005), cognitive mapping is used as a modelling device providing a representation of a situation (or perceptions and interpretations of a situation), thus aiding description, analysis and understanding. In other words, cognitive maps are a means of representing the way in which an individual or group define and conceptualise a situation (Eden, 1988).

Regardless of the research technique (methodology) being applied, being able to understand the client's perception of the problem is an important function of the cognitive mapping technique. The technique's ability to help structure, organise and analyse data, enable both the client and the analyst together to negotiate a suitable direction forward (Ackerman *et al.*, 1992). It is based in an interpretive and subjectivist view of the individual and organisations.

Getting started with cognitive mapping is well described by Ackerman *et al.* (1992). Typically cognitive maps reveal a network of ideas, linked by arrows representing relationships between ideas or constructs which are themselves "captured chunks of text" (Bryson, *et al.*, 2004; as quoted by McKay and Marshall, 2005). The text at the base of the arrow is said to cause or lead to, or to have consequences for the idea at the head of the arrow (Eden and Ackermann, 2001). Textual constructs that are only at the base of arrows often represent actions, while those that are only at the head of arrows often represent goals or objectives in a particular situation (Eden, 1990). Reading the map from the bottom (actions) through to the top (goals) allows insights into the way an individual defines the problem and perceives that certain actions taken will ultimately lead to the positive outcomes desired in the resolution of the problem (Eden, 2004).

Cognitive mapping is a similar concept such as 'concept mapping' and 'mind mapping', a 'theory of action approach' (Argyris and Schön, 1974; Patton, 1997) and

'problem and objective trees' (Clark and Timms, 2000). The latter, i.e. problem and objective trees, is also very similar to 'Coloured Cognitive Maps' described by Venable (2005), which is a way to both understand a problem situation and a way to derive proposed solutions from it. The shift from problem understanding to design (or planning) expressly represents a shift in focus from the necessary negative lens to a positive lens focusing on desirable future state in which understood problems and their causes can be resolved.

A feature of this thesis, however, is that the reader is not meticulously led through the developmental stages for each cognitive map or 'theory'. In fact, the research process was primarily aiming to develop, refine or improve these theories from the data, using SSM and cognitive mapping. As mentioned earlier, most of the theories developed in this thesis were not intended to stand alone, but were related to existing theories within a field, thus amplifying and extending the current understandings of the phenomena in question. The iterative reflection (action research) process using the SSM research framework and cognitive mapping (see illustration of action research process in **Figure 2.3**) gave ample opportunity to ensure that the ideas or constructs (used in the cognitive mapping) fitted the data and worked in explaining phenomena to the reader. Reflecting on the data, I formed [new] assumptions (or hypothesis) about what occurred and why. As mentioned above, Stringer (1999; as quoted by Dick, 2006) explicitly equates such assumptions with theory. As Strauss and Corbin (1990) prescribed, at every step, appropriate assumptions developed, which were quickly integrated with each other. According to McKay and Marshall (2005), cognitive mapping acknowledges the existence of multiple, often conflicting mental models and "provides a framework in which assumptions underlying these mental models can be explored and improved". As assumptions evolved, I was directed to new sources of library materials for comparison and confirmation. Next, I started to name broader ideas or constructs in ways that are consistent with the terminology of the phenomena or appealing to participants in it. Beyond that, Strauss and Corbin (1990) mentioned that grounded theory research moves to develop models describing the processes underlying the phenomena, iterating between inductive and deductive processes.

Walsham (1995) recommended preserving a considerable degree of openness to the data and a willingness to modify initial assumptions and theories. This, again, was indicative to the iterative process of data collection and analysis, with initial theories

being expanded, revised, or abandoned altogether. In using SSM, therefore, there was a clear parallel to the tight spiral of action research, with the same advantages. This is supported by the idea posed by Dick (2005) to take special effort to be responsive to the data, to seek disconfirming evidence assiduously, and to defend by careful argument your decision to do so. The researcher continually asks, "Where might I find data which is most likely to challenge or refine the theory I have so far developed?". Data collection continues until "saturation", the point at which the additional data doesn't warrant the effort required for capture. The iterative process of data collection and analysis in this thesis was facilitated with the application of the SSM research framework.

As Glaser and Strauss (1967) and Dick (2005) advised, constant comparison remained a helpful process during this phase described in **Chapter 5**. This involved asking and answering questions and making comparisons between observations. In this way, grounded theorists develop theoretical sensitivity by "taking apart an observation, a sentence, a paragraph and giving each discrete incident, idea or event, a name, something that stands for or represents a phenomenon" (Strauss and Corbin, 1990). My aim as I read was to compare literature to the emerging theory, resulting from the iterative application of the SSM research framework, in the same way that you compare data to the emerging theory. Dick (2005) noted that whether or not you do precisely this, the key issue is how you treat apparent disagreement between your emerging theory and the literature. "You don't assume that your theory must be wrong. After all, you have been concerned throughout with its fit to the data and its ability to make sense of actual experience. You seek to extend the theory so that it makes sense of both the data from your study and the data from the literature".

Reading and using literature later is less an issue for Glaser (1978, 1992). Dick's (2005) view is that it makes sense to access relevant literature as *it becomes relevant*. In **Chapter 5**, I located my research findings, emerging from the application of the SSM research framework, within the relevant fields of literature, as well, to a certain extent refined my findings in the light of the literature in slightly different but related fields. This procedure is well described in **Section 2.4.5.2**. In short, a progressive accessing and reading of relevant literature became a part of my data collection and analysis procedure. In this respect, it is advisable to regard literature as something to which one can compare emerging explanations. According to Dick (2000b), there is a strong

emphasis in grounded theory on the simultaneous collection and interpretation of data. This better allows the data to guide interpretation and methodology.

2.5.4. SYNTHESIS OF THEORETICAL AND PRACTICAL INSIGHTS INTO THE FOCAL RESEARCH PROBLEMS

As was explained above, the aim of the research process followed in this thesis was to develop or improve theories that would facilitate action research among resource-poor farmers. These theories and their implications for practical application are synthesised in **Chapter 6**. Checkland and Howell (1998) stated that this change in F, M and A is typical of action research and must be expected when researching in that mode. However, it is clear that the formulation of changes and lessons learned will be improved by declaring in advance the intellectual framework within which 'lessons' are defined. Checkland and Howell (1998) later concluded that "if the taken-as-given structure of ideas is thought about carefully, however, it may be possible to pinpoint useful principles which can be tested in further action and, if we are lucky, transferred to a whole range of problematic situations". Well tested methodology is worth having, in spite of its necessary generalization.

As recommended by Strauss and Corbin (1994), this research process was used:

- a) to create theory from the data that has been collected and analysed; and/or
- b) to confirm, elaborate and modify theories that are currently in existence by comparing the 'goodness of fit' with data as it is collected and analysed.

For thesis purposes, Dick (1999a) recommended using the following questions after the data analysis process:

- a) What actions have you carried out and what outcomes have you achieved?
- b) How and why these differed (if they did) from what you expected (or intended)?
- c) What you learned about the client system, your methodology, yourself, and any other aspects?

The theory that emerged from my (the researcher's) collection and analysis of qualitative data is in one sense equivalent to what I *know systematically* about my own data, because, as Glaser and Strauss (1967) stated, "he knows what he knows, ... 'in his bones' he feels the worth of his final analysis. If he has participated in social life of his subject,

then he has been living by his analysis, testing them not only by observation and interview but also by daily living.”

2.6. IMPROVING THE RIGOUR AND QUALITY OF THE RESEARCH PROCESS

Glaser and Strauss (1967) claimed that the presentation of grounded theory, developed through analysis of qualitative data, is often sufficiently plausible to satisfy most readers. However, there is always the question of how I could ensure that any claims (or judgements) I make are reasonably fair and accurate. Clarity, consistency, parsimony, density, scope, integration, fit to data, explanatory power, predictiveness, heuristic worth, and application are all mentioned by Glaser and Strauss as pertinent evaluative criteria, although they do not work them into a coherent view of theory appraisal. Glaser (1998) reminded us that descriptive critiques, which are all about worrisome accuracy, do not apply to grounded theory. Describing what is going on, “does not explain conceptually what is going on as a fundamental pattern of process, typology, cutting point, binary, etc.” In particular, judgments about the rigour of research are often based on narrow criteria: criteria which make sense only for the methodology for which they were developed. Grounded theory has its own sources of rigour. It is responsive to the situation in which the research is done. There is a continuing search for evidence which disconfirms the emerging theory. It is driven by the data in such a way that the final shape of the theory is likely to provide a good fit to the situation. In fact, Glaser (1998) suggests two main criteria for judging the adequacy of the emerging theory: that it fits the situation; and that it works -- that it helps the people in the situation to make sense of their experience and to manage the situation better.

Although the terminology differs, good grounded theories are judged similarly to good analytically induced theories. In grounded theory literature, completeness is referred to by the *fit* of the theory to the data. Grounded theories are also judged by their generality in applying to any relevant phenomena, which is similar to the mutually exclusive matching of data to categories discussed earlier. When the theories are meaningful, they are said to *work* in explaining what happened, predicting what will happen and interpreting what is happening in an area of inquiry. Other characteristics that appear in only some of the texts include modifiability to subsequent observations and control with regard to action toward phenomenon (Strauss and Corbin, 1990; Glaser, 1978).

But what about meta-evaluation, or 'evaluating evaluation' in order to improve the rigour of the study? In this case it would be evaluating the [quality of the] grounded theory research. Bob Dick (2005; personal communication) mentioned that if grounded theory is done well, it has evaluation built in. He mentioned that "each time you add to your sample (data) you are seeking to add whoever (or whatever) offers the maximum challenge to your emerging theory. Each time you interpret a new piece of data you are doing the same. At the same time you can compare your results to the literature (treating the literature as just more data). That further enhances the built-in evaluation". You can also make use of other qualitative research methods for increasing rigour: informants checking your data; as in action research, trying the theory out in practice; triangulating your data by using multiple sources, multiple methods and multiple researchers. Dick (2005; personal communication) said that "beyond that (above), if you wish to do any meta-evaluation, that wouldn't do any harm". With respect to cognitive mapping, quantification (evaluation) has been debated since its inception (Hughes, 2005). Axelrod (1976; as quoted by Hughes, 2005) argued that for many purposes quantification is not needed "since many important properties about a cognitive map depend on the structure of the relationships and their signs rather than on more detailed knowledge".

As Bob Dick suggested above, I considered evaluation already included in the data collection, analysis and interpretation process, so I decided against an extra meta-evaluation of the research process. However, to strengthen my data analysis and interpretation process, I did find *evaluation* theory and practice very useful and applicable. As Patton (1997) advised, I believed the aim was to find reasonable estimations of the likelihood that particular activities have contributed in concrete ways to observed effects, with an emphasis on the word *reasonable*. Not definitive conclusions. Not absolute proof. Evaluation offers reasonable estimations of probabilities and likelihood, enough to provide useful guidance in an uncertain world (Blalock, 1964; as quoted by Patton, 1997). McNiff *et al.* (2003) reminded us that, if you say, 'I think that such and such happened', you can expect someone to say, 'Prove it.' The answer is that you can't. You can't prove anything. The word 'prove' does not exist in action research (or grounded theory). You can however produce reasonable evidence to suggest that what you feel happened really did happen, and you are not just making it up.

The above, I thought, ties in quite well with the goal of grounded theory research. According to Patton (1997) absolute judgements of a positive or negative nature are less useful than specific, detailed statements about levels of impact, the nature of relationships and variations in implementation and effectiveness. This shifts the focus from whether findings are negative or positive to whether the evaluation (research) results contain useful information that can provide direction for programmatic action, or, in this case, theory development. The challenge, according to Patton (1997), is to find those 'vital few' facts among the 'trivial many' that are high in payoff and information load. The 20-80 rule expresses the importance of focussing on the right information. The 20-80 rule states that, in general, 20% of the facts account for 80% of what's worth knowing.

What about the credibility of this study? The researchers' conviction about his own theory (described in **Section 2.6.3.4.**) does not mean that his analysis is the only plausible one that could be based on his data, but only that he has high confidence in its credibility. According to Glaser and Strauss (1967), what the researcher has confidence in, is not a scattered series of analysis, but a systematic ordering of them into an integrated theory. He has, in fact, discovered, through principally inductive effort, a substantive theory about delimited arrays of data, which he is ready to publish.

2.7. SUMMARY AND CONCLUSION

In order to develop the general methodological approach for this study, this chapter started off by describing the goal and main research problems of the study and then the rationale for the research approach followed. In this section I tried to motivate for the reader why we need solutions which emerge from *interaction*; simultaneously I introduced *systems thinking* and *interpretive action research* with their different portfolio of interventions. From there I proceeded to select and describe a suitable research approach and methodologies that could facilitate a process of iteration and theorising. The research approach selected for this study advocates the use of multiple methodologies, which is a combination of grounded theory, action research and SSM, as the most appropriate for developing theories within the paradigm of constructivism and interactive agricultural science. The design of the research process resulted in effectively using and analysing the different data sources within the following four phases: a) theory as an initial guide to design and data collection; b) application of initial theories in a Landcare project; c) an iterative process of data analysis and theorising; and d) synthesis of theoretical and practical insights into the focal research problems. Finally, in

attempting to improve the rigour and quality of the research process, I found that the following are the two main criteria for judging the adequacy of the emerging theory: a) that it *fits* the situation; and b) that it *works* -- that it helps the people in the situation to make sense of their experience and to manage the situation better. I realised the importance of producing reasonable evidence to suggest that what I feel happened really did happen, and I am not just making it up. Because this will support that in which I have confidence being not a scattered series of analysis, but a systematic ordering of them into an integrated theory.

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CHAPTER 3. INITIAL UNDERSTANDING OF THEORY AS GUIDE TO DATA ANALYSIS

3.1. INTRODUCTION

This chapter is a synthesis of the most important theories relating to action research that guided the community development process in a resource-poor farming context in the Bergville project. Compared to a reflection on the theories only (**Chapter 3**), the *application* of these theories in a real-life situation (i.e. a Landcare project) is described in **Chapter 4**. The theories described below also served as a *primary source of data* to inform the data analysis and theorising process, which is described in **Chapter 5**. From these theoretical concepts, principles and practices, the following ideas were seen as most critical in the formulation (integration) of the process which was applied in the Bergville project (a detailed description is attached on the CD in **Annexure 12**).

3.2. SUSTAINABLE AGRICULTURE

Firstly, I learned that **sustainable agriculture** has now become one of the most important concepts in agricultural development (Harwood, 1990; WCED, 1987; Pretty, 1996; Rigby, Howlett and Woodhouse, 2000; Stoneham, Eigenraam, Ridley and Barr, 2003; Röling and Wagemakers, 1998), but that it is not a simple model or package to be imposed - *it is more a process for learning* (Benor and Harrison, 1977; Kilvington, Nixon and Yeabsley, 2002; Marsh, 1998; Rhoades and Booth, 1982; Van de Fliert, 2000; Pretty, 1996; Röling, 1995; Röling and Wagemakers, 1998; Uphoff, Esman and Krishna, 1998). Secondly, '*true participation*' is seen as one of the critical components of success in promoting sustainable agriculture practices (Allen, 2000; Chambers, 1990; Chambers and Ghyllyal, 1985; Uphoff *et al.*, 1998; Pretty, 1996; Pretty, Morison and Hine, 2003; Selener, 1998; Tan, 1985; Van De Fliert and Braun, 2002; Vernoooy and McDougall, 2003; Vincent, 2003). This has opened my eyes to the now growing family of 'participatory approaches and methods' that enable people to share, plan, act, observe, reflect and learn. Thirdly, in a more bio-technical sense, I understood that 'systems high in sustainability are making the best use of nature's goods and services whilst not damaging these assets' (Pretty, 1996; Pretty *et al.*, 2003; FAO, 2001). From that perspective, it was encouraging to learn that the social, economical and environmental benefits of conservation agriculture (CA), which we promoted in the project, are substantial. Pretty *et al.* (2003) found that these practices have led to a 93% increase in per hectare food production, averaged across 208 initiatives (projects) they surveyed world-wide.

3.3. A MULTI-LEVEL STAKEHOLDER FRAMEWORK (MLSF)

I found the **multi-level (hierarchical) stakeholder framework (MLSF)** a promising platform from which to launch initiatives for sustainable agriculture (Burrough, 1997; Dent, 1995, 1996; Hurni, 1997; Rogers and Bestbier, 1997; Smith, 1997; Smith, Van Zyl and Bouwman, 2000). In addition to making me aware of the importance of identifying and working with different stakeholders (at various levels), it re-emphasised a 'bottom-up' approach, which place people at the centre of their own development (DWAF, 1996; FAO, 1997; Howard, 1998; Hutchinson and Toledano, 1993; Ryan and Bray, 1997; Pieri, 1997).

3.4. MULTI-STAKEHOLDER PROCESSES

Following from the above-mentioned, I discovered that **multi-stakeholder processes (MSP)** are needed to transform the MLSF into an active and living system that is able to mobilise the people participating in the Bergville project and enable them to ultimately change the situation they are living in (Allen, 1997; Clark and Timms, 2000; Defoer and Budelman, 2000; Dick, 2001a; MSP Resource Portal, 2004; Selener, 1998). Most importantly, however, is that MSPs must *facilitate* the wide involvement of people in problem-solving and decision-making (MSP Resource Portal, 2004; Scoones *et al.*, 1996; Smith, Van Zyl and Bouwman, 2000; Röling, 1995; Woodhill, 2004). I soon accepted this idea of 'facilitation' as central to our (the researchers or implementing agents) role and to the success of the Bergville project and of any other similar initiative. Indeed a paradigm shift was needed by most of us involved in the Bergville project in the direction of more facilitation. Of great practical value to me (i.e. how to bring everything together) was learning about the different views on the steps and stages within a MSP, which also changed our initial ideas which were mostly influenced by the Farming Systems Approach. One critical principle that emerged was that of 'the dynamic and iterative nature of the MSP' (Woodhill, 2004). Again, it was re-assuring to learn that there are many different [participatory] methodologies and tools that a facilitator can draw on and combine into a purpose-driven MSP.

Another breakthrough in my understanding of sustainable agriculture was that *scaling-out* and *scaling-up* processes can be linked, illustrated and focused within the MLSF through the application of these participatory methodologies (Douthwaite, Kuby, Van de Fliert and Schulz, 2003; Ison, Maiteny and Carr, 1997; Snapp and Heong, 2003). Furthermore, for these processes to empower the disempowered, they need support from *partnerships* (Kusek and Rist, 2004; Wilcox,

2004; IK Notes, 2004; Livelihoods Connect, 2004). Although it was not always possible to choose our partners in the Bergville project, our vision became one of choosing partners which have *some shared goals and values*. A major personal revelation, discovered through theory and practice, is how important it is to *manage relationships* among partners and stakeholders, in order to work collaboratively to achieve sustainable improvements. Finally, although this idea was acknowledged perhaps too late in the Bergville project, I learned that working with local institutions is critical for achieving sustainable local development (DFID, 2001; IAC, 2004; Marsh, 2002; Krishna, 2004; Raina, 2003; Uphoff, Esmann and Krishna, 1997). However, according to Dalal-Clayton, Dent and Dubois (2003), a major challenge is to build up effective middle-level institutions, creating strong bridges that link up local institutions with institutions providing much needed resources from higher-up in the hierarchy.

3.5. CONCEPTS AND PARADIGMS

Reading more about different, but relevant **concepts** and **paradigms**, a deeper theoretical understanding was created which further led towards the adoption of action research as main methodology under the paradigm of constructivism and interactive agricultural science. The first of these concepts was *systems thinking*, which seems very suitable to study and solve complex dynamic issues of both a physical and social nature (Checkland, 1981; Clark and Timms, 2000; Woodhill, 2004). I intuitively, more than anything else, related to *experiential learning* (the cycle) as THE model to focus on the elements of learning in groups (Argyris, 1983; Kemmis and McTaggart, 1988; Kolb 1984). Importantly, I realised that it is necessary to complete the cycle for effective learning to occur, which later emerged to be particularly challenging working with the group of resource-poor farmers in Bergville. It appears to be no coincidence that there are similarities between this concept of experiential learning and that of action researching as Kurt Lewin (1946, 1947) is considered to be an important contributor to the development of both action research and experiential learning. From literature it appears that action research is the connecting of cycles of experiential learning focused on a particular situation. The learning outcomes of each cycle provide input to the next. Thus action research can be interpreted as a single phenomenon described from different perspectives. Important, is that all action research shares a commitment to both theory development and actual change. So does *action learning*, which was the next concept I studied (Coghlan, Dromgoole, Joynt and Sorensen, 2004; Dick, 2006; King Gunton, Freebairn, Coutts and Webb, 2000; Marquardt, 2004; Roberts, 1997; Zuber-Skerritt, 2005). I realised that action learning is a particular structural approach directed to learning in a social setting, which could be of great use in some of the group activities we tried

to facilitate in the Bergville project. Again, as with experiential learning, action learning and action research are similar in practice. In fact, action learning seems to be more similar to mainstream action research than are some of the more marginal action research variations, leading to routine use of action learning by many action researchers, including myself. I was comforted to learn that action learning is described by some researchers as an underlying precept of action research. In conclusion, the three methodologies (or concepts) of inquiry discussed above, i.e. action research, experiential learning and action learning, consequently formed the foundation of my action researching approach to the facilitation of [experiential] learning with resource-poor farmers in the Bergville project. Similar to the methodological approach of this thesis (described in **Chapter 2**), the approach followed in the Bergville study can be seen as using 'multi-methodologies' or 'triangulation'.

3.6. ACTION RESEARCH

Approximately one year after starting the Bergville project, I realised that **action research** is the [main] methodology best fitting the situation in the Bergville project. In a practical sense, I saw action research as the 'umbrella' methodology, most closely related to the *constructivist paradigm*, which formed the motivation for this study (Dick, 1993; Röling and Woodhill, 2001; Woodhill, 2004). I furthermore saw *action research* as the 'main methodology', working in harmony with a family of research methodologies which aim to pursue action and research outcomes (these concepts and complementary methodologies are discussed separately in **Section 3.7**) (Argyris, 1983; Carr and Kemnis, 1986; Checkland, 1981; Guba and Lincoln, 1989; Patton, 1997). Understanding in essence what action research could contribute, i.e. *action* and *research* to bring about *change* in the Bergville farming community *and* in the project, was a major leap in methodological thinking and design. I was relieved to find that it was still a very valid and sound form of *research*, which would, through participation, increase *understanding* on the part of the researcher, but also the client. As the definition put it, action research is: a) pursuing action **and** research, through b) a cyclic process, alternating action with critical reflection.

As shown above, action research provides a framework I could use to formalise and make this natural learning process in the Bergville project more effective. Going back to an earlier discussion, the basic underlying assumption which underpins this theory and practice is the existence of an experiential-based learning cycle (Allen, 2001; Baskerville and Wood-Harper, 1996; Checkland, 1981, 1991; Dick, 1993, 1997a, 1998, 2006; Gummesson, 1991; Kemmis and

McTaggart, 1988; Kolb, 1984; Pontius, Dilts and Bartlett, 2002). A specific challenge for me was to make each step in the cycle practical and real for the participants. As will be illustrated in **Chapter 4**, the *critical reflection*, which is as important as the action, was particularly difficult. Since it is the critical reflection which provides the "research" (Dick, 2002), the improved understanding [of theory and practice], then it should be seen that all participants in the action research process are 'guided' through that stage. The following principles of action research were emphasized in the literature:

- a) it is *action oriented*, intended to achieve change (Dick, 1993, 2006);
- b) because change is an emphasis, action research is usually *participative* (Allen, 2001; Dick, 1991, 1997a, 2006; Oja and Smulyan, 1989); and
- c) action research is *responsive* to the situation (Beilin and Boxelaar, 2001; Dick, 1993, 1998, 2006; Van de Fliert, 2000).

Once again the [main] role of the action researcher emerged even stronger than before, which is to *facilitate* (guide) communities (participants) through all the stages of the action research cycle (Allen, 2001; Argyris and Schön, 1974; Pretty and Chambers, 1993; Pretty, 1996; Senge, 1990). Action researchers are also responsible to develop a learning environment in the multi-stakeholder process, using various participatory action research methodologies, techniques and tools.

3.7. COMPLEMENTARY ACTION RESEARCH METHODOLOGIES

From the above experiences and reflection on existing theories, I saw the multiple and interchangeable use of experiential learning, action learning and action research as the 'main' or 'umbrella' action research methodological framework. However, I soon found that it did need other **complementary action research methodologies** in various stages of the project to strengthen the MSP within the Bergville project, since no single methodology is likely to be comprehensively applicable in a given situation and a different mixture of methodologies may be appropriate at different stages of the MSP (Ison *et al.*, 1997; MSP Resource Portal, 2004; Oliga, 1988; Roberts, 1997; Woodhill, 2004). Our challenge as facilitators was to adapt such methodologies or create our own specific methodology to meet the unique circumstances of the Bergville project. Fortunately, from theory it was acceptable to use diverse methodologies that may range from "reductionist scientific research to creative artistic expressions". I found that a number of methodologies were relevant to the Bergville project. *Soft systems methodology*

(SSM) (Checkland, 1981, 1985, 1991; Checkland and Scholes, 1990; Vickers, 1961, 1967, 1970, 1983) provided a useful basis to assess messy, ill-structured, real-world problems such as those found in the Bergville project, where it is difficult to define objectives, or to decide whose were most important. This consequently led to the use of SSM to develop a 'platform for land use management' in the Bergville project (Röling, 1997; Röling and Jiggins, 1998). The "soft" platform perspective implies attention to action research methodologies, such as M&E, for the facilitation of social learning so as to take stakeholders on a learning path towards the sustainable management of the "hard" system, i.e. natural resources. I viewed this so-called *coupled system* as a suitable approach to design and facilitate the implementation stage of the MSP in Bergville. What was then needed was the facilitation of multiple stakeholder processes at different levels of the MLSF to form "nested platforms" and to agree on collective action for adaptive management. Then there was still a need to pay attention to other complementary methodologies that could fill the gaps at certain stages of the MSP.

One of these methodologies was the *Farming Systems Approach (FSA)* (FAO, 1989; Tripp, 1991; Gilbert *et al.*, 1980; Norman, Worman, Siebert and Modiakgotla, 1995; Simmonds, 1985; Matata, Anandajayasekaram, Kiriro, Wandera and Dixon, 2001), which had some notable successes in rural livelihood programs as well as sustainable management of natural systems, although there is some criticism also. I was relieved to find that there are already increasingly more examples of FSA practitioners who have made substantial contributions to transform it to a new research approach, reinforcing principles consistent with various types of adaptive research with a *farming system* (research) perspective (Anandajayasekeram, Torkelsson and Dixon, 1999; Matata *et al.*, 2001). Some of these examples demonstrated a shift from technology transfer mode to a *facilitation mode*, where research and action are linked, multiple perspectives and interpretations are respected and collegial interactions are encouraged. FSA thus shifted from a hard systems approach, where models are formulated, solutions designed and the process is controlled by the researchers, to a soft systems (action research or co-learning) approach, where boundaries and conditions are negotiated among actors, where action and reflection become part of an ongoing cycle, and where the political implications of encounters are made explicit (Anandajayasekeram and Rukuni, 1989; Anandajayasekeram *et al.*, 1999; Farrington and Martin, 1988; Ison *et al.*, 1997; Matata *et al.*, 2001; Scoones *et al.*, 1996). I found that this new role for FSA, founded on a combination of methodological innovation and new organisational arrangements and linkages, offered the potential to add much value to the methodological development in the Bergville project.

The study of another methodology, *Farmer Participatory Research (FPR)* (Chambers and Ghyldal, 1985; Farrington and Martin, 1988; Rhoades and Booth, 1982; Selener, 1998; Tan, 1985; ILEIA, 1989), emerged from a need by the researchers [in the Bergville project] to use research approaches that would result in technologies beneficial to and therefore to be adopted by resource-poor farmers. Firstly, FPR practitioners emphasise the *participation* of farmers in the process of technology generation. Secondly, a basic tenet of this approach is that agricultural technology must emerge from the farmers' needs as they identify them. Thirdly, farmers conduct *experiments* and evaluate the appropriateness of a technology on the basis of their own criteria, on site and with their active participation. The biggest contribution that FPR, in combination with FSA, made to my theoretical understanding was on the role of *on-farm experimentation* and trials within the MSP and action research process. I learned that experimentation is not only useful and essential in determining the viability of technologies according to the farmers' criteria, but more so in developing *farmers' capacity for experimentation* and the contribution that it could make to the learning, or action research process. By participating in farmer-managed research, researchers strengthen farmers' capacity for experimentation. From a bio-technical point of view, proponents of farmer participatory research promote *low cost technologies* and a minimisation of external inputs by using locally available resources and strengthening the farmer's experimental capacity. These features, which aim at sustainable and environmentally sound development, were most appropriate to the situation in the Bergville area. My main conclusion here was that farmers' experimentation should be an essential and integral part of the action research process followed in Bergville. Again our (i.e. researchers) role was described as "facilitators and advisors when farmers engage in problem definition, experiment design and evaluation".

The *Farmer Field School (FFS)* approach (FAO, 2000; Simpson and Owens, 2002; Pontius *et al.*, 2002) was seen as a methodology that could contribute to the Bergville project in many respects. Firstly, it could provide us the opportunity to help farmers to acquire an understanding of important 'systems' concepts and relationships through a 'training-of-trainers' approach. Secondly, it views *farmer-to-farmer training* (or extension) through FFS 'graduates' as a promising route to multiply FFS (Quizon, Feder and Murgai, 2000). This was one of the main motivations of following this same philosophy in the Bergville project, where 'lead farmers' had to communicate the new technologies to others in their immediate localities (communities); this later proved to have made significant contributions to local social development. Thirdly, one of the most uplifting contributions of FFS to Bergville was that of the educational philosophy of the FFS, which rests on the foundations of *adult non-formal education* and reflects the four elements

of the '*experiential learning cycle*' (Fell, 1986, 1996). This was my main inspiration to design the '*training-of-trainers*' strategy in Bergville on non-formal education principles, emphasising learning by doing, and empowering farmers to identify and solve their own problems. Participation, self-confidence, and collective action and decision-making are some of the principles fostered during the experiential learning process. FFS further encouraged us as trainers to move away from the role of an instructor, but of *facilitators of the experiential learning process* (Pontius *et al.*, 2002). Additionally, FFS highlights the use of *group dynamics* exercises, which enliven the process, strengthen the coherence of the group, and make the members more aware of the importance and dynamics of group processes (Van de Fliert, 2000). During these training-of-trainer (TOT) sessions, a FFS recommendation is the schooling of farmers in experience-based learning methods that will help them organize and facilitate their own 'training' using local resources. This group and individual capacity-building processes encourages an adaptive management approach by farmers, which need to be supported by action research principles, such as continuous monitoring and feedback processes at the community level (Pontius *et al.*, 2002). One of the more recent areas where FFS has been applied is in the process of *institutionalization* (Simpson and Owens, 2002; Pontius *et al.*, 2002). The application of participatory, non-formal adult education methods represents a real advance over models based on information dissemination and the delivery of simple messages. But this is not enough. The long-term development of a sustainable small-scale agriculture also requires strong *farmer groups* with linkages among themselves and with the wider community. This last development was also a turning factor in our approach to form small *learning groups* around the lead farmers.

Finally, the idea that FFS are not an end in itself, but a starting point for the development of a sustainable agricultural system in a given locality, is central to the philosophy followed to ensure 'sustainability' after phasing-out in the Bergville project. Similar to what FFS advocates, the Bergville project aimed to provide farmers with an initial experience in experimentation based on ecological principles, participatory training and non-formal education methods. Once this foundation has been laid, farmers are better able to act on their own and to sharpen their observation, research and communication skills. Hence, the project sets in motion a longer-term process, in which "opportunities are created for local leadership to emerge and for new, locally devised strategies to be tested". From a FFS perspective, this longer-term process has been identified as *community FFS* (Simpson and Owens, 2002), with a goal to institutionalize FFS at the community level. From a Bergville project perspective, reaching this point was seen as a key indicator of 'sustainability'.

Monitoring and Evaluation (M&E) (Abbot and Guijt, 1998; Herweg and Steiner, 2002; Patton, 1997; Woodhill and Robins, 1998; IFAD, 2000) was seen as the main methodology being studied and adopted under the action research “umbrella” in the Bergville project. The two main purposes M&E was used for in Bergville were: a) to support decision-making and planning in view of improvement and b) for rendering judgements or accountability. Literature shows that perhaps the main reason why M&E is such a prominent action research methodology, is that there is probably far more written on M&E alone than on all (other) action research methodologies combined. Fortunately for groups like us in Bergville, which had to deal with the complexities of reality, changes in [M&E] methodology over time has been mostly from positivism to action research and from quantitative to qualitative. Most useful to us, working within an action research framework, was that many appropriate MSP methods could be based on M&E principles and practices, always with a view to bringing about change (Dick, 1993). Literature also shows how other action research methodologies, such as SSM, can be successfully used as an evaluation tool (Dick, 1993). In fact, the main stages of M&E closely relates to the learning cycle of action research. One must then also realise that the formalized description of key ‘steps’ in M&E hides what is, in fact, an iterative and negotiated process to which all the partners can contribute.

My most critical understanding from literature was that the “establishment of adaptive and continuous M&E systems” should be an essential tool for adaptive strategies to manage complex environmental systems (Ekboir, 2003; Horton and MacKay, 2003). Similar to the ‘concepts and principles’ of action research described above, *participation* of primary stakeholders during the evaluation process goes without saying (Guba and Lincoln, 1989; Patton, 1997; MacKay and Horton, 2003; Woodhill and Robins, 1998). Ideally, key stakeholder, such as farmers, should be involved from the beginning. However, the increasing use of collaborative (participatory) approaches to research and development poses new challenges for decision-makers and evaluators. One of the most pressing challenges we also experienced was to develop *participatory and systems-based evaluative processes* (Allen, 2000), to allow for ongoing learning, correction and adjustment by all parties concerned. From that perspective, the M&E design in Bergville became part of the project intervention to the extent that the way it was conducted supported and reinforced accomplishing the desired project goals.

Some of the M&E practices perceived to be most useful to the Bergville project, were *evaluation frameworks* (Carter, 1996; Freebairn and King, 2003; Glenn and Pannell, 1998; Herweg, Steiner

and Slaats, 1998; Gameda and Dumanski, 1994; King *et al.*, 2000; Lopez-Ridaura, 2005; Lopez-Ridaura, Masera and Astier, 2002; FAO, 1993; OECD, 1996; ICASA, 1996; Conway, 1994), a *theory-of-action* (Argyris and Schön, 1974; Dick, 2003; Patton, 1997), and *participatory self-evaluation* (Dick, 2002; Uphoff, 1989; Williams, 2004). Since learning and improved decision-making skills are important but vague as a criterion for 'sustainability' (they appear more difficult to measure than past criteria such as the adoption of a technology), these proposed qualitative evaluation methods were used as a way around this difficulty. For example, the approach we used is to place a flexible and practical evaluation methodology in the hands of [project] farmer participants. The idea was that this methodology, i.e. *participatory self-evaluation*, could and would be useful to local group facilitators (or lead farmers) and to anyone else working in support of project goals, but its aim was to strengthen group management capabilities directly. The possibility that we could provide local *self-help (learning) groups*, who wished to achieve economic, technical, social and other improvements, with an ability to establish their own collective operational capacity, was closer to the goal of 'sustainability' than ever before. By using M&E methods, a critical aim of action research in view of sustainable agriculture, namely *to develop the self-help competencies of people facing problems*, could be reached (Williams, 2004).

3.8. PARTICIPATORY TOOLS AND TECHNIQUES

The lower-end of my description on the initial understanding of theories deals with **participatory tools and techniques**. By tools and techniques we mean the specific ways of completing tasks that add up to a methodology (MSP Resource Portal, 2004; Woodhill, 2004). Whatever the methodology we chose for the Bergville project, we required some means for collecting the information (e.g. in the case of monitoring data) and reflecting on the information (e.g. in the case of a review workshop). Furthermore, a key part of facilitating the MSP is to use *tools and techniques* that enable people to visualise and understand issues, to communicate with each other, analyse options and reach decisions in structured ways (Vincent, 2003). From my own experience, it was most satisfying to discover that the last decade has seen exciting innovations and a tremendous spread of participatory tools and methods in the context of sustainable development (Pretty and Chambers, 1993; Pretty, Guijt, Scoones and Thompson, 1995). On the other hand it was frustrating to first understand and then apply them correctly within the action research cycle, mostly directly from literature resources without any prior training in them. My frustration was also voiced by other researchers who were asking about when and how, and which type of method, in combination with which traditional research tools, should be used.

Fortunately, the rapid expansion of new participatory methods and techniques has drawn on many well-established traditions that have put participation, action research and adult education at the forefront of attempts to emancipate and empower people (Pound, Snapp, McDougall and Braun, 2003; Rocheleau, 2003; Pretty *et al.*, 1995). It would seem that the emphasis on participatory methods is on those that are fostering a *sensitive and mutually beneficial dialogue* (Vincent, 2003). In trying to implement what they recommended in the Bergville project, I used a combination of tools and techniques to alter the tempo and nature of the action research process. Finally, I see this diversity and complexity in the way systems of interaction can be put together as strength which could greatly influence the speed and impact of our efforts to facilitate action research in view of sustainable agriculture.

3.9. SUMMARY AND CONCLUSION

In order to promote sustainable agriculture, it is critical to facilitate a *process of learning*, which has '*true participation*' of relevant stakeholders as a critical component. To enable people to learn, it is necessary to use a growing family of 'participatory approaches and methods'. In a more bio-technical sense I learned that the social, economical and environmental benefits of conservation agriculture (CA) are substantial.

I discovered that multi-stakeholder processes (MSPs) can *facilitate, scale out and scale up* the wide involvement of people in the learning process, which is needed to transform a multi-level stakeholder framework (MLSF) into an active and living system. For that *strategic partnerships* and an effective *working relationship* with local institutions is critical.

Using a 'multi-methodology' or 'triangulation' approach, three methodologies (concepts or theories) of inquiry, i.e. action research, experiential learning and action learning, formed the foundation of my action researching approach with resource-poor farmers in the Bergville project. In a practical sense, I saw action research as the 'umbrella' methodology, most closely related to the *constructivist paradigm* and working in harmony with the other research methodologies. A specific challenge was to make each step in the cycle practical and real for the participants - of particular 'difficulty' was the *critical reflection* step.

No single methodology is likely to be comprehensively applicable in a given situation and a mixture of methodologies may be appropriate at different stages of the MSP. From that perspective, it is acceptable to use diverse but relevant (to the action research approach)

methodologies, such as *Soft Systems Methodology (SSM)*, *the Farming Systems Approach (FSA)*, *Farmer Participatory Research (FPR)*, *Farmer Field School (FFS)* and *Monitoring and Evaluation (M&E)*.

Participatory tools and techniques are specific ways of completing tasks that add up to a methodology. A key part of facilitating the MSP is to use *tools and techniques* that enable people to learn. The last decade has seen exciting innovations and a tremendous spread of participatory tools and methods in the context of sustainable development. The rapid expansion of these tools and techniques has drawn on many well-established traditions that have put participation, action research and adult education at the forefront. Participatory methods that foster a *sensitive and mutually beneficial dialogue* are emphasised in this study.

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CHAPTER 4. APPLICATION OF THEORIES IN A LANDCARE PROJECT

4.1. INTRODUCTION

This chapter outlines the application of initial theories (**Chapter 3**) in the Bergville Landcare project. **Chapter 4** serves as the “act” phase of this iterative thesis research process (**Figure 2.2**) and describes the approach of how the initial theories (methodologies) were applied in the Landcare project in view of using it as a primary data source (for this thesis). The latter includes project documentation (e.g. annual progress reports), personal experiences from my researcher diary, significant changes observed and monitoring and evaluation (M&E) data. In contrast, **Chapter 2** is a description of the methodological approach of THIS thesis. For practical and academic purposes, it is important to understand the differences between the action research approach taken in this thesis and the one followed in the Landcare project.

4.2. OVERVIEW OF PROJECT ACTIVITIES AND DOCUMENTATION

The ARC-ISCW Landcare team started with the project in August 2000. **Table 4.1** represents the chronological implementation of the major activities in the Bergville Landcare project. **Table 4.1** also serves to indicate the relevant project documentation that was used as data in the thesis research process (See **Annexure 1** to **13** included in the attached CD) and links it to certain project activities listed in the table. At the start of the project, the ARC-ISCW was involved with many other stakeholders in negotiating a range of issues, such as selection of study area, appropriate approach and methodologies, implementing partners, traditional protocol, communication channels and communication forums. During the diagnostic phase the participants developed a project structure to indicate the different forums and how the project would link up with them (See **Annexure 8**). With regard to the approach taken, the ARC-ISCW decided to combine forces with the KZN-DAEA to introduce FSA as preferred methodology for the North-West Region of the Province (see **Chapter 1**). By June 2000 ARC-ISCW decided to participate in the process where the CGIAR Institute of Wheat and Rice Research (CIMMYT) supported KZN-DAEA in training staff-members to apply FSA techniques in practice. By August 2000 the ARC-ISCW decided to initiate the FSA process in the Landcare project, which follows a step-wise implementation of various participatory phases and methods. These steps were: a) Diagnosis, b) Planning / Design, c) Implementation / Experimentation, and d) M&E.

Table 4.1. A chronological representation of the major activities of the Bergville (Emmaus) Landcare project

Date, period, location and documentation	Activities implemented at the time; methodology used	Participants; roles	Comments; reflection
September 1999 , Port Shepstone, KwaZulu-Natal (KZN) (See business plans and memorandum of agreement (MOA) in Annex 2)	Initial contact with National and Provincial stakeholders at ARC-ISCW marketing event; submission of 1 st business plan and signing of MOA	ARC-ISCW management was marketing institute's programmes and expertise; National Department of Agriculture (DoA) requested ISCW to submit project proposal; KZN Department of Agriculture and Environmental Affairs (DAEA) suggested tentative target areas for project implementation	No involvement of communities in the identification of study location
April to July 2000 ; various locations in KZN, e.g. Cedara, Ladysmith, Bergville (See 1 st Progress report in Annex 1 and minutes of 1 st meeting in Annexure 2)	Stakeholder analysis; went through formal channels of KZN-DAEA;	Identify and communicate with stakeholders on different levels, i.e. provincial (Landcare coordinator), regional (Ladysmith) for approval, district (at District Task Team meeting for introduction to district) and community (traditional authorities, farmers)	Project was positively accepted by all stakeholders; protocol and procedures were discussed; beginning of good relationships
21st to 25th August 2000 ; Drakensville resort and Emmaus area, Bergville district (See 1 st Progress report in Annex 1)	Diagnostic survey; semi-structured interview technique; use of 'checklist' to guide interviewing	ISCW for coordination and facilitation; KZN-DAEA for survey team leaders; CIMMYT for training and facilitation; local farmers for participation in survey	Farmers were not part of the survey team; methods to adequately treat survey data were lacking; benchmarking was not properly done
20th to 22nd September 2000 ; Drakensville resort, Bergville district (See 1 st Progress report Annex 1)	Planning and design phase); participatory planning workshop; methodology of Tripp and Woolley (1989)	Researchers (mainly from the ARC) and KZN-DAEA extension personnel from the district involved in diagnostic and experimental activities. Other persons, such as specialists in subjects that were particularly relevant to the research program (i.e. agronomists, economists, extension specialists, etc.)	Farmers were not part of the planning process; methodology was primarily developed to plan and design experiments
October to November 2000 ; Emmaus ward, Bergville district (See RM Trial information in Annex 3)	Implementation phase started; used soft system methodologies for 'platform' development; establishment of researcher-managed (RM) trial (four	Researchers facilitated implementation process of all major methodologies (activities) for platform development; Local farmers were main clients (end-users), while KZN-DAEA extension personnel were primary	No active involvement (empowerment) of farmers until this stage; poor attendance of community meetings in Potshini; RM trial implementation required expert skills

	experiments) in Potshini community; community meetings in Potshini; Initial farmer-managed (FM) trials were implemented	stakeholders; Potshini farmers participated in establishment of RM experiment; CIMMYT funded initial FM trials	and experience
28th March 2001 , Potshini experimental trial site, Bergville district. (See 1 st Progress report in Annex 1)	First annual Farmers' Day; major awareness activity	Local farmers, KZN-DAEA staff from all levels, traditional authorities, local council members, DoA staff and ARC researchers and managers	Good attendance, but mostly from Potshini community; poor transport services for remote communities
3 July 2001 , Ladysmith, KwaZulu-Natal (See 1 st Steering Committee Meeting (SCM) minutes in Annex 4)	Inaugural meeting of the steering committee (SC) for the Bergville Landcare project	ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; SC's role was to oversee project implementation and progress	Platform for effective cooperation established; involvement and ownership by higher-level stakeholders gained
12 July 2001 , Cedara, KZN (See minutes of investigative meeting (SCM) in Annex 5)	Meeting on the investigative components for the Bergville Landcare project	Researchers from ARC and KZN-DAEA	Platform for cooperation on research activities established; factors for experimentation discussed and elaborated; roles and responsibilities identified
July to August 2001 (See 2 nd Progress report in Annex 1)	Selection of lead farmers; Started collection of continuous, annual monitoring process; first action forum	Researchers provided initial criteria for selection of lead farmers; Extension personnel and farmer structures completed selection process ISCW facilitated action forum meeting with primary stakeholders (farmers, extension and researchers); Researchers coordinated M&E survey and selection of indicators	Selection of poor candidates were not totally averted; included 50% women farmers for gender sensitivity
3 to 7 September 2001 , Drakensville resort, Bergville district (See 1 st Training course program and materials in Annex 6)	1 st training course for lead farmers (trainers or Landcare facilitators)	ISCW researchers designed and facilitated training course; Lead farmers and extension personnel were participants	Training program and topics were relevant; training materials and manual did not contain much visuals
October to November 2001 ; Emmaus ward (See 2 nd progress report in Annex 1)	Established 20 new FM trials; plant RM trial for 2 nd year	Lead farmers was responsible to establish FM trials on their farms; on le; Included multiple cropping systems and biological nitrogen fixation	Exciting to include new principles of conservation agriculture (CA); challenge to

		(BNF) components in RM trial; Involved ARC-RFI and ARC-PPRI as new research partners	coordinate and distribute inputs among farmers
15 February 2002; KZN-DAEA office in Bergville (See 2 nd SCM minutes in Annex 4)	2 nd Steering Committee Meeting (SCM)	ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from Emmaus area	First time to involve participating farmers in SCM
27th March 2002 Potshini trial site (See 2 nd progress report in Annex 1)	2 nd Annual Farmers' Day	Local farmers, KZN-DAEA staff from all levels, traditional authorities, local council members, DoA staff and ARC researchers and managers	Good attendance, but mostly from Potshini community; poor transport services for remote communities
April 2002 Zamimpilo Community hall, Emmaus (See 2 nd progress report in Annex 1)	Monthly action forum meetings continued; Initiation of M&E process to focus farmer-to-farmer extension; used theory-of-action method	ISCW facilitated action forum meeting with primary stakeholders (farmers, extension and researchers); from 2 nd and 3 rd year, lead farmers took over the facilitation responsibilities	Attendance in action forums were low at the start, but improved quite quickly; responsibility to take minutes of action forums were shared between stakeholders, but it was never typed due to resource constraints
April to May 2002; 10 sub-wards in Emmaus ward (See 2 nd progress report in Annex 1)	Farmer field days; continued every year during this period; farmers used on-farm trials for demonstrations	Lead farmers were responsible for organising field days; supported by local KZN-DAEA extension staff	Participation and support in field days were good; the manner issues were presented was somewhat disappointed
20 August 2002 Zamimpilo Community hall, Emmaus (See 3 rd SCM minutes in Annex 4)	3 rd Steering Committee Meeting	ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from Emmaus area	The Zamimpilo hall soon became too small, moved to bigger community hall
2 to 6 September 2002, Drakensville Resort, (See 2 nd Training course material in Annex 6)	2 nd training course for trainers; multiple cropping systems and biological nitrogen fixation (BNF) components	ARC researchers designed and facilitated training course; Lead farmers and KZN-DAEA extension personnel were participants	Practical exercises and demonstrations with multiple-cropping systems were difficult to perform
November 2002 Emmaus ward (See 3 rd and 4 th progress reports in Annex 1)	Introduced multiple cropping to farmer trials; trials were divided in 3 parts; farmer could choose alternative (cover) crops of choice	ARC researchers coordinated distribution of inputs, such as seeds and agro-chemicals; lead farmers were responsible for implementation and management of trials	Most farmers struggled to manage new crops properly in first season

<p>5th March 2003 Main trial site in Potshini (See 3rd progress reports in Annex 1)</p>	<p>3rd Annual Farmers' Day</p>	<p>Local farmers, KZN-DAEA staff from all levels, traditional authorities, local council members, DoA staff and ARC researchers and managers</p>	<p>The concept of farmer cooperatives was first introduced; first awards to lead farmers</p>
<p>10 March 2003, Zamimpilo Community hall, Emmaus (See 3rd Training course material in Annex 6 and 3rd progress report in Annex 1)</p>	<p>3rd Training course for trainers; value adding on soyabeans, mushroom production</p>	<p>ARC researchers facilitated training course; Lead farmers and extension personnel were participants</p>	<p>Training on value adding seemed to be valuable, especially for local women</p>
<p>15 April 2003 Zamimpilo Community hall, Emmaus (See 4th SCM minutes in Annex 4)</p>	<p>4th Steering Committee Meeting</p>	<p>ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from Emmaus area</p>	<p>SCM approved my request to use project data for PhD studies</p>
<p>April 2003 Potshini community (See 3rd and 4th progress reports in Annex 1)</p>	<p>Introduced grazing management (GM) component on a pilot scale</p>	<p>University of KwaZulu-Natal was new research partners responsible to introduce GM in Potshini</p>	<p>Very few grazing management practitioners to use; success stories to implement sustainable GM in communal systems – new challenge</p>
<p>May to October 2003 (See 4th progress report in Annex 1)</p>	<p>Implemented mechanisation strategy</p>	<p>ISCW formed partners with manufacturers to design and implement appropriate implements; lead farmers were trained and used to convert and train other farmers</p>	<p>New implements were innovative and cost effective; would have liked to spent more time to test it with farmers</p>
<p>June to October 2003 (See 4th progress report in Annex 1)</p>	<p>Continued with annual M&E actions as well as monthly action forums; focused farmer-to-farmer extension with M&E tools; Strengthened learning in farmer groups through the introduction of participatory self-evaluation (PSE) tools</p>	<p>ISCW facilitated M&E process in action forums; farmers collected yield data and soil samples themselves with support of KZN-DAEA extension personnel; lead farmers responsible to use PSE tools within their groups</p>	<p>Difficult to assess the quality of farmer-to-farmer extension process; lack of good indicators on some aspects; needed more time to introduce PSE tools to farmer learning groups</p>
<p>28 October 2003 Zamimpilo Community hall, Emmaus (See 5th SCM</p>	<p>5th Steering Committee Meeting</p>	<p>ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from</p>	<p>Provincial Evaluation Committee recommended further funding of the project.</p>

minutes in Annex 4)		Emmaus area	
10 March 2004 Main trial site in Potshini (See 4 th progress report in Annex 1)	4 th Annual Farmers' Day	Local farmers, KZN-DAEA staff from all levels, traditional authorities, local council members, DoA staff and ARC researchers and managers; many other partners and stakeholders participated	Awards for best leader farmer performers
6 April 2004 Zamimpilo Community hall, Emmaus (See 6 th SCM minutes in Annex 4)	6 th Steering Committee Meeting	ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from Emmaus area	New provincial Landcare coordinator was introduced to meeting; many changes in KZN-DAEA structures were frustrating and confusing
27 October 2004 Zamimpilo Community hall, Emmaus (See 7 th SCM minutes in Annex 4)	7 th and final Steering Committee Meeting	ISCW management; KZN-DAEA North-west region staff; KZN Landcare coordinator; ISCW Bergville Landcare team members; farmers from Emmaus area	SC commented that the project activities progressed without the need for intervention; due to the restructuring process in the provincial Landcare programme, ARC experienced certain difficulties in performing its duties
9 March 2005 Main trial site in Potshini (See 4 th progress report in Annex 1)	5 th (and last) Annual Farmers' Day	Local farmers, KZN-DAEA staff from all levels, traditional authorities, local council members, DoA staff and ARC researchers and managers; many other partners and stakeholders participated	All primary stakeholders of project received appreciation on their role in the success of the project
April 2005 to March 2006 (See Exit Strategy information in Annex 7)	Implemented project Exit Strategy; Scaling up through stakeholder workshops; impact assessment using convergent interviewing	ISCW facilitated workshops with stakeholders on all levels (from district to national) to share experiences and lessons learned; ARC-Sustainable Rural Livelihoods (SRL) programme funded this phase	Good acceptance and interest in project results; impact assessment revealed encouraging information
8 February 2006 Emmaus community hall	Final action forum meeting	Farmers facilitated action forum meeting with primary stakeholders (farmers, extension and researchers); commercial no-till farmers attended	Participants were sad to realise it is the end of their relationship

4.3. DIAGNOSTIC SURVEY

The diagnostic phase of the Bergville Landcare project took place from 21st to 25th August 2000 (See details in 1st Progress Report, **Annexure 1**). At that stage the Emmaus ward in the eastern part of the Bergville district had already been identified as the tentative target group and / or target area. This decision was primarily made by the district KZN-DAEA extension staff who had a good understanding of current projects and needs in the Bergville district. **Table 4.1** shows the stakeholder groups who participated in the survey, while a list of participants can be found in the 1st Progress Report, **Annexure 1**. Of note is that no farmers were participating in the diagnostic phase workshop, a decision that was probably not well thought through (See **Excerpt 4.1** below).

Excerpt 4.1. Research diary - diagnostic phase

Date	Activities / events / incidents	People present	Critical reflection
24 August 2000	Diagnostic stage, dealing with survey data - no farmer input	Participants in diagnostic survey; no farmers present	We missed an early opportunity to give farmers ownership of data and process. How were those decisions taken? How can we resolve this problem?

A semi-structured interview technique (informal survey) was used to collect the necessary data from the farming communities in Emmaus study area. The interviews were conducted by means of a checklist that was prepared and approved by the survey team. All the relevant topics or questions (*what we really wanted to know*) were covered in the checklist and it formed the 'guidelines' for the interviews.

For the participants of the diagnostic phase, the **intended outcomes** of this informal survey were the following:

- ❑ To describe and understand the current farming and / or production systems
- ❑ To identify and analyze the key farmer problems, needs, fears and aspirations (within agro-socio-economic situation)
- ❑ To identify possible and existing interactions and structures (linkages)
- ❑ To develop some preliminary solutions/ interventions (ideas) on how to solve these problems
- ❑ To orientate and plan the first phase(s) work

The diagnostic phase was also a good 'team building' exercise for the people that would become partners or team members in the project (See 1st Progress Report in **Annexure 1** for more details on diagnostic phase activities, participants and results).

4.4. PLANNING AND DESIGN

The planning and design phase workshop of the Bergville Landcare project took place at the Drakensville Holiday Resort from 20th to 22nd September 2000. This workshop also served as a practical training session for various stakeholders. The workshop was facilitated by Mr. Lucas Serage and Mr. Lucky Lesofi of the ARC – Small Grain Institute in Bethlehem.

The planning and design stage (i.e. problem analysis and selection of appropriate interventions) is a crucial step in the farming systems approach. It combines the available technical knowledge of the scientific community and the indigenous technical knowledge (ITK) in addressing the identified problems of the target group. Effective planning depends on the information obtained during the diagnostic stage, the diagnosis that takes place afterward (supplementary surveys, observations, crop or soil samples, etc.) and the results of the experiments itself.

The participants in the meeting were researchers (from the national Agricultural Research Council and Provincial Department of Agriculture of the KwaZulu-Natal Province) and extension personnel from the Bergville district; most of them had also been involved in the diagnostic phase. Other persons, such as specialists in subjects that are particularly relevant to the research program (i.e. agronomists, economists, extension specialists, etc.), also participated (See 1st Progress Report for list of participants, **Annexure 1**). Again, no farmers were present (See **Excerpt 4.2** below). The meeting took place sufficiently in advance of planting so that the development team was able to select and prepare the site for on-farm experimentation, to engage with the local community and arrange materials for the establishment of the experiments.

The objectives of the workshop to plan the Bergville Landcare project were the following:

- ❑ To clearly define (analyse) problems identified during the diagnostic survey;
- ❑ To establish the causes and potential solutions to the identified problems;
- ❑ To identify interrelations among problems and causes;

- ❑ To identify feasible interventions;
- ❑ To plan implementation of the interventions.

Excerpt 4.2. Research diary - planning and design phase

Date	Activities / events / incidents	People present	Critical reflection
20 September 2000	Planning workshop, introduction of participants – no farmer participants	Participants in planning workshop; no farmers present	How could this happen again? I think the emphasis on training of KZN-DAEA staff put process on wrong track. Principle of participation was not used; roles and responsibilities were unclear; methods were ill-defined and poorly understood.

Beginning with the diagnostic stage and extending into planning and experimentation, researchers should think in terms of *problems*, *causes* and *solutions*. These three terms are central to the discussion of planning as it is presented in the approach of Tripp and Woolley (1989), because they provide a way to prioritise research activities and correspond to the questions, “What is wrong?” “Why?” and “What can we do?” The problems identified during the diagnostic survey were then prioritised and ranked (**see Table 4.2**) (See diagnostic survey report attached to the 1st Progress Report, **Annexure 1** for ranking method and detailed results).

Table 4.2. Prioritised agricultural problems in the Emmaus Ward, Bergville District

Highest rank	Medium rank	Lowest rank
1. Stray animals	1. Weeds	1. Knowledge and skills
2. Lack of money	2. Weevils	2. Labour
3. Stalk borer	3. Cutworms	3. Waterlogging
4. Soil acidity	4. Tractors/tillage	4. Vandalism
5. Late planting		
6. Phosphorus deficiency		
7. Nitrogen		
8. Poor condition of draught animals		
9. Lack of cultivar choices		
10. Lack of markets		

In the next step the development team tried to consider as broad a range of solutions for the above priority problems as possible. In the final step, the list of solutions was narrowed by evaluating each solution according to a set of criteria (See Planning and design report attached to the 1st Progress Report, **Annexure 1** for more details of criteria and methods used).

Once the development team had rated each proposed solution on the basis of these criteria, they came to a decision regarding the future of the solutions. If a proposed solution is thought to be acceptable for on-farm experimentation, it was included in the list of experimental factors (*Basket A*). If more diagnostic activities should take place before and while experiments are continuing, those factors / solutions were listed in *Basket B*. If a proposed solution had potential but requires more research before it can be tested on farms under farmers' conditions, it was included in the list of themes for longer term research (*Basket C*). If the proposed solution required special consideration by extension, credit or input suppliers (the fifth criterion on the list), a note was made in *Basket D* regarding suggested interaction with appropriate institutions (See Planning and design report attached to 1st Progress Report, **Annexure 1**, for more details of results, including proposed solutions).

4.5. DESIGN OF EXPERIMENTS

The experimental factors, which were listed in *Basket A*, were consequently used to design the experiments in the Bergville Landcare project. With the contribution of the stakeholders at the 'planning and design' workshop in Drakensville a range of experiments for the main researcher-managed trial were designed (See Planning and design report attached to the 1st Progress Report, **Annexure 1** for more details of results, including proposed solutions). At that stage, however, I became aware that the technique used for the planning and design workshop (Tripp and Woolley, 1989) was primarily developed for the design of experiments (See **Excerpt 4.3**). It was only later that I realised that we also needed a comprehensive, strategic project plan, which required a different technique and a different outcome.

Excerpt 4.3. Research diary - design of experiments

Date	Activities / events / incidents	People present	Critical reflection
10 October 2000	Experimental design exercise	Only researchers from ARC-ISCW	This worked well to design experiments. We could identify factors and continue to design scientific experiments.

4.6. THE RESEARCH PATHWAY IN PILOT STUDY

The aim of the Bergville Landcare project was to develop and implement sustainable land management practices through appropriate interventions. As described above the pathway of the research and development (R&D) undertaken at the Bergville Landcare project initially followed the steps described by FSA, i.e. Diagnosis, Planning / Design, Implementation and Monitoring and Evaluation (M&E). At that stage my own theoretical understanding of agricultural research and development (discussed in **Chapter 3**) has influenced my ideas on the approach to be followed. For instance, I realised that working in a complex situation would require a systems approach and not a linear transfer of technology model. Due to these new insights at the start of the implementation phase, the project team decided to move away from the more linear approach of FSA and rather aimed to develop a so-called 'soft systems platform' (Röling, 1997) using action research methodologies, tools and techniques. The research process of this thesis lies within the premises of the soft system platform with the main research outcome "to develop or improve theories and practices that would facilitate action research among resource-poor farmers for sustainable management of natural resources".

The idea that a system perceived as "hard" (such as natural resources) requires a "soft" platform to manage its sustainability leads us to coupled systems (Röling, 1997). The platform perspective implies attention to SSM and action research, so as to take stakeholders on a learning path towards effective platform development. From the initial theories investigated in **Chapter 3**, six methodologies or 'pillars', which all fall within the constructivist paradigm and are complementary to action research, were identified for successful soft system platform development during the implementation phase of the Landcare project. These pillars were the following:

- ❑ Awareness (and communication)
- ❑ Local (social) institution building
- ❑ Training of trainers
- ❑ Farmer-to-farmer extension
- ❑ On-farm experimentation (using conservation agriculture principles)
- ❑ Partnerships

For the Landcare project it was important to develop an integrated natural resource management system (i.e. soft systems platform) through a vigorous process of interaction with all

stakeholders. Furthermore, it made no sense to speak of integration without fundamentally considering the whole issue of communication for the purposes of integration and social learning. The integration of the six methodologies of the platform was critical, for example. This was achieved through the application of action research methodologies, methods and tools that lie within the constructivist paradigm and the concept of soft systems platform development. The main action research methodology used in the project for this purpose was monitoring and evaluation (M&E), which will be discussed in detail below.

We believed that by being deliberate and intentional about a process of iteration (the use of repeated cycles), learning and integration would be maximised. In brief, the research 'pathway' of the pilot study consisted of an iterative and cyclic approach of action and research with four major phases: plan, act, observe and reflect. The basic underlying assumption which underpins theory and practice is the existence of an experiential-based learning cycle (Kolb, 1984). This cycle helps people to learn and create knowledge as follows: a) on the basis of their concrete experience; b) through observing and reflecting on that experience; c) by forming abstract concepts and generalisations about what to do next; and d) by testing the implications of these concepts in new situations. The latter will lead to new concrete experiences, and hence the beginning of a new cycle. These main stages of action research (or the 'Learning Wheel' or 'Learning Cycle') are well introduced by the theory and practice of M&E, which involves a spiral of steps, 'each of which is composed of a circle of planning, action and fact-finding about the result of the action'. Furthermore, since M&E is so well documented and described in literature, it was an easy choice of methodology for application in the Landcare project. **Figure 4.1** illustrates the research pathway followed in the Bergville study, indicating the formation of a soft system platform. Although the six pillars (methodologies) worked in parallel, the aim was to continuously integrate and improve them through the M&E cycle. This implied that the inputs, activities, outputs and changes resulting from these methodologies were observed, evaluated and re-planned on frequent events and with different stakeholder groups. These exercises, using M&E tools and techniques, are described below.

It is to be kept in mind that the research methodology of this PhD study (See **Chapter 2**) is using the 'action research process' followed in the Bergville project as the "ACT" phase of the [thesis] research process. In other words, it forms a primary source of data for this thesis research process. The primary and secondary data sources, which are discussed in **Chapter 3** and **4**, will be analysed in **Chapter 5** to generate theoretical and practical insights (implications), which is discussed in **Chapter 6**.

Following below is a discussion of the application, assumptions and intended outcomes of the methodologies, or 'pillars', used for successful soft system platform development during the implementation phase of the Bergville Landcare project. This information is a direct outcome of my own investigation on current theories (see **Chapter 3**) and can be seen as a summary of my thoughts when each of these methodologies was implemented. In **Chapter 5**, these assumptions were used to test my experience against. This process formed part of my analysis (**Chapter 5**) where I identified disconfirming evidence for assumptions in searching for new theories and recommendations.

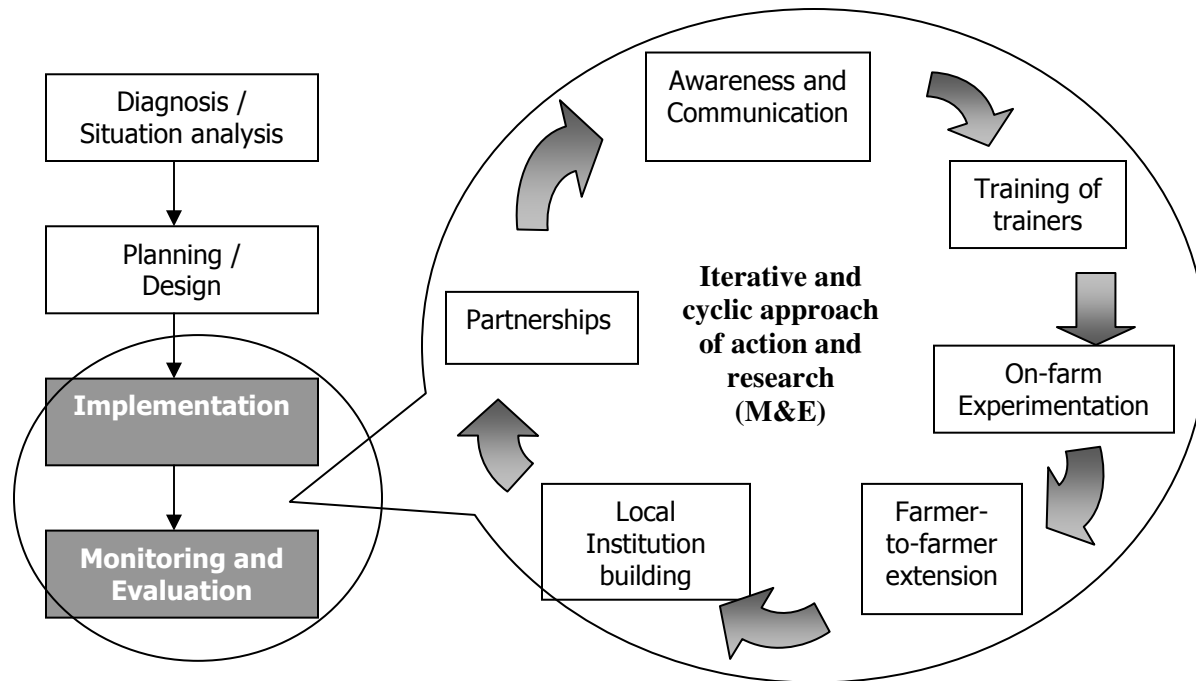


Figure 4.1. The research pathway followed in the Bergville study (Smith *et al.*, 2001)

4.7. ON-FARM EXPERIMENTATION

4.7.1. BACKGROUND

In the process of agricultural technology development and transfer, many of the selected interventions normally require the generation and testing of technologies. The information required to assess a potential solution of an identified problem determines the purpose of experimentation and the type of experiments to be carried out (Matata *et al.*, 2001). On-farm experimentation is a widely used action research methodology applied in many participatory

and systems approaches, such as Farming System Approach (FSA), Farmer Participatory Research (FPR), Farmer Field Schools (FFS), etc.

4.7.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES OF ON-FARM EXPERIMENTATION IN BERGVILLE STUDY

Two types of on-farm experiments were implemented in the Bergville study. Those were firstly a **researcher-managed (RM)** trial at the Potshini trial site and secondly, **farmer-managed (FM)** trials on twenty lead farmers' fields. The objective of the RM trial, also classified as an exploratory experiment, was to determine whether the new technology, which was based on Conservation Agriculture (CA) principles, could function, in a technical and biological sense, in the physical environment of the Bergville area.

The objectives of the twenty FM trials, also classified as adaptation and/or verification trials, were to improve experiential learning, improve modification and dissemination of technologies to local farmers, increase awareness among farming communities and facilitate farmer-to-farmer extension and training.

4.7.2.1. RESEARCHER-MANAGED (RM) TRIAL

The Potshini area was selected as a suitable site for the establishment of the RM trial. The trial site was selected at the initiation of the project (in 2000) in co-operation with the community and the extension staff of the KZN-DAE. The trial site lied on a local farmers' (Ms. Mabaso) field and is dominated by a deep (900 mm) Avalon soil form (see **Annexure 3** for a detailed soil description). Since the establishment of the trial, the local community in Potshini were actively involved and supportive with the application of lime, planting, maintenance and harvesting activities.

The objective of the RM trial (described in **Table 4.3**), sometimes classified as an exploratory experiment, is described above. Because all of the work related to the treatment variables was handled by researchers, the trial of about 0.75 hectare in size was relatively complex as it intended to answer the relevant questions (factors) that evolved from the diagnostic and planning phases for experimentation. Three of the four experiments in the RM trial had some form of formal, replicated (statistical) design. The fourth experiment was only used for demonstration purposes on annual farmer days. A detailed trial design (layout) is found in **Annexure 3**, while the different trials are described in detail in the annual progress reports, **Annexure 1**.

Table 4.3. Application, assumptions and intended outcomes of On-farm Experimentation in the Bergville Landcare project

Application (Type of experiment)	Assumption(s)	Intended Outcomes
Researcher-managed (RM) trial (Potshini trial site)	<ul style="list-style-type: none"> ▪ Applied research on identified factors and conservation agriculture technologies will lead to improved and appropriate technology ▪ Annual information days will raise awareness with various stakeholders 	<ul style="list-style-type: none"> ▪ Improved and appropriate technology for local conditions ▪ Better understanding of the use of conservation agriculture technologies under local conditions ▪ Increased awareness of Landcare practices and technologies among stakeholders
Farmer-managed (FM) trials on 20 local farmers fields	<p>Experimentation by farmers:</p> <ul style="list-style-type: none"> ▪ Improves the collection and use of M&E information ▪ Leads to a better understanding, by researchers, of systems used by resource-poor farmers ▪ Provides an experiential learning environment for farmers ▪ Facilitates the modification and dissemination of technologies among local farmers ▪ Allow a platform for field days (in communities) and 'Look and Learn' visits, which will increase awareness among local farmers 	<ul style="list-style-type: none"> ▪ Improved experiential learning ▪ Improved modification by local farmers ▪ Improved dissemination of technologies to local farmers ▪ Increased awareness among farming communities ▪ Effective farmer-to-farmer extension and training ▪ Generation of local CA technology ▪ Adoption of new and appropriate CA technology

Researchers from the ARC were mainly responsible for the implementation and management of the RM trial, which included the choice of treatments, experimental designs, experimental material and inputs, data collection and data analysis. Local farmers from the Potshini community were used as casual labour during routine operations, such as planting, weeding and harvesting. This approach did not always fit comfortably within the participatory approach

we wanted to apply (see **Excerpt 4.4**) and one would usually want to see farmers gaining much more from such an activity. However, the farmers did gain from it through the following aspects: a) it produced technology that were tested under local conditions and that was ready for farmer experimentation; and b) it was very useful as an awareness raising tool during the annual farmer days.

Excerpt 4.4. Research diary - planting of RM trial

Date	Activities / events / incidents	People present	Critical reflection
15 November 2001	Planting of main trial site at Potshini.	Researchers from ARC and local farmers.	Everything went smooth and we could 'control' the variables. But how could we engage farmers more constructively in the RM trial?

4.7.2.2. FARMER-MANAGED (FM) TRIALS

The 2004/2005 season was the fourth season where FM trials were included in the project. After the training-of-trainers process with the lead farmers and extension had reached a peak, the twenty selected lead farmers established on-farm, farmer-managed experiments on the demarcated 1000 m² plots for the first time in October 2001. These FM experiments continued until the 2004/2005 season and they were coordinated and facilitated by the ARC researchers and KZN-DAEA extension officers. Various new technologies, based on CA principles, were introduced to the farmers through these trials. This includes aspects such as minimum- or no-tillage, crop rotation, special implements, use of herbicides, integrated pest management, liming and soil fertility management (see details of FM trials in the four Annual Progress Reports, **Annexure 1**). FM trial results and their use as a learning tool are described below.

The objectives of the twenty FM trials (as described in **Table 4.3**), also classified as adaptation and/or verification trials, were to improve experiential learning, improve modification and dissemination of technologies to local farmers, increase awareness among farming communities and facilitate farmer-to-farmer extension and training. Usually, these types of trials are used to test adaptation of a narrowed-down choice of options over a given range of environmental conditions, to adapt potential solutions to the requirements of different target groups and to explore the compatibility of tested options with certain personal goals and preferences. The aim

of the Bergville project was that the twenty lead farmers, extension officers and researchers worked together on problem definition and design, while the implementation and management of the trials were mainly the responsibility of the farmers. Following from there, the aim was to do monitoring and evaluation (M&E) collaboratively. In this case, a collaborative relationship meant balanced participation in and control over the research process in order to achieve the objectives of both farmers and scientists. For a detailed discussion of the results of the above-mentioned experimental activities and process, i.e. planning, monitoring, evaluation and implementation, see **Section 4.14** below, and for an analysis of these processes, see **Chapter 5**.

The CA technologies were demonstrated and compared in space (i.e. against traditional practices on the farmers' fields) and over time (i.e. consecutive years). Lead farmers, and later on their trainees, were provided with the necessary inputs for the 1000 m² plot, such as legume (cover crop) seed, agricultural lime, herbicides, fertilizers and pesticides, as well as training on how to apply these inputs. ARC-ISCW scientists and local extension officers paid regular visits to all lead farmers for monitoring and general assistance. The vision was that these lead farmers (or Landcare facilitators), after experiencing the benefits of CA technology, would expand them to the rest of their fields and exchange their knowledge with other farmers. Furthermore, district extension staff would ideally play a key role in the success of these trials, as well as with the spread of information from farmer to farmer, as they have easy access and well established communication channels to the farmers. For a discussion of the results of the above-mentioned activities and processes, see **Section 4.14** below, and for an analysis of these, see **Chapter 5**.

One year after introducing multiple cropping principles in the RM experiments at the Potshini trial site, the research-team decided to introduce some of these newly tested and promising options to the farmers for experimentation. Hence, over the last three seasons of the project (2002 to 2005), these 1000 m² plots were divided into three parts, using each third for the following practices: a) maize, b) soyabean and c) intercropping. Maize and soyabean were rotated every year, while maize was alternatively used either with soyabean, lab lab, cowpeas or dry beans as an intercrop practice in the last third of the plot. Farmers received the following fertiliser according to the recommended application rates: Superphosphate, LAN and KCl. No nitrogen was recommended for the legumes, as they were inoculated with Rhizobium.

4.8. FARMER GROUPS AND LOCAL INSTITUTIONS

4.8.1. BACKGROUND

According to Uphoff *et al.* (1998), developing organisational capacities is more crucial to effective and sustainable rural development than any other activity. In sustainable development extension, groups and teams are the main operational units that can be worked with. The concept of groups should be taken in its widest sense as being a group of people who have similar aims. This could be a community group, or an agency team, or a combination of agency and community people. Groups, in this sense, are the operational unit for extension because, with certain exceptions, there are too many individuals to work with, while the whole community is too big (and has too many perspectives) to work with as a unit (Allen *et al.*, 2002).

4.8.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES OF LOCAL INSTITUTIONALISATION IN BERGVILLE STUDY

Two distinct methods were employed in the Bergville project to foster the development of social structures or local institutions, i) a **monthly action forum** and ii) the formation of small **learning groups**.

The monthly action forum is frequently mentioned in this study. This forum was constituted of the selected lead farmers, the local extension technicians and the ARC researchers as key participants (primary stakeholder groups), although it was open to any other stakeholder of the Landcare project, including farmer trainees. This monthly farmer forum was seen as the 'heart' of the project – it is here that the project was managed in a participatory and adaptive manner. Therefore, in order to learn and adapt as a multi-stakeholder group, a process was continually facilitated to *implement, co-ordinate, monitor, evaluate, reflect, plan and communicate (feedback) activities around the Bergville project in an interactive and participatory way*. Sometimes, it was necessary to use this forum to (re-)training farmers in some of the technologies, or to introduce new tools and techniques to the farmers. From the second year, the forum meetings were chaired (facilitated) on a rotating basis by one of the lead farmers. **Table 4.4** shows the application, assumptions and intended outcomes of *Local Institutionalisation* in the Bergville Landcare project. For an analysis of how these activities and processes worked in practice, see **Section 4.14**, and **Chapter 5**.

Table 4.4. Application, assumptions and intended outcomes of Local Institutionalisation in the Bergville Landcare project

Application (Nature of farmer groups)	Assumption(s)	Intended Outcomes
Action Forum <i>(monthly meetings of farmer representatives, researchers and extension agents)</i>	<ul style="list-style-type: none"> ▪ Forum serves as a platform for communication and interaction between various stakeholders ▪ Serves as a platform for monitoring, evaluation, reflection and planning of project activities ▪ Allow for (re-)training on new technologies 	<ul style="list-style-type: none"> ▪ Effective communication and interaction between key stakeholders ▪ Learning and capacity building among stakeholders ▪ Ownership of Project activities among primary intended users ▪ A culture of adaptive management and strategic decision-making
Learning groups <i>(Small farmer groups formed by trained local lead farmers or Landcare facilitators)</i>	<ul style="list-style-type: none"> ▪ Forms a platform for farmer-to-farmer extension or training ▪ Provide an environment conducive for learning among farmers ▪ Formation of co-operatives, which will provide access to credit, inputs and markets 	<ul style="list-style-type: none"> ▪ Increased adoption of best practice technologies ▪ Increased capacity to monitor, evaluate, plan and act (adaptive management and innovation) ▪ Increased knowledge and skills on best practice technology (human capital) ▪ Formation of co-operatives; access to credit, inputs and markets ▪ Strong and stable local institutions and communities (social capital)

4.9. FARMER-TO-FARMER EXTENSION

4.9.1. BACKGROUND

Farmer-to-farmer extension has developed as a means of improving the dissemination of technical improvements at the local level. Farmers working with researchers and extension officers are encouraged to share their technical developments with other farmers building a process of information exchange (Scarborough, Killough, Johnson and Farrington, 1997). Experience from various parts of the world has proved that farmer-to-farmer extension is an

effective extension approach for sustainable technology dissemination (Muok, Kimondo and Atsushi, 2001). Instead of expecting farmers who live in dispersed, hard-to-reach locations, to come to central training locations, trainers often have to go among the people and train them in or near their homes. Scarcity of good trainers limits the extent of training. A diffusion method of training through fellow farmers can multiply the numbers of trainers, sustaining a process that we call *horizontal diffusion* (Uphoff *et al.*, 1998).

Methods used to promote farmer-to-farmer extension in general include:

- ❑ Training of farmers and farmer-extensionists by external agents and other farmers (e.g. from another area) in technological developments and in communication, extension and in training skills
- ❑ Cross-visits among farmers and exposure among farmers to other institutions of interest, such as research organisations, other successful projects and commercial farms
- ❑ Facilitation of farmers' research into, and testing and adaptation of, new technologies and management practices
- ❑ Farmer group formation and development, and regular group meetings for planning, reflecting, learning, sharing experiences and problems, evaluation, etc.

4.9.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES OF FARMER-TO-FARMER EXTENSION IN BERGVILLE STUDY

Farmer-to-farmer extension was introduced in the Bergville project as a means of improving the dissemination of technical improvements on the community and sub-community (farmer group) level. The vision was that lead farmers who went through the training-of-trainers process and who were working with researchers and extension personnel, would consequently share their technical knowledge with other farmers and assist in facilitating a learning process among their trainees (see a discussion of this process in **Section 4.14**. It is also analysed in **Chapter 5**).

M&E, as key action research methodology, was introduced by the project to facilitate the farmer-to-farmer extension process. This particular M&E process used a 'theory of action' approach, which was discussed by Smith *et al.* (2003), Smith *et al.* (2004) and Smith *et al.* (2005). It is also discussed in **Section 4.14** and analysed in **Chapter 5**. The vision was that the lead farmers would use this theory of action as a road map towards attaining their goals in farmer-to-farmer

extension. **Table 4.5** helps to explain the application, assumptions and intended outcomes of farmer-to-farmer extension in the Bergville Landcare project

Table 4.5. Application, assumptions and intended outcomes of Farmer-to-farmer Extension in the Bergville Landcare project

Application (Nature of farmer-to-farmer extension)	Assumption(s)	Intended Outcomes
Farmer-to-farmer Extension (dissemination or 'scaling-out' of new technology from lead farmers i.e. 'trainers' to farming community)	<ul style="list-style-type: none"> ▪ Would facilitate the dissemination of new technologies to intended users ▪ Would develop local leadership in farming communities ▪ Would increase local capacity to experiment, communicate and facilitate ▪ Would help to reach intended users in remote areas ▪ Would develop local capacity to monitor, learn and adapt 	<ul style="list-style-type: none"> ▪ Increased adoption of best practice technologies ▪ Increased capacity to monitor, evaluate, plan and act (adaptive management and innovation) ▪ Increased knowledge and skills on best practice technology (human capital) ▪ Formation of co-operatives; access to credit, inputs and markets ▪ Strong and stable local institutions and communities (social capital)

Some of the main methodologies, tools and techniques used to promote and assist farmer-to-farmer extension in the Bergville project included:

- ❑ Training of lead farmers and extension officers by external agents (e.g. ARC researchers) in technological developments and in communication, extension and training skills, i.e. *Training-of-trainers* methodology discussed in **Section 4.10**
- ❑ Farmer field days, Cross-visits or Look-and-Learn visits among farmers and exposure among farmers to other institutions of interest, such as research organisations (*awareness and communication* methodology)
- ❑ Facilitation of farmers' research into, and testing and adaptation of, new technologies and management practices (*on-farm experimentation* methodology discussed in **Section 4.7**)

- ❑ Farmer group formation and development, and regular group meetings for planning, learning, sharing experiences and problems, evaluation, etc. (*local institution-building methodology discussed in Section 4.8*)
- ❑ Monitoring and Evaluation (M&E) in the form of a Theory-of-Practice and participatory self-evaluation tools, which primarily guides and improve the farmer-to-farmer extension process, as well as facilitating the learning process.

4.10. TRAINING-OF-TRAINERS

4.10.1. BACKGROUND

Training is an important aspect of capacity building, but like technology development, it is more a process than a once-off activity. It is not something undertaken to start a process of technical or organisational change, but rather a continual effort to upgrade human resources by sharing ideas and concepts and disseminating techniques, methodologies and skills (Uphoff *et al.*, 1998). Program implementation and training should each build on the other. Training curricula have to be relevant to carrying out day-to-day tasks, but in turn experience needs to feed into training activities as new problems are discovered and new solutions developed to deal with them. Training should not, therefore, proceed separately from the rest of a program's efforts or be tacked on as an afterthought, as happens when training is seen as something less glamorous and less appreciated than design and implementation (Uphoff *et al.*, 1998). Hence, training is seen as vital to achieve project outcomes and goals.

Just as it is never complete, training does not provide any final solutions to the issues it addresses. What training can best provide is a set of concepts and tools that enables program staff and participants to approach problems with trained though still open minds. The test of successful training and technology diffusion lies in the continuing ability of program staff and participants to appreciate and assess new problems and opportunities as these arise from day to day, to devise innovative solutions for these problems and to make good use of new opportunities. Thus, rural development is knowledge driven, whether that knowledge concerns technology, organisation or management (Uphoff *et al.*, 1998).

4.10.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES IN PILOT STUDY

4.10.2.1. TRAINING COURSES ON PRINCIPLES OF CONSERVATION AGRICULTURE

The Bergville study’s ‘training-of-trainers’ approach was developed on the principles of adult and action learning (Fell, 1986, 1996, undated). The first and second major training courses for ‘trainers’ on Conservation Agriculture (CA) technology were described in the 2nd Progress Report, **Annexure 1** and in **Annexure 6**. The technical outcome of these courses was firstly, to equip lead farmers with sufficient knowledge and skills to independently implement CA practices on their farms and secondly, to engage in farmer-to-farmer extension. These farmer-managed trials would form the basis for continuous ‘training’ of other farmers (i.e. farmer-to-farmer extension) and M&E. Apart from providing training on technical aspects of best practices, a whole series of lectures in life skills were also presented during the first training event, which included topics such as knowing yourself: self-esteem and confidence, setting of vision and goals and leadership (see information on training courses in **Annexure 6**).

4.10.2.2. CONTINUOUS TRAINING AND CAPACITY BUILDING

The application, assumptions and intended outcomes of Training-of-trainers in the Bergville Landcare project are shown in **Table 4.6**. It is also analysed in **Chapter 5**.

Table 4.6. Application, assumptions and intended outcomes of Training-of-trainers in the Bergville Landcare project

Application (Nature of training-of- trainers)	Assumption(s)	Intended Outcomes
Training of selected lead farmers and extension officers	<ul style="list-style-type: none"> ▪ Would facilitate the dissemination of new technologies to intended users ▪ Would develop local leadership in farming communities ▪ Would increase local capacity to experiment, communicate and facilitate ▪ Would develop local capacity to monitor, learn and adapt 	<ul style="list-style-type: none"> ▪ Increased capacity to monitor, evaluate, plan and act (adaptive management and innovation) ▪ Increased knowledge and skills on best practice technology (human capital) ▪ Local capacity to facilitate, communicate and train <p>Local leadership to facilitate strong and stable social institutions and structures (social capital)</p>

4.11. AWARENESS

4.11.1. BACKGROUND

Farmers' Days were primarily an awareness-raising activity where the audience, which consists of local farmers, provincial and national departmental staff, local leaders and organisations, and other relevant stakeholders, were informed about the vision, objectives, activities and technologies of the project. One of the main purposes of the RM trial site in Potshini was to serve as a platform to launch these annual awareness events (or farmers days). A typical farmers day programme would consist of a number of presentations, both from an inspirational and technical point of view, followed by a range of demonstrations of new or improved technologies. The local lead farmers, extension officers and researchers collaboratively organised and presented these events. Farmer field days, organised by lead farmers and extension officers, were also used to raise general awareness in the communities, but is discussed under farmer-to-farmer extension (see **Section 4.9**)

4.11.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES OF AWARENESS EVENTS IN BERGVILLE STUDY

Table 4.7 shows the application, assumptions and intended outcomes of the annual awareness events (farmers days) in the Bergville Landcare project. For more detailed information on the activities and outcomes of these awareness events, see the annual project progress reports in **Annexure 1**.

Table 4.7. Application, assumptions and intended outcomes of annual awareness events in the Bergville Landcare project

Application (Nature of farmer days)	Assumption(s)	Intended Outcomes
Annual awareness events (farmers days) at the main trial site	<ul style="list-style-type: none"> ▪ Would inform various stakeholders about project activities, technologies and achievements ▪ Would allow project participants to share their experiences with other interested people 	<ul style="list-style-type: none"> ▪ Outside stakeholders aware of project activities, technologies and achievements ▪ Good interaction and communication between project participants with various interested parties, stakeholders and funders

4.12. PARTNERSHIPS

4.12.1. BACKGROUND

According to Wilcox (2004), it is difficult to provide a formal definition of partnership that suits all circumstances, but the key characteristic is that the partners aim to achieve something they could not do alone, by pooling skills and other resources. To do this they need a shared vision of their goals, and a way of working together which realises this ambition. This may involve a long-term formal structure, or a shorter-term agreement.

Wilcox (2004) explained that partnerships are best seen as processes to build relationships and get things done – not just formal structures. In each situation there will be some benefits and opportunities in working partnerships and also some barriers and challenges in making the partnership work. Examples of benefits and opportunities are:

- ❑ Making one plus one equal more than two – sharing ideas and resources towards common goals.
- ❑ Gaining access to the skills of others.
- ❑ Mutual support to maintain enthusiasm and commitment.
- ❑ Learning from seeing things differently, through others' eyes.
- ❑ Ability to secure funding that requires working partnership.
- ❑ Opportunities to reach a wider audience

Examples of barriers and challenges for effective partnerships are:

- ❑ Suspicion of others involved, and lack of trust.
- ❑ Fear of losing separate identity.
- ❑ Unacceptable inequalities of power and control.
- ❑ Failure to recognise different personality types and communication styles.
- ❑ Lack of clarity on roles, responsibilities and leadership.
- ❑ Confusions about the nature and style of involvement – by representation or participation.
- ❑ Time necessary to develop relationships and feasible plans.

4.12.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES IN PILOT STUDY

A few major partnerships were formed during the lifespan of the project, which resulted in a true inter-disciplinary approach addressing the various components of the farming system or the project strategies. The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was responsible for overall project management and implementation. Naturally, their closest partners in the project were the farmers in the Emmaus area and the KZN-Department of Agriculture and Environmental Affairs (DAEA). The ARC-Institute for Range and Forage (ARC-RFI) was responsible for the multiple-cropping component, the ARC-Plant Protection Research Institute (ARC-PPRI) was responsible for crop rotations with legume crops, especially soyabeans, and the University of KwaZulu-Natal, School of Applied Environmental Sciences was responsible for veld (grazing) management in the Potshini pilot site.

A few informal partnerships were formed with local stakeholders, organisations and operators. The first is a German company DGRV who helped to facilitate the formation and training of farmer group co-operatives, which would facilitate access to credit, inputs and markets. The second was Extro-foods, which is a soyabean processing factory in the town of Bergville and who provided support to the Landcare project through training and the provision of a market for soyabeans. The third partner was Mowplough, which is the provider of conservation tillage implements such as the McGoy ripper and the Saffim planter. The fourth partner was Famlee Save, a local service provider in Bergville who is very active in the provision of appropriate agricultural inputs for small-scale farmers in the district, such as implements, seed and agro-chemicals. The vision was that local service providers, such as Famlee Save, will play a critical role in the sustainability of small-farmer groups and their access to inputs.

Another partner arriving in later phases of the project (i.e. 2004) was the University of KwaZulu-Natal, School of Bioresources, Engineering and Environmental Hydrology with a Smallholder Systems Innovation (SSI) project in integrated watershed management. This project selected the Emmaus area based on the presence and achievements of the Bergville Landcare project and would greatly compliment the work done thus far. The project *inter alia* addresses questions such as the upstream-downstream implications of the upgrading of rainfed agriculture. They would join forces with the Farmer Support Group (FSG) attached to the same university.

The following is a list of all parties involved:

The co-ordinating lead agencies were:

- ❑ ARC-Institute for Soil, Climate and Water (ARC-ISCW);
- ❑ KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA)

The main collaborating agencies were:

- ❑ Farming communities in the Bergville district, such as the Potshini community in the Emmaus Ward;
- ❑ Farmer organizations, such as farmer associations and clubs;
- ❑ ARC-Institute for Range and Forage (ARC-RFI);
- ❑ ARC-Plant Protection Research Institute (ARC-PPRI);
- ❑ University of KwaZulu-Natal, School of Applied Environmental Sciences (UN-SAES);
- ❑ Relevant NGO's such as ACAT;
- ❑ Local input suppliers, such as Famlee Save;
- ❑ National Department of Agriculture (DoA).

Contact with farming communities and community leaders usually took place through the KZN-DAEA Extension Services, as well as project structures and processes, such as the monthly action forum, awareness events, experimentation and M&E activities. Close collaboration and communication were at all times maintained with all the relevant departments in KZN-DAEA. **Table 4.8** shows the application, assumptions and intended outcomes of 'partnerships' in the pilot study.

Table 4.8. Application, assumptions and intended outcomes of Partnerships in the Bergville Landcare project

Application	Assumption(s)	Intended Outcomes
Partnerships with various national, provincial and local actors in rural development	<ul style="list-style-type: none"> ▪ Would improve service delivery of implementing agents in especially training, awareness raising and experimentation ▪ Would improve the level of technology development ▪ Would increase local ownership and commitment 	<ul style="list-style-type: none"> ▪ High quality of service delivered by implementing agents ▪ Appropriate technology developed ▪ Joint responsibilities

4.13. MONITORING AND EVALUATION

4.13.1. BACKGROUND

A central challenge and objective for future research is the application and integration of information from participatory monitoring into a participatory development process. Without sufficient feedback from monitoring into development processes, the monitoring becomes an end in itself, rather than a means to sustain the participation of stakeholders, enhance the development process and improve the local environment. This process is done by means of collating, analysing, reflecting, evaluating and sharing with the relevant people or groups. Consideration of methods for analysis and evaluation and participation of stakeholders is important (Abbot and Guijt, 1998). According to Woodhill and Robins (1998), participatory M&E is all about focusing and improving community or farmer activities to achieve project goals and objectives. To do this you need to involve people in ways that will be rewarding for them, will allow them to feel part of the evaluation and will lead to a commitment for change. It is critical that M&E is designed to facilitate learning.

In growing numbers, service providers, governments, other funders and the public are calling for clear evidence that the resources they expend actually produce benefits for people. Such benefits are usually called the expected or intended **outcomes**, which are benefits for participants during or after their involvement with a program. Outcomes may relate to knowledge, skills, attitudes, values, behaviour, condition or status. Outcome measurement is part of a learning loop that feeds information back into projects on how well they are doing. If reflected upon it offers findings one can use to adapt, improve and become more effective (United Way of America, 2001; Patton, 1997).

4.13.2. APPLICATION, ASSUMPTIONS AND INTENDED OUTCOMES OF M&E IN PILOT STUDY

In the Bergville Landcare project, five major M&E processes were implemented since the start of the project. Although they were linked with each other, they operated on different levels and involved different users. A summary of the application, assumptions and intended outcomes of M&E in the Bergville Landcare project are shown in **Table 4.9**.

The first process used the *Sustainability Dimensions (SD)* framework using simple Logframe principles as point of departure designed at the start of the project (1st annual Progress Report,

Annexure 1). It therefore operated on the project level and involved the developing (implementing) agents (researchers, extension officers and lead farmers) as primary intended users. Its intended use was to improve project implementation and adaptive management and it primarily involved the formation and improvement of a soft systems (social) platform.

Table 4.9. Application, assumptions and intended outcomes of M&E in the Bergville project

Application	Assumption(s)	Intended Outcomes
Sustainability dimensions (SD) using Logframe	<ul style="list-style-type: none"> ▪ Would facilitate the development of project outcomes and indicators ▪ Would improve and focus project management ▪ Would ensure project sustainability 	<ul style="list-style-type: none"> ▪ SMART outcomes and indicators ▪ Adaptive management on project level (by implementing team) ▪ Project sustainability
Theory of action	<ul style="list-style-type: none"> ▪ Would improve and focus farmer-to-farmer extension (scaling-out) process ▪ Would improve participation, ownership and commitment of lead farmers or facilitators in the above process ▪ Would develop and improve leadership among local farmer communities 	<ul style="list-style-type: none"> ▪ An effective farmer-to-farmer extension or scaling-out process, i.e. the increased adoption and use of new technologies ▪ Lead farmers playing an active and leading role in the above process ▪ An increased level of farm management knowledge and skills among farming communities ▪ Target area sustainability, i.e. higher yields, incomes and food security
Participatory self-evaluation	<ul style="list-style-type: none"> ▪ Would strengthen group management capabilities ▪ Would improve self-reliance of groups 	<ul style="list-style-type: none"> ▪ Vibrant, self-reliant small farmer groups ▪ Improved collective operational capacity of groups ▪ Project sustainability
Action learning and adaptive management	<ul style="list-style-type: none"> ▪ Would facilitate learning and adaptive management in groups, i.e. to plan, act, observe and reflect ▪ Would improve self-reliance of groups 	<ul style="list-style-type: none"> ▪ Vibrant, self-reliant small farmer groups ▪ Improved ability and capacity of groups to manage adaptively ▪ Project sustainability
Convergent interviewing	<ul style="list-style-type: none"> ▪ Would help to assess the impact and sustainability of the project 	<ul style="list-style-type: none"> ▪ Assessment of impact and sustainability

The second M&E process used a *Theory of Action* approach and its intended use and purpose was to focus and improve the farmer-to-farmer extension strategy and dissemination of knowledge and skills among the broader farming community (i.e. scaling-out). This process was initiated at a later stage of the project when the action forum was established and involved the lead farmers as primary intended users.

The third process used two different, but related *participatory self-evaluation (PSE)* tools, which were introduced to the farmers. The purpose of the first tool was to strengthen group management capabilities and was used annually or bi-annually, while the purpose of the second tool was to facilitate learning and adaptive management among farmer groups on a daily/weekly basis.

The fourth process was aimed to collect information among the farmers on the impact and sustainability of the project through a *convergent interviewing* process. Finally, evaluation findings were used to demonstrate the impact and accountability of the Landcare project to stakeholders (including funding agencies) on a provincial and national level. Evaluation results discussed above were aggregated (linked) with the SD to formulate meaningful findings on higher levels of the stakeholder hierarchy, i.e. provincial and national levels.

As described in **Section 4.6**, the vision was that the iterative M&E process would focus, integrate and improve the six major strategies or pillars of the soft system platform, i.e. experimentation, training-of-trainers, farmer-to-farmer extension, partnerships, awareness and local institutionalisation around farmer groups. The ultimate goal, of course, was sustainable management of natural resources (i.e. the hard system). From current M&E theories and practices discussed above and in **Chapter 3**, a series of key principles and activities were used for the development and implementation of the M&E system in the Bergville Landcare project. These activities are listed and discussed below and, together with all other M&E processes, were discussed in detail in the annual Progress Reports (Smith *et al.*, 2001, Smith *et al.*, 2003, Smith *et al.*, 2004, Smith *et al.*, 2005), in **Annexure 1**.

4.13.2.1. GUIDING THE STRATEGY FOR IMPACT

To know how best to mobilise project resources and partnerships for making an impact, implementers need to understand the project strategy and redirect it when problems arise. Guiding the project strategy is largely about asking the right questions – and getting answers – at

the right moments (**Box 4.1**). M&E processes are critical for making collaborative decisions about adjusting the direction of a project (IFAD, 2000).

Box 4.1. Five Strategic M&E Questions to Manage for Impact (IFAD, 2000)

Relevance – Is what we are doing now a good idea in terms of improving the situation at hand? Is it dealing with the priorities of the target groups? Why or why not?

Effectiveness – Have the plans (objectives, outputs and activities) been achieved? Is the intervention logic correct? Why or why not? Is what we are doing now the best way to maximise impact?

Efficiency – Are resources use in the best possible way? Why or why not? What could we do differently to improve implementation, thereby maximising impact, at an acceptable and sustainable cost?

Impact – To what extent has the project contributed towards long-term goals? Why or why not? What unanticipated positive or negative consequences did the project have? Why did they arise?

Sustainability – Will there be continued positive impacts as a result of the project after the funds run out in four of five years? Why or why not?

4.13.2.2. SUMMARY OF KEY ACTIVITIES APPLIED ON PROJECT (WARD) LEVEL M&E

The key activities of the M&E process, which were mainly taken from Abbot and Guijt (1998), Herweg and Steiner (2002), Patton (1997) and Woodhill and Robins (1998) and which were seen as applicable by the ARC-ISCW for the Bergville project, are described in detail in the 1st Progress Report (Smith *et al.*, 2001), **Annexure 1**. These activities are summarized as follows:

- a) Initiate the start of a participatory monitoring process and identify possible participants;
- b) Identify and/or clarify the goals and objectives of the project;
- c) Develop a suitable monitoring framework (of which the identification and selection of indicators are central);
- d) Systematic implementation of the monitoring calendar (consisting of the collection of baseline and continuous monitoring data);
- e) Dealing with the data (prepare and analyse the results, involve stakeholders in judgement and decision-making);
- f) Documentation of the findings; and
- g) Using the information.

Within the scope of this research process, it was most practical to highlight some of the more relevant activities and components of the M&E system in view of the development or improvement of theories. However, it must be stressed that each of the listed activities would usually play a key role in the iterative process.

4.13.2.3. IDENTIFY AND/OR CLARIFY THE GOALS AND OBJECTIVES

At the time the M&E process had to be designed and implemented, I realised that clear goals and objectives were never developed for the project. This should actually have been the first step of the process. It should be kept in mind that the planning method used (see **Section 4.4**) was never designed to achieve this outcome. This was a dilemma and there were no clear solutions and a way forward, mainly due to a lack of relevant experience and expertise on the project team. My perception as project leader was that we didn't have any resources (time and finances) left to rectify the problem. My own thoughts (research diary) at that stage explain the reality of the situation (see **Excerpt 4.5**). The decision to at least design something on my own was taken in the context described above, but further investigation into the current theories and practices of M&E (see **Chapter 3**) later showed me, in hindsight, what methodologies and tools would actually be useful in such a situation. This process and the emergence of new ideas and theories will be properly analysed in **Chapter 5**.

Excerpt 4.5. Research diary - start of M&E process

Date	Activities / events / incidents	People present	Critical reflection
02 May 2001	Facing the problem of a lack of goals and goal setting. ARC-ISCW office.	Myself, no other stakeholders.	What about project goals? How do I develop goals now? I don't know what methods will work the best. There is nobody else that could assist; maybe I should simply try something myself.

Based on my limited experience in M&E at that stage, I decided to use, without the participation of any other stakeholders, a Logframe approach, introduced to ARC-ISCW by Ofir (2002), to develop project goals that would allow the continuation of the M&E process. The goals I developed were derived from my common understanding of goals and intended outcomes of R&D projects in general, as well as from the terms of reference and business plan developed for the Bergville project. The goal, objectives and outcomes identified and clarified for the Bergville project, using a Logframe structure and principles, are shown in **Table 4.10**.

Table 4.10. Summary of the goal, objectives and outcomes of the Bergville Landcare project as developed with a Logframe Analysis

Goal	Objectives	Outcomes
To develop and implement profitable and sustainable farming systems	To increase farming production and profitability <i>(Economic viability)</i>	Adoption of 'best farming practices' Positive change in behaviour of farmers Diversification of farming systems Increased yields and profitability
	To improve / conserve the soil quality <i>(Bio-technical feasibility)</i>	Increase in soil organic matter and aggregate stability Decrease in erosion Improvement in soil fertility and soil acidity status
	To empower local farming communities <i>(Social acceptability)</i>	Increased use of skills, knowledge and ability Improved communication and participation

4.13.2.4. THE IDENTIFICATION AND SELECTION OF INDICATORS

In identifying indicators, the decision to use a SD framework was entirely influenced by M&E theories as they emerged through the literature at that stage. I realised that sustainable land management (SLM), as introduced through the project, needs strategies that adapt as they go along to ensure that the project has impacts that are positive. Successful management strategies in SLM therefore need to be based on effective monitoring and evaluation systems to guide learning. Douthwaite, De Haan, Manyong and Keatinge (2001) emphasised that, given that change is expected during the course of a project, the monitoring and evaluation system itself must also be adaptive and flexible.

The indicators developed using the Logframe structure for each of the goal, objectives and outcomes were subsequently grouped into indicators for social acceptability, bio-technical feasibility and economic viability for measurement and analysis purposes. Herweg and Steiner (2002) proposed this type of illustration of indicator trends or impacts. My vision was that these sustainability dimensions (SD) could be used as a framework or structural systems model to link the indicators and to monitor and evaluate the sustainability of the new or improved farming systems (i.e. land management practices) implemented in the Landcare project. Indicators collected over five seasons in the Bergville Landcare project are shown in **Table 4.11**.

I should make it clear that this activity did not involve other stakeholders since the project team, was still caught-up in the situation discussed above. The main constraint confronted with was simply a lack of knowledge and skills in facilitating a participatory M&E process among primary stakeholders. All the researchers were trained in natural sciences and the abilities of the extension staff in general were limited. Mentorship from outside or 'higher-levels' were erroneous or at the most vaguely accessible. I believe that, although this situation sounds trivial, it poses serious problems to practitioners in community-based R&D.

The situation most pertinently relates to a lack of capacity in using action research methodologies with farmers, as well as a clear ignorance on the roles and responsibilities of the different stakeholders (see **Excerpt 4.6** for my personal reflections on this aspect). However, since this situation (data) was grounded in real-life experiences and 'lessons learned', it provides us with an ideal opportunity to contribute to a new or improved 'theory-of-action'. What was needed then is "a general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate an inductive theory about a substantive area". In **Chapter 5** these issues are further analysed.

Excerpt 4.6. Research diary - reflection on capacity, roles and responsibilities of stakeholders

Date	Activities / events / incidents	People present	Critical reflection
15 October 2001	Desk-top study and planning. Having difficulty to find a way forward in making decisions around the use of various AR tools by specific stakeholders. ARC-ISCW office.	Myself, no other stakeholders.	<p>I am feeling frustrated and uncomfortable – I cannot do it alone, it is not appropriate, I must use other people. But who and how can I use them? It seems as if they don't have the skills to do it. How can they be capacitated and who can I involve? What should my role be?</p> <p>I think this should have been done right at the beginning: clarifying the roles and responsibilities of each stakeholder group.</p>

4.13.2.4.1. Systematic implementation of the monitoring calendar

4.13.2.4.1.1. Collection of baseline data

The lead farmers, which were selected to participate in the on-farm, FM trials, were used in the M&E survey. In the first season (2001), baseline data was collected, which included the collection of soil and yield samples (i.e. indicators for bio-technical feasibility) and the collection of indicators for social acceptability and economic viability using questionnaires (See **Annexure 9** to view the various versions of questionnaires used to collect socio-economic information). Samples were taken in the demarcated 1000m² plots under both treatments, i.e. 'new or improved practices' and 'traditional practices'. The idea was to measure and compare any changes in a range of indicators against this baseline data over time and also in space (i.e. between the two plots - traditional vs improved). The various indicators that were identified through the Logframe were collected from these farms.

4.13.2.4.1.2. Collection of continuous monitoring data

During the second (2002), third (2003), fourth (2004) and fifth year (2005) of the project, the same indicators were collected, which served as the sets of continuous monitoring data. At the same time the 'lessons learned' by the farmers, the extension staff and the researchers were identified using questionnaires (See **Annexure 9**). The main aim of this exercise was to support the evaluation and 'adaptive management' process on the project level, and to facilitate the learning process among the participants.

4.13.2.5. USING A 'THEORY OF ACTION' IN M&E

My improved theoretical understanding of M&E and action research in 2002 made me realise that we needed to change the way we implement and facilitate the process within a multi-stakeholder environment. See **Excerpt 4.7** for my reflection on these issues in my personal research diary. At this stage we finally had farmers and other stakeholders involved in various forums and activities, of which the monthly action forum were seen as the most important. I realised that we had to do something special to win back the trust and ownership we probably left astray with missed opportunities and non-participation. The question was how we could constructively involve them over a long period (e.g. 3 to 5 years), *inter alia* within the M&E process. This further led me into current theories, exploring different tools and techniques relevant to use in groups such as this.

Excerpt 4.7. Research diary - implementing a Theory of Action

Date	Activities / events / incidents	People present	Critical reflection
17 May 2002	Starting an M&E process to focus farmer-to-farmer extension process.	Myself, lead farmers and extension officers.	At last we have farmers involved in project activities. What methods can we now use to focus their efforts? ToA - is it the right tool, will it work? How can I test and improve the process?

To focus and improve farmer-to-farmer extension, a 'theory of action' approach (as described by Patton, 1997) was selected to develop an M&E framework. (See 1st and 2nd annual progress reports (Smith *et al.*, 2002, 2004), **Annexure 1** for detailed discussions). Hence, I equipped myself with appropriate action research tools allowing me to facilitate a participatory process whereby lead farmers built the proposed implementation-outcomes hierarchy through a typical 'chain of events' or a theory of action. The lead farmers used this theory of action as a road map towards attaining their goals in farmer-to-farmer extension. They 'climbed the ladder' (outcomes hierarchy) together, selected indicators and monitored their progress. They reflected upon indicator trends in the monthly forum and plan different strategies to improve or maintain the theory of action. They reached out to other farmers and worked with individuals and groups and trained them in CA practices. They monitored changes in knowledge, attitude and skills as well as changes in practice and behaviour among the farming communities. They set up their own targets (milestones) and interactively worked towards that as a group of 'movers and shakers' of agricultural development in their region. In order to ensure that the process was effective, continuous support, training and evaluation for this group was essential and was coordinated and facilitated through the farmer forum. See **Appendix 2** in the 4th Progress Report, **Annexure 1**, to view the Theory-of-Action developed and used in the Bergville Landcare project. Also see **Section 4.14** below for a discussion of the results in the Bergville project and **Chapter 5** for an analysis.

The above description of a 'theory of action' (i.e. model) used in the Bergville pilot project, spells out a typical chain of events that is needed to reach the stage where outcomes and impact are reached, i.e. where end-users really benefit. It is critical to always understand the underlying assumptions of each event of a theory of action. The chain of events used for the Bergville

project corresponds to those described by Patton (1997) and the Kellogg Foundation (2004) as follows:

- a) Inputs (resources) must be assembled to get the intervention started
- b) Activities are undertaken with available resources
- c) Participants engage in project activities
- d) Participants react to what they experience
- e) As a result of what they experience, changes in knowledge, attitudes and skills occur (if the intervention is effective) – short-term outcomes (1 – 3 years)
- f) Behaviour and practice changes follow knowledge and attitude change – medium-term outcomes (4 – 6 years)
- g) Overall impacts result, both intended and unintended – long-term outcomes or impact (7 – 10 years)

It is important to understand that the model and its 'If...Then...' assumptions needed continuous testing (and improvement, if necessary) through proper monitoring and evaluation. I learned from literature that the concepts of experiential learning (from Kolb, 1984) and adaptive management (Allen, 2001) represent appealing terminology and methodology to such situations. In general, it is wrong to simply assume that the interventions implemented are effective. In the context of the Bergville Landcare project, the primary intended users or participants were the farming communities in the Emmaus ward. Selected lead farmers or Landcare facilitators were being trained and capacitated as trainers (of other farmers) through a series of training events. Their primary role was to empower other farmers in their respective sub-wards through a farmer-to-farmer extension process.

4.13.2.6. PARTICIPATORY SELF-EVALUATION AND ACTION LEARNING

One of the major 'pillars' or strategies of the Bergville Landcare project was to establish strong and effective local institutions. This *inter alia* implied self-managed and self-reliant group capacities at the sub-community and community levels so that people can improve their economic and social conditions and those of their families through collective action. From literature (Uphoff, 1989), such capacities themselves should be developed in a participatory manner, not simply as creations of some higher-level body, but through the ideas, action and initiative of group members themselves. My vision was that lead farmers (group promoters or facilitators) participating in the project should play a crucial catalytic role in this process, acting not as groups' planners or leaders, but as facilitators and supporters of growing group capacity.

I was convinced that M&E should be a key element in capacity building in this regard. The methodology introduced to the farmers was intended to help lead farmers and their Landcare groups in creating their own participatory self-evaluation (PSE) capability. Other persons may do separate evaluations of Landcare group performance and capacity as there is a role for outside evaluations in any program. But according to Uphoff (1989) this methodology is designed to become a group's own method for strengthening its own ability to meet its members' needs through collective action and adaptive management. However, at that stage we were facing another dilemma that was most definitely going to influence our efforts to introduce PSE methodology. The project, which was funded by the NLP through the KZN-DAEA, has been terminated and only one season was left to complete this process. Whether this was going to be enough time remained to be seen. See **Excerpt 4.8** below for my personal thoughts on that.

Excerpt 4.8. Research diary - termination of project funding

Date	Activities / events / incidents	People present	Critical reflection
April 2004	News that Landcare funds have been terminated; 1 yr left. Poor goodwill and insight from senior departmental officials into issue of sustainability	Myself, lead farmers and extension officers.	I feel frustrated and disappointed. Have we done enough to ensure sustainability? I would have liked more time to finish the process, maybe 2 more years. What is the best way to go about now? What methods should we emphasize? Will it be worthwhile to start with PSE at such a late stage? HOW?

Tool 1: A methodology for participatory self-evaluation

This methodology, described by Uphoff (1989) was introduced in the Bergville project to strengthen group management capabilities. It covers many different activities or modes of operation from which a group may choose as being relevant to its own situation and goals (See **Appendix 4**, 4th Progress Report, **Annexure 1**). As few as a half dozen might be chosen, or possibly all of them. The number can be increased as new questions are selected by the group for evaluation, or decreased as previously-selected ones are dropped by agreement of the members.

Ideally, the questions concerning performance and capacity should be agreed upon. Then the most important thing is the amount and honesty of discussion that is devoted to each question, to arrive at a shared understanding of how well or how poorly the group is doing in that particular regard. Since there was very little time and capacity left, I decided that the best way to do it in that situation is to do the first part myself (i.e. selecting the questions) and then allow as much time possible for the farmers to get to know it, i.e. to use, reflect and improve it. I should re-emphasise that at that stage I was the only researcher that played a facilitating role in the project, because of a high personnel turnover in the ARC-ISCW. My view (or perception) was that nobody else had the theoretical insights and hence would be in a position to introduce these tools to the farmers. I also tried to weigh up all the negative and positive consequences of the approach we followed, e.g. a lack of initial ownership would hopefully be cancelled by sufficient interactive testing-reflection-learning sessions with the tools. There were moments during the process, however, that I could feel some tension or confusion among the farmers. See **Excerpt 4.9** for a better insight into my personal experiences at the time. One of the problem areas was the lack of insight I had into the learning process among the farmers themselves. I had very little information from that apart from the feedback of the farmers. These results and issues are discussed in **Section 4.14** and further analysed in **Chapter 5**.

Excerpt 4.9. Research diary - introducing PSE tools to farmers

Date	Activities / events / incidents	People present	Critical reflection
July 2004	Action forum, working with farmers to test PSE tools. Farmers give feedback on their use of PSE among their trainees.	Myself, lead farmers, farmer trainees and extension officers.	I don't know if this is really working? Some farmers respond well, others not. I try to involve extension more; can't tell if it is working. I don't see another way of doing it, must just keep on with reflection sessions as time allows.

The functioning of this tool is best shown by taking an example from Uphoff (1989). Let us assume that the group has agreed it wants to have *active participation* from all members in its meetings and group activities. (This is seen by the project as not only contributing to group success in the short-run but also to the group's long-run survival.)

Whoever is leading the discussion will ask the group: Which of the following statements *best describes* members' participation in the group?

- (a) All members participate actively in meetings and group activities. Everyone feels free to speak up and play an active role.
- (b) Most members participate actively in meetings and group activities. Most feel free to speak up and play an active role.
- (c) Some members participate actively in meetings and group activities. Some feel free to speak up and play an active role.
- (d) Few members participate actively in meetings and group activities. Few feel free to speak up and play an active role.

This pattern of four alternatives is repeated for all of the self-evaluation questions. The first being (a) represents a *most satisfactory situation*, with *little or no room for improvement*. The second being (b) describes a *satisfactory situation*, but with *some room for improvement*. The third being (c) characterizes an *unsatisfactory situation with definite room for improvement*, while the fourth being (d) presents a *very unsatisfactory situation with very much room for improvement*.

For the sake of giving some simple scores to the answers, the first answer is counted for 3 points, the second for 2 points, the third for 1 point, and the fourth is zero. Three points is considered an excellent score; two points is very good but can be improved; one point is not very good, with much room for improvement. Zero indicates abysmal performance and should prompt serious discussion and inputs from participants.

The numbers are not the most important result of self-evaluation. More important is the *discussion* that goes into agreeing on them. Groups would like to think that their performance is top-rate. But before they can achieve the top score (3 points), all members have to agree that everyone is participating actively in meetings and group affairs. If anyone thinks otherwise, the group needs to resolve any differences of opinion. Members can give examples of when everyone participated or when they did not, when some skipped meetings or did not turn up for group work. If a top score cannot be justified, can it be said that most members are actively participating, or only that some are? This is a matter of judgment as no strict numerical standards are possible. In a weak group, the disagreement will indicate whether some participate actively, or only a few do.

Tool 2: A methodology for action learning and adaptive management

Using action research (and learning) principles and practices, I developed and adapted two more tools for use by the lead farmers to facilitate the learning and adaptive management process in their respective Landcare groups (See **Appendix 3**, 4th Progress Report, **Annexure 1**). These two tools, which are supposed to compliment each other, were adapted from the work of Williams (2004), Kolb (1984) and IFAD (2000). They were introduced to the group simultaneously with Tool 1 described above.

4.13.2.7. CONVERGENT INTERVIEWING

According to Dick (1990, 1998), convergent interviewing is a technique one can use to gather information. Although it has many uses, it is most valuable when one is in some doubt about the information which is to be collected. Also, if one intends to use structured or quantitative surveys to collect information, convergent interviewing can help you to decide what questions to ask in the survey. My feeling was that there were not enough resources remaining to do an extensive impact assessment survey in the project, hence I was looking for a tool that could be used to gather such information without requiring many resources. Therefore, convergent interviewing was selected as a tool to assess the impact and sustainability of the Bergville project, i.e. to assess what worked and what did not work, are farmers self-reliant, are farmer groups active and learning, etc. In other words, convergent interviewing was used to assess the sustainability of the project, rather than using any other kind of assessment tool, such as a structured, closed-ended questionnaire or a focused-group discussion. It was done at the end of the project and there was no opportunity to reflect on the results with the group of participants.

The main characteristic that made convergent interviewing very appealing for my need was that it combines some of the key advantages of both unstructured and structured interviews.

- ❑ Unstructured interviews (without specific questions) collect broad information. But they can be hard to interpret.
- ❑ Structured interviews (conducted through a face-to-face survey) collect information efficiently. But you may never know if you asked the right questions.

Dick (1998) summarised convergent interviewing as follows:

- ❑ First put the person at ease. When you've established rapport, ask a single, broad question. Then keep the person talking for as long as you can, about one hour or a little longer. Then and only then ask any specific questions.
- ❑ Conduct a pair of interviews (preferably by different interviewers). Compare the themes which emerged from each. If the two informants agreed on a theme, in later interviews (with other persons) probe for disconfirming views. If they disagreed about some topic, in later interviews probe for an explanation. In other words, idiosyncratic information is discarded and probing questions are devised to structure the dialogue in the next pair of interviews, with other members of the group, in order to test convergent information and explore and explain divergent information.

Convergent interviewing achieves its result by leaving much of the content unstructured. You don't ask only a series of pre-determined questions. The information is therefore determined by the person being interviewed. The data analysis process, however, is tightly structured. Much like grounded theory, you analyse the information systematically. You use only relevant information from earlier stages in subsequent stages where you iteratively code and categorise your interview data or memo's. The systematic approach extends to sampling, data collection, and particularly interpretation. This helps to improve efficiency and reduce bias.

The convergent interviewing process took place in the Emmaus ward during the week of 16 to 20 May 2005. My aim was to conduct an interview of about an hour with each of the twenty lead farmers in the project. I scheduled four interviews for each day and during each interview I was accompanied by a local extension officer for translation purposes. My approach in using the convergent interviewing technique differed slightly from the one described by Dick (1990). Firstly, I was the only person conducting the interviews - it was not conducted in pairs, since I did not have enough resources to train and/or involve another person. Secondly, using it as a tool for an impact assessment is somewhat different from its usual application to collect information as part of an ex-ante (prior to) assessment. My argument was that it would still be the most useful tool to collect information on impact and sustainability directly from farmers; it just adds something extra to what a normal informal survey would produce. A discussion of the interview results is given in **Section 4.14.4** and the grounded theory analysis on this process in **Chapter 5**.

4.14. RESULTS OF BERGVILLE M&E PROCESS

The idea with this section was to use the results of the Bergville Landcare project M&E process, as taken from the annual Progress Reports, **Annexure 1**, to describe and illustrate the performance

of the major strategies forming the pillars of the soft system platform in the project. The vision of the project was to develop this soft systems platform in order to manage the natural resources in a sustainable manner (see **Section 4.6**). From existing theories six appropriate methodologies were selected for effective platform development and their application, assumptions and intended outcomes in the Bergville Landcare project were discussed above. What follows below is a discussion of the impact of these strategies as it was measured and discussed through the M&E framework of the project. This discussion and interpretation of results, as part of the writing of the progress reports, were mostly done by me with the assistance of other researchers. A more critical reflection on this aspect is given in **Chapter 5**. It should be kept in mind that this section still forms part of the 'Application of theory' or the 'Act' phase (i.e. **Chapter 4**) of the grounded theory research process and was hence treated as a primary source of data (see discussion in **Section 2.5**). The data was derived from the same sources mentioned in **Section 2.5**, i.e. project documents (**Annexure 1 to 9**), my personal research diary, specific 'significant changes' and M&E results.

4.14.1. RESULTS AND DISCUSSION: SUSTAINABILITY DIMENSIONS (SD)

As discussed in **Section 4.13**, the SD was used as a framework or structural systems model to link the indicators over all the levels of the hierarchy and to evaluate the sustainability of the project in view of the social acceptability, bio-technical feasibility and economic viability (See **Table 4.11**). I tried to select as many as possible indicators that are sensitive enough to be used over the short-term although soil organic carbon (% C) and earthworms, for example, should rather be viewed over the medium to long-term. Most of these indicators, if not all, could also show changes and impacts resulting from project activities to higher (e.g. provincial and national) scales as well as lower (e.g. community and farm) levels.

The values of most indicators collected at the initiation of the Landcare project were relatively low. After four years, most indicators showed slight to moderate improvements (e.g. pH, P, K, ground cover, acid saturation). A few indicators showed moderate to strong improvements (e.g. Ca, number of farmers trained, number of implements converted, number of farmers attending forums), while others stayed constant (e.g. % C, earthworms). A few indicators showed negative trends, especially at the end (e.g. Ca, Mg, pH and Acid Saturation). The indicators, regrouped into sustainability dimensions of social acceptability, bio-technical feasibility and economic viability, were used to evaluate the changes towards or away from sustainability, which have been induced by the Landcare project.

Table 4.11. Impact and outcome indicators for bio-technical feasibility, social acceptability and economic viability collected in the Bergville Landcare project

Indicators	Sustainability dimensions	Baseline values (2001)	1 year after start (2002)	2 years after start (2003)	3 years after start (2004)	4 years after start (2005)
<ul style="list-style-type: none"> ▪ Soil Organic Carbon (% C) [3] ▪ % Residue (ground) Cover [30] ▪ pH (topsoil) [5.5] ▪ Ca – topsoil (mg l⁻¹) [240] ▪ Mg – topsoil (mg l⁻¹) [80] ▪ P – topsoil (mg l⁻¹) [8-12] ▪ K – topsoil (mg l⁻¹) [120] ▪ Acid Saturation (%) [20-30] ▪ Earthworms – topsoil ▪ # implements converted for conservation tillage 	Bio-technical feasibility	1.6	1.6	2	2	2 **
<ul style="list-style-type: none"> ▪ Farmer-to-farmer extension: # farmers trained ▪ Participation in action forums ▪ # of farmer-managed trials (# lead farmers) ▪ # of training courses for lead farmers ▪ # of field days ▪ # PSE* tools introduced for group learning ▪ Estimated area under CA practices (ha) ▪ Farmer cooperatives 	Social acceptability	0	0	85	331	500
<ul style="list-style-type: none"> ▪ Maize yield (ton ha⁻¹) [4] ▪ Gross margin (R ha⁻¹) [R3000 ha⁻¹] 	Economic viability	1.5	3.2	3.1	4.9	4.3
		- 178	Maize: R800 Soyabean: R1000 Intercrop: R2480	Maize: R800 Soyabean: R1000 Intercrop: R2480	Maize: R1500 Soyabean: R2500 Intercrop: R3021- R3442	Maize: R1548 Soyabean: R2521 Intercrop: R3021- R3442
					LEISA:*** R2500 - R2800	LEISA:*** R2500- R2800

The data was collected from lead farmers in the Bergville district, Emmaus Ward; average values are shown. Target values are indicated in [brackets]; the monitoring period stretched from October 2001 to June 2005.

* PSE – Participatory self-evaluation; ** not at target levels; *** LEISA – Low External Input Sustainable Agriculture

4.14.1.1. BIO-TECHNICAL FEASIBILITY

By viewing the indicator trends for bio-technically feasibility in the Bergville Landcare project over a period of four years, the impacts of the new or improved 'best practices' generally appeared to be positive. Over the short-term (first three years), all the soil fertility indicators (Ca, Mg, K and P) showed positive trends, although all of them, except P, were already within their target levels at the start. In the second year soil P has reached the target level. Although these indicator trends don't prove that fertilisation practices amongst the participating farmers have improved, there was evidence that some farmers' knowledge with regard to fertiliser choice and practice has improved significantly. This information was captured through frequent (annual) monitoring and field visits, monthly action forums and the convergent interviewing at the end of the project. See **Excerpt 4.10** for my personal account of these events.

Excerpt 4.10. Research diary - a note on farmers' knowledge level

Date	Activities / events / incidents	People present	Critical reflection
February 2004	Field visit to lead farmer trials. Discussion (with Farmer X) on her practices, problems	ARC researchers, DoA and KZN-DAEA staff, lead farmers	Her crop stand looks good, almost no signs of deficiency. She said she used recommended fertilizer rates, including top-dressing. She sees it as important and bought extra fertilizers for rest of her fields; she buys as much as she can afford.
November 2004	Action forum, reflection on seasonal activities and problems. Farmers discuss a question on planting and fertilizer practices.	Myself, lead farmers, farmer trainees and extension officers.	Discussion is quite lively; I am surprised with the high level of debate. Farmer Y stresses the importance of top-dressing. Farmer Z emphasizes planning and purchasing of fertilizers much in advance of planting. I am not sure what is really happening on the ground - how can I find out?
May 2005	Convergent interviewing with 20 lead farmers	Myself, KZN-DAEA extension, lead farmers	Most farmers appreciate the knowledge and skills they received; most feel they have enough skills and "can do it practically on their own". Almost all farmers mentioned that they gained a lot of technical knowledge and skills from the project.

Soil acidity indicators (*AS* and *pH*), have also improved, especially *Acid Saturation (AS)*. *AS* has almost reached its target levels of 20%, however *AS* values (as well as *Ca* and *Mg* values) have risen again to 30% and indicates a need for maintenance liming. Only 5 ton ha⁻¹ lime was applied on all the farmer-managed trials, irrespective that some of the fields had lime requirements of up to 12 ton ha⁻¹ (*AS* is used to determine lime requirements). Fortunately, the KZN-DAE has implemented a liming project in the Emmaus area (among others), which has greatly benefited many of the local farmers. Field experience has proved that the soil acidity problem will only be alleviated by applying the recommended amount of lime and then follow it up (maintenance) every year or two with lower levels of lime. Therefore, maintenance liming should be encouraged on these fields. Within the CA concept the practice of applying smaller quantities of lime (1 to 2 ton ha⁻¹) more regularly (every second or third year) on the soil surface is now widely used and is recommended for the future. The cost of lime for resource-poor farmers, however, still remains the biggest hurdle.

The soil physical indicator (*%C*) has not changed significantly by 2005, but should be viewed over the long term (**Table 4.11**). The *% Ground Cover* has not really improved over the five seasons. This raised concerns because a good mulch layer on the soil surface is an essential element of the Conservation Agriculture practices promoted by the Project. Mulch is not only an indicator of improved protection of the soil against rainfall erosion, but it also indicates conditions conducive to aggregate formation, infiltration and biological activity (e.g. earthworms). Overall, it indicates conditions of improved soil fertility and soil water conservation. A minimum target level of 30 % ground cover is usually set for fields under CA, although a much higher mulch cover is ideally required.

The situation with regard to mulching in communal areas is complex and requires further discussion. The biggest constraint for creating a good mulch layer in the Emmaus area is uncontrolled grazing by livestock on crop fields during the winter – this removes most, if not all, of the crop residues on the soil surface. The introduction of legumes and temperate cover crops through multiple cropping (i.e. rotations and intercropping) aims to alleviate this problem, however, at the end of the Landcare project in 2005 it has had a relatively small impact on the % ground cover remaining at planting in November – the extent of the problem made it insurmountable over the short- to medium-term. Although above ground cover (mulch) on farmers' fields was still low, it is believed that the introduction of crop rotations using cover crops still improved the belowground biomass (i.e. root mass) considerably over the medium-term. It is common knowledge that the above-ground biomass is sustained by a root system, which is

related in volume to the amount of above-ground biomass. These roots have exudates (i.e. humates and humic acids) that improve soil physically and chemically. Physically, they promote good soil structure and increase the water holding capacity of the soil (That is apart from the effect of roots on the development of channels and soil pores). Chemically, they serve as an adsorption and retention complex for inorganic plant nutrients. Nutritionally, they are sources of nitrogen, phosphorus and sulphur for plants and micro-organisms. All of these effects increase the soil health and productivity of the soil, but it cannot be measured by %C (Walkley-Black method of analysis), which is an exponential equation and require substantial improvement in organic matter to increase one level of %C. It is therefore recommended to use alternative methods of analysis which was not included in this study.

The long-term vision should be the development of a mulch layer through the cultivation of summer and temperate cover crops by as many farmers in the area as possible. This could definitely have a positive impact on the soil health, aggregate stability and water holding capacity of the soil. On the RM trial at Potshini, for example, the impact of an improved mulch cover, together with minimum tillage, on soil health, was measured to some extent (see 3rd and 4th Progress Reports, **Annexure 1**).

Although a few *earthworms* were seen on the RM trial at Potshini (no formal surveys were done), no earthworms have been found on the FM trial sites, which is a reason for concern. Earthworm population per se is an important indicator of soil health. Evaluation of the environmental sustainability (i.e. soil health or quality), however, should be based on a long-term monitoring programme. Monitoring data should continuously be analysed and evaluated in view of the development of sustainable land management practices.

4.14.1.2. ECONOMIC VIABILITY

By viewing the indicators *crop yield* and *gross margin*, the CA technology improved the economic viability of farming systems significantly (**Table 4.11**). On average, crop yields of the twenty leader farmers improved considerably from 1.5 (2001) to 3.2 (2002) to 3.1 (2003) to 4.9 ton ha⁻¹ (2004) and to 4.2 (2005) due to the introduction of CA practices. It was encouraging to see that most farmers who were using CA technology for two years or more, have mastered it almost completely. Farmers increased their maize yields to such levels that commercialisation of excess produce is already possible for some of them. Food security, i.e. the ability to produce enough food for household consumption, was achieved by most of the participating farmers. However, it

must be said that the increases in yields were mainly as a result of improved fertiliser practices, which were part of the starter packages, and most probably not a result of the main CA principles, i.e. reduced tillage, multiple cropping and mulching.

Calculations of *gross margins* under various scenarios with best practices were made with 2003/2004 grain prices and yields obtained in the farmer-managed trials (see **Table 4.11** and **Annexure 10** for calculations). The scenario performing the best was intercropping (from R3 000 to R3 500 ha⁻¹). The higher total production of two crops from one field, i.e. maize and a legume such as soyabean, had the biggest influence on gross margin. The increases in yield, as well as a reduction in mechanisation costs, are the main contributing factors in the sharp increases in gross margin or profitability.

Crop rotations with maintenance liming of 1 t ha⁻¹ (broadcasted) have gross margins of R1 548 ha⁻¹ (maize) and R2 521 ha⁻¹ (soyabean), while those with strip liming (45cm) have gross margins of R1 678 ha⁻¹ (maize) and R2 651 ha⁻¹ (Soyabean). Traditional practices using tractor contractors have a **negative** gross margin of R178 ha⁻¹, while traditional practices using animal traction have a gross margin of R322 ha⁻¹. Gross margins indicated in **Table 4.9** used the average yield of the lead farmers, i.e. 4.9 ton ha⁻¹ (sole crop) and 4 ton ha⁻¹ (intercrop), in the calculations. In 2003, a tentative target was set at R 3000 ha⁻¹ by researchers, however, I later realised that for resource-poor farmers, crop yield and financial targets might be misleading (see **Excerpt 4.11** for my personal insights into this matter). For resource-poor farmers, who have a continuous battle to achieve food-security for their households, issues such as food distribution through the year and stabilisation of yields on lower than optimal (our target) levels with using only the minimal external inputs that they can afford, might be more realistic indicators.

Excerpt 4.11. Research diary - a thought on indicators for economic viability

Date	Activities / events / incidents	People present	Critical reflection
May 2005	Convergent interviewing. Farmer Y talks about her food security situation: "I use a lot of maize as green maize. I only decide what inputs to buy when I know how much money is available, sometimes it is almost nothing".	Myself, KZN-DAEA extension officer and Farmer Y.	The use of green maize will influence the 'final yield'. What matters for them is availability and distribution of food. Improving the diversity and quality of diet would also help. But most important, maximum returns (gross margins) do not count as much for her, but a stable yield and minimized risks do. We should consider these aspects when selecting indicators in future.

In support of the above-mentioned insights, an investigation into *low external input sustainable agriculture (LEISA)* showed promising results. The high input costs of the 'best practices' described above, especially to resource-poor farmers, is a concern. The use of CA principles to develop LEISA practices, especially using crop rotations, resulted in the minimisation of the use of external inputs, in this case fertiliser. This practice would greatly minimise the financial and food-security risks for resource-poor farmers. While maintaining maize yields of above the target levels of 4 ton ha⁻¹ (with no fertiliser), this crop rotation practice achieved gross margin values of R2 500 to R2 800 ha⁻¹, which I is a significant breakthrough in view of food security and financial risks.

4.14.1.3. SOCIAL ACCEPTABILITY

The indicators for social acceptability showed that a good 'social' or soft system platform had been formed for sustainable land management (SLM) in the Emmaus area. In 2005 the situation with regard to the formation of *Co-operatives* was *unknown*, as there were indications that this process had been derailed. The indicator *Participation in farmer forums* showed a sharp increase in 2003 and then a small decline in 2004 and 2005. On average 50 farmers attended the monthly farmer forums in October 2005, comparing to 70 farmers in 2004 and 80 in 2003. On some occasions (action forums) more than 150 people participated. Participants in the forum were the lead farmers and those farmers who have been trained by them. Lead farmers themselves showed a much better attitude towards attending forums – attendance registers showed that by October 2004 all of them have been attending regularly. This indicated to a high degree of participation, as well as a high morale within the participating group. Good interaction between farmers, extension officers and researchers occurred in these forums. Although there were minutes taken during these action forums by the secretary of the Landcare committee (Mr. Nicolas Madondo) and myself, they were seldom typed and distributed. I realised the predicament that we experienced, but there was never a good solution for it. Firstly, the farmers didn't have access to computers and I did not have enough support (capacity) from ISCW staff to prepare the minutes. In retrospect, giving that responsibility to local extension staff might have been the best option. During the project we did not realise how important this exercise was; we never critically reflect on it and we were never sensitized on the use of it. Perhaps there is a different way of doing it in this context, which will be analysed in **Chapter 5**.

Most of the *FM trials* managed by the 20 lead farmers were successfully implemented from 2002 and served as an important tool in farmer-to-farmer extension, awareness and M&E. Annual field inspections by a team of ARC researchers, KZN-DAEA staff and some lead farmers, revealed that most of the lead farmers mastered the new technology in their second season of

experimentation (2003/2004) (see **Insert 4.1** for an indication of this 'significant change'). The 'evaluation team' had to score each farmer's performance using a few criteria agreed on in the group. The process included a rating on the following criteria: crop emergence and spacing, weed and pest management, intercropping and rotations, mulching, nutrient deficiency symptoms and use of CA equipment. This information revealed that the use of CA technology among farmers was improving significantly over the seasons. It firstly indicated that experimentation is a very useful tool to increase the level of knowledge and skills among the farmers and secondly, that farmers need a critical period of experimentation to experiment with the new technology. This is probably even more so when it is complex technology, such as conservation agriculture.

Insert 4.1. A significant change, the performance of farmers in on-farm experimentation

Year 2: 2002		Year 3: 2003		Year 4: 2004		Year 5: 2005	
Average score (%)	% farmers > 70%	Average score (%)	% farmers > 70%	Average score (%)	% farmers > 70%	Average score (%)	% farmers > 70%
52	39	61	50	63	53	74	71

Although there were a fair number of 'training-of-trainers courses' for lead farmers and extension staff, it is very difficult to assess to what extent it did give them enough capacity for their role as 'movers and shakers' of agricultural development in the area. Training per se is only one component (pillar or strategy) of the soft system platform; platform development portrays the collective capacity of people in the Emmaus area to manage their natural resources in a sustainable manner. The *number of field days* showed a high level of awareness-raising activity among the farmers, although no information exist that tells something of the quality of these events. Around 300 people on average attended the annual farmers days.

There seemed to be a high morale among the participating farmers, shown by the *high attendance of monthly action forums*. One reason could definitely be the result of the farmer-to-farmer extension strategy and group activities; the action forum is the platform where this process is being facilitated. Another reason, which was difficult to explore, might be the availability of food (lunch) during these events and furthermore, the prospect of getting free agricultural inputs by participating in this project. **Excerpt 4.12** shows my personal thoughts on

the issue and it is further analysed in **Chapter 5**. From above discussions, all indications are that the six major strategies or pillars of the platform, represented by these indicators, were successfully implemented.

Excerpt 4.12. Research diary - a thought on reasons for participation in action forums

Date	Activities / events / incidents	People present	Critical reflection
June 2004	Action forum. I get the feeling that many farmers are just 'passive observers', or they are here for the wrong reasons, e.g. to get something for free, such as food and agric inputs.	Myself, KZN-DAEA extension officers, lead farmers and their trainees.	Is this situation acceptable; can we get people involved in another way? How can we get the right people here, those who want to learn or contribute something? What is the role of food and free inputs? Is this sustainable? Maybe it still works if we at least facilitate a strong learning process.

4.14.2. RESULTS AND DISCUSSION: USING A 'THEORY OF ACTION' IN EVALUATION

The 'theory of action' conceptualised by the group of lead farmers is shown in **Appendix 2**, 4th Progress Report, **Annexure 1**. Once an espoused theory of action (i.e. what they planned to do) has been delineated, the issue of learning, adapting and focusing through M&E remained. For each of the events/outcomes, indicators and targets, as well as method of monitoring, were developed to support this process (See **Appendix 2**, 4th Progress Report, **Annexure 1**). These (and other) M&E concepts were used to shape and test the theory of action. When the M&E system was in place, each step in the chain could be evaluated and hence improved or altered if necessary. The results of this process that was facilitated in the Bergville project, including its successes and failures, are discussed below.

The purpose of this monitoring tool (see **Figure 4.3**), which was frequently used with the lead farmers in the monthly forums, was to help focus the farmer-to-farmer extension strategy towards the intended outcomes. In general this tool facilitated the continuous improvement of this process towards a more effective, streamlined and flexible farmer-to-farmer extension strategy, which disseminated the new technology to farmers in the whole of the Emmaus ward. Some of the 'significant changes' that this tool facilitated are illustrated in **Insert 4.2**. This information was collected from my own minutes and memos of the monthly action forums.

Insert 4.2. Significant changes brought about by map learning tool

Domain of change	Significant changes in project	Examples of changes during project
Changes in the quality of people's lives	<p>Community level changes:</p> <ul style="list-style-type: none"> ▪ Higher level of knowledge and skills; ▪ Changes in behaviour and practice; ▪ Increased production and profitability; ▪ Adding value to grain crops 	<ul style="list-style-type: none"> ▪ Around 2000 farmers made aware of new technology ▪ ±400 farmers trained in new technology ▪ ±400 farmers (trainees) practicing CA ▪ Most participating or trained farmers reaching food security status ▪ Some (±20) farmers gaining access to commercial markets ▪ Some (±20) farmers, mostly women, have an increase in value adding activities, e.g. household usage of soyabean products
Changes in the nature of people's participation in development activities	<p>Farmers learned valuable lessons working with it as a group, which sometimes resulted in certain changes and improvements in their approach or their tactics.</p>	<ul style="list-style-type: none"> ▪ They developed their own metaphors (in the local Zulu language) for the learning cycle (i.e. act, monitor, reflect, plan). ▪ They strengthened the group of lead farmers by replacing poor performers ▪ They identified areas or farmers in need of support, either on technical matters or in FFE extension process ▪ They rewarded good performers and success stories ▪ They learned from each other, especially good performers, using the best approach in FFE
Changes in the sustainability of people's organisations and activities	<ul style="list-style-type: none"> ▪ A strengthening of local farmers institutions; ▪ Better local networking and communication; ▪ Strengthening of extension activities and linkages with farmers organisations 	<ul style="list-style-type: none"> ▪ Lead farmers and their trainees forming the backbone of local farmer organisations ▪ Monthly action forums, cross visits and field days serving as a good platform for future networking and communication ▪ Departmental extension staff have better understanding and relationships with farmers

The primary intended use of this theory was to focus and improve farmer-to-farmer extension, which was aimed at leading farmers or farming communities towards actual adoption of recommended practices. This was one of the intended outcomes of the Project. During the last three off-seasons (i.e. winter-months) of the project, lead farmers engaged in farmer-to-farmer extension and continued to 'teach' farmers who had joined their Landcare groups. Farmer trainees who were taught about the new agricultural techniques (change in knowledge), then started to believe in it (change in attitude) and by the end had learned how to apply it (change in skills). This process was monitored closely, using a **map** showing changes in the number of farmers trained (See **Figure 4.3**). The indicator used here was **Number of farmers trained** (by lead farmers) – it is a quantitative indicator of qualitative short-term outcome data, i.e. the *change in knowledge, skills and attitude (KSA)*. To measure the quality or 'level' of KSA, a qualitative assessment, i.e. *convergent interviewing*, was done at the end of the project as an impact assessment (see **Section 4.14.4** for results and discussion of convergent interviewing).

The higher-level or medium-term outcome, which is whether they actually began to **use** the new CA technology (i.e. change their agricultural practices), was closely monitored from the 2004 season onward. These observations showed how many farmers who were trained in the farmer-to-farmer extension strategy, were actually using, or experimenting with the new practices. However, the training of other farmers continued. An assessment of these results also formed part of the impact assessment (convergent interviewing) conducted in the 2005/2006 season. The following M&E data could be drawn from the Map shown here (**Figure 4.3**):

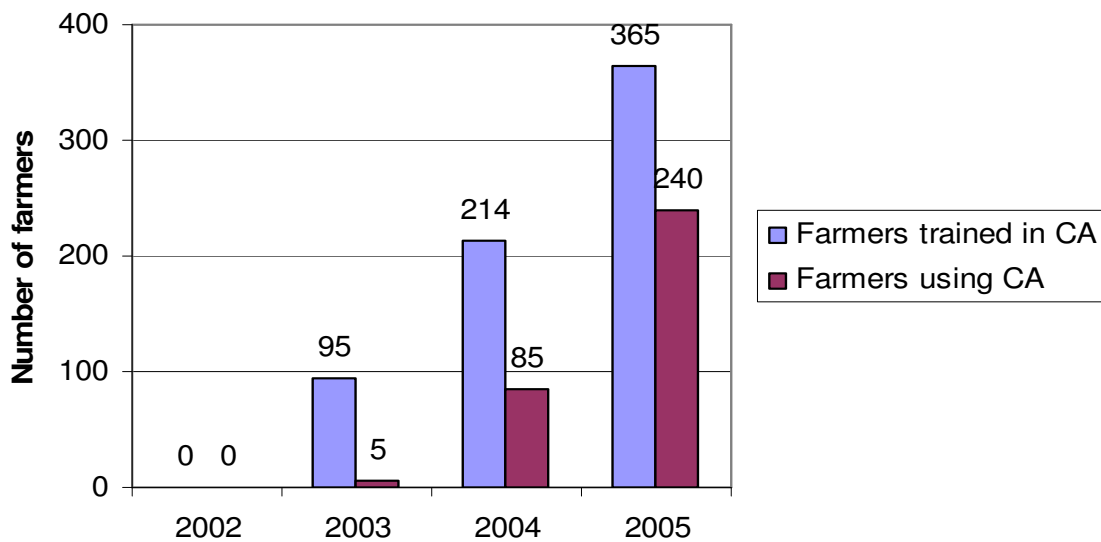


Figure 4.2. The number of farmers trained and those using CA through farmer-to-farmer extension at October each year

The farmer-to-farmer extension (FFE) process was initiated in the 2002/2003 season after the training of the lead farmers (i.e. training-of-trainers process). By the end of the first year of FFE (i.e. October 2003) 95 farmers (trainees) were trained by lead farmers, while 5 of the lead farmers have started to use (experimenting with) CA practices on the rest of their farm (apart from their 1000m² trials). By October 2004, 214 farmers were trained through FFE, while 85 farmers (including lead farmers) have started to use (experiment with) CA on their on-farm trials. By October 2005, 365 farmers were trained through FFE, while 240 farmers (including lead farmers) have started to experiment with CA on their 1000m² plots. The use of CA in fields other than their FM trials have not been measured adequately during the project, although such an attempt was made during the convergent interviewing.

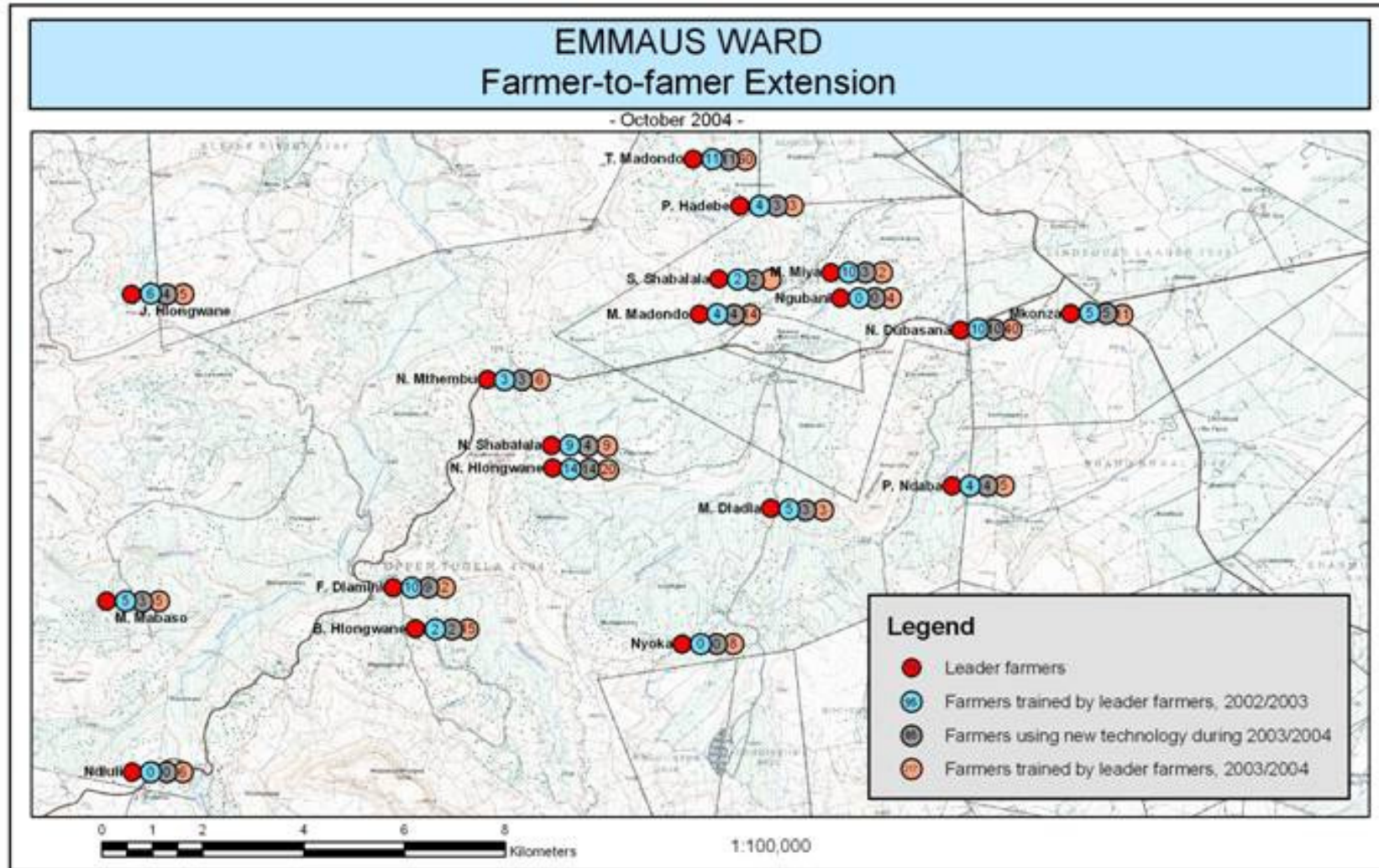


Figure 4.3. Map used as a learning tool in farmer-to-famer extension

4.14.2.1. OTHER ACTION RESEARCH METHODS AND TOOLS USED WITH FFE PROCESS

The aim was to structure or facilitate the monthly action forum in such a way that it served as a platform to reflect on the strategies and actions of the Bergville project. Most of these actions were consequently planned and coordinated in the same forums. Farmer-to-farmer extension and farmer learning group activities (i.e. local institution building) were the main actions launched during the off-season, i.e. April to October. In order to use the time during the monthly forums to effectively monitor and evaluate these actions, a few simple action research tools were used to iteratively *reflect* on the actual *actions*, drawing out the *lessons learned* as well as their *implications* for future action. This was then [continuously] build into new *action plans*. The two main tools used in combination were *small break-away groups* and *evaluation questions*. Usually I facilitated such an exercise, starting by dividing the forum into small groups of 5 to 10 persons, then I would ask them to work through a few evaluation questions and report back after a certain period. The questions were usually based on the action learning tool (discussed below), which were the following: WHAT has succeeded or failed? WHY have we had success or failure? WHAT are the implications for the project? NOW WHAT, what actions will we now take to make improvements? I believe the outcomes of these exercises were usually positive and I realised that more of them had to be done in the action forums. See my personal description on this experience in **Excerpt 4.13**. Many of these exercises were done to reflect on the information displayed by the map, in other words the M&E data on FFE. Other M&E and experimental data were also used in similar fashion, such as those collected from FM and RM trials.

Excerpt 4.13. Research diary - a personal reflection on the use of action research tools in action forum

Date	Activities / events / incidents	People present	Critical reflection
July 2004	Action forum. Using break-away groups to work through evaluation questions. Good interaction and spirit exist in groups.	Myself, KZN-DAEA extension officers, lead farmers and their trainees.	This is working well; I can see participants are seriously joining in the group discussions. Feedback is a bit disappointing; I wish I could improve the quality of feedback and lessons learned. I don't think they really understand 'reflection' and 'lessons learned'. But overall I wish we could do much more of these exercises in the action forums or other events.

4.14.2.2. INTERPRETATION: THEORY-OF-ACTION

The lead farmers had a huge impact on the dissemination of CA technology to other farmers by training 365 farmers from April 2002 to October 2005. In 2003/2004, 85 of the 95 farmers trained during the previous season (2002/2003) used CA practices, which can be viewed as a very high 'adoption rate'. However, a more accurate description would probably be that most farmers trained by lead farmers started to 'experiment' with the new CA technology on a small plot in the next season, using the starter-pack of agricultural inputs for which they have 'qualified'. From our initial assumptions it is clear that the role of experimentation in the project was primarily to create and facilitate experiential learning and innovation, which would ultimately lead to a change in farmers' behaviour as well as their practices. From that perspective 'farmers experimentation' *per se* cannot be seen as adoption. Real adoption, i.e. change in practices should be measured much later, e.g. after the so-called *attribution gap* of the project. According to Herweg and Steiner (2002), the impact chain (utilisation, effect, benefit / drawback, impact) needs time to develop, time during which the number of actors and their interactions increases. This makes it more and more difficult to attribute a change to a single factor or project. This is called the 'attribution gap'. Due to this *attribution gap* it is not easy to attribute changes to a project using a linear, causal bridge. Ekboir (2003) referred to a *complex adaptive system (CAS)*, where impacts result from the interaction of several causes preventing the attribution to individual variables. What is known, however, is that the strength of innovation networks (e.g. farmer experimentation and other soft systems strategies employed in the Bergville project) and the quality of research institutions have a substantial influence on the probability of success (Ekboir, 2003). In other words, valuable information for the management of research systems cannot be obtained from one-time measures of outcomes but from continuous monitoring of the processes that produce the outcomes.

During the convergent interviewing the issue of sustainability (i.e. whether this behaviour will continue beyond the project without the assistance of starter packs, i.e. adoption) was evaluated and will be discussed below. This 'indicator' formed part of the 'Theory of Practice' used in the farmer-to-farmer extension strategy (See **Section 4.13.2.5**). The monitoring map shown here was used to collect (in a participatory way) and show the indicator. As mentioned above (see **Insert 4.2**), during the M&E process it was found that some of the lead farmers did not perform as was expected from then, which led to a decision to replace them by other farmers. The farmers participating in the monthly forum made these decisions themselves and selected new lead farmers.

It appeared that lead farmers were using their FM-trials and farmer field days effectively as main tools for awareness among other farmers. Feedback from these activities in the monthly action forums showed that participation in these events was good, with an average attendance of about 40 to 50 people per field day (See Annual Progress Reports in **Annexure 1**). Usually farmers joined forces and resources with those farmers having the best on-farm trials, leading to an effective show-casing of CA technology in practice. As a result of these events, interested farmers voluntarily joined the group and got involved with one-to-one and group training activities. Lead farmers were encouraged to engage in group learning activities and used tools designed by the ARC to facilitate the learning process (See **Section 4.14.3** below).

4.14.3. RESULTS AND DISCUSSION: PARTICIPATORY SELF-EVALUATION AND ACTION LEARNING

The participatory self-evaluation (PSE) tools (See **Section 4.13.2.6**) were first introduced in the 2004 season. The three tools, shown in **Appendix 3** and **4**, 4th Progress Report, **Annexure 1**, essentially made use of action research (or learning) principles and methodologies (such as evaluation) and aims to generate capacity among farmers to evaluate, learn and manage adaptively. As described above, I introduced these tools to the farmers during the farmer forums within a very short period, realising that one risks failure of adoption due to a lack of ownership. A few training sessions on the use of these tools were held and lead farmers were requested to use these tools with their trainees during FFE and group learning events in their respective communities or sub-wards. In **Section 4.14.4** below the use (adoption) of these tools by lead farmers and their groups, as assessed through the convergent interviewing, are discussed.

4.14.3.1. INTERPRETATION: PARTICIPATORY SELF-EVALUATION TOOLS

The *formation of small farmer cooperatives* showed sharp increases during the 2002/2003 season (see **Table 4.11**), although there seemed to be a problem with the further expansion of the co-operative approach thereafter. The number of co-operatives formed from 2004 to 2005 was not clear, since it was difficult to get good feedback from farmers on that respect. My perception is that there was a leadership problem – the person in charge was incompetent to manage and coordinate this process. This situation indicated a further need of strengthening local institutions, including small farmer group activities around technical and learning aspects, as well as more formal activities such as the formation of cooperatives, which were ultimately aiming to facilitate access to credit, inputs and markets. That is why the project started to focus on the formation and empowerment of small farmer groups around the lead farmers in 2004/2005. In **Table 4.11**,

the indicator of *Number of PSE (learning) tools* indicated that there was an effort made to develop and introduce these type of tools that would help farmers (i.e. leaders and their groups) to evaluate, learn and manage adaptively. The vision was that these tools would enhance the development of vibrant, self-helping farmer groups, which I see as one of the most important indicators for project sustainability. This issue is further assessed and discussed through convergent interviewing (see **Section 4.14.4**).

During the period when I introduced these tools to the farmers (from June to October 2004), I came under the impression that the use (adoption) of the two types of learning tools introduced to the lead farmers (through the monthly forums) was limited. I assumed that this could be as a result of following a wrong approach, but it could also be due to the limited time available to train and practice the use of these tools with the lead farmers (see my view on this issue from my personal research diary in **Excerpt 4.14**). The tools were only introduced to them quite late in the season and it was found that most of the time in the forums was taken up by routine project (process and implementation) management actions, leaving very little time to M&E and learning activities. By the end of 2004, my impression was that much more time was going to be needed to train and practice these tools. From my theoretical understanding at that stage, I still believed they were invaluable for vibrant, self-reliant groups and sustainability. I learned afterwards what elements (activities) were still necessary or outstanding, which will be discussed in **Chapter 5**.

Excerpt 4.14. Research diary - a personal reflection on the introduction of PSE tools to farmers

Date	Activities / events / incidents	People present	Critical reflection
September 2004	Action forum, working with farmers to test PSE tools. Farmers give feedback on their use of PSE among their trainees.	Myself, KZN-DAEA extension officers, lead farmers and some of their trainees.	It seems as if PSE tools are not used by most farmers. What is wrong? Was the approach to top-down, or was there simply not enough time left? Is it the right tools and what are the alternatives? What is the balance between top-down and bottom-up approaches; how can I reconcile them? I don't know if and how I could find out. Maybe one should not look at the use of these tools, but how it changed the users' attitude, behaviour and way of thinking, doing and making decisions.

4.14.4. RESULTS AND DISCUSSION: CONVERGENT INTERVIEWING

4.14.4.1. AN OVERVIEW OF CONVERGENT INTERVIEWING PROCESS

The convergent interviewing took place from 16 to 20 May 2005 (see **Table 4.12** for a schedule of the interviews with lead farmers). During the interviewing, which I did with 16 of the 20 lead farmers who participated in the Bergville project, I was accompanied by one of the KZN-DAEA extension officers working in the Emmaus ward. Their role was mainly to translate between the farmers and myself. As discussed in **Section 4.12.2.7**, I started the process by asking a single, broad question. The question I asked them was: “**Tell me all about your experiences in the project?**” I explained to them that “I would like to find out what worked and what not; what was successful and what not; what was good and what not?” Then I kept the person talking for as long as possible before I asked more specific questions.

Table 4.12. Convergent interviewing schedule with lead farmers in Bergville Landcare project

Date and time of interview, name of translator	Person interviewed; Sex	Local community, sub-ward
Monday, 16 May 2005 (Zanele Khumalo)		
13:00	1. Nontombi Mashibas Hlongwane (female)	Mamfemfetheni
15:00	2. Ntombana Shabalala (female)	Mamfemfetheni
Tuesday, 17 May (Carol Kubone)		
10:00	3. Bongiwe Hlongwane (female)	Magangangozi
12:00	4. Fikile Dlamini (female)	Magangangozi
14:00	5. To Mbele (female)	Magangangozi
16:00	6. Dompas Nesta Ngubo (female)	Mhlwazini
Wednesday, 18 May (Sipho Hlongwane)		
08:00	7. Manqoza Dladla (male)	Stulwana
10:00	8. Nonkosi Mthembu (female)	Mamfemfetheni
12:00	9. Msongwelwa Madondo (male)	Mlimeleni
15:00	10. Phelezela Hadebe (male)	Potshini
Thursday, 19 May (Carol Kubone)		
08:00	11. Namile Dubazana (female)	Izinyanyane
10:00	12. Phozoma Josiah Ndaba (male)	Vimb'ukhalo
12:00	13. Sizakele Miriad Miya (female)	Nokopela
14:00	14. Dabula Elias Ngubane (male)	Nokopela
16:00	15. James Ntolo Mabaso (male)	Ndunwane, Ngoba
Friday, 20 May (No translator used)		
09:00	16. Nicolas Thabani Madondo (male)	Potshini

As the interviews progressed, I compared the themes which emerged from each. Since I did not have another informant, once I agreed on (identified) a theme, in later interviews (with other

persons later in the week) I probed for disconfirming views. If they disagreed about a specific topic, in later interviews I probed for an explanation. In other words, idiosyncratic (excessive) information was discarded and probing questions were devised to structure the dialogue in the next interviews, with other members of the group. This process helped to test convergent information and explore and explain divergent information. During the interviewing process a full report of the discussions was prepared which included the discussions as completely as possible, using the participants' own words. I tried to list the statements, ideas and attitudes expressed for each topic of discussion (See **Annexure 13** for a full report of the convergent interviewing results).

As mentioned above (**Section 4.12.2.7**), the data analysis process was tightly structured. Much like grounded theory, I analysed the information systematically. Having the original memo's (i.e. transcript or documentation of the raw data) of the discussions available, I started to **code** it using the left margin of the transcript and the right margin to write additional comments (which was my first interpretation of the data). The heart of the analyses was to use key words and phrases from the discussions to identify **themes** or **categories**. Hence, I used only relevant information from earlier stages in subsequent stages to iteratively code and categorise my interview data or memo's. This end-product of categorising consequently formed the framework for my interpretation and discussion of the convergent interviewing data. This framework (headings), I found, corresponded closely with the major strategies, activities and outcomes of the Bergville project. The systematic approach of analyses was extended to the interpretation process, which was therefore dominated by a systematic (constant) comparison between discussions in each of these categories. It must be kept in mind that the purpose of this exercise was to gain an understanding of the impact and sustainability of the Bergville Landcare project.

4.14.4.2. INTERPRETATION OF CONVERGENT INTERVIEW RESULTS

As mentioned above, the framework of categories formed during the analysis process, were consequently used to interpret and discuss the convergent interviewing results. Those are discussed in detailed in **Annexure 13** and summarised below. In total eleven categories were used, i.e. monthly action forums, training of trainers, on-farm experimentation, awareness events, farmer-to-farmer extension (FFE), monitoring and evaluation (M&E), local institutionalisation, sustainability, changes in income, poverty and food security status, and problems experienced.

a) Monthly action forums: All the farmers said that the forums were handled well and they gained a lot of experience from it. For many reasons these meetings were important to them,

but most pertinently they received new information, or had the opportunity to review on the technical aspects and used to share ideas and agreed on solutions. They also seemed to have improved their confidence and leadership skills in the forums, although one farmer complained about the lack of clear communication among the group in the forums.

b) Training-of-trainers: Farmers appreciated the idea of having the training events away from home (away from their 'problems'). They also praised the quality of the major training course events.

c) On-farm experimentation: Most farmers were convinced that on-farm experimentation was very successful in helping them to learn the new technology, as well as convincing other farmers of the benefits and successes of conservation agriculture (CA). The interview results revealed that farmers took one or two seasons of experimentation to master the new CA technology. The results revealed that some farmers were looking for recipes (i.e. 'instructions') and were not able to experiment freely with new CA principles, while others did experiment by themselves. Farmers also began to grasp the effect of CA on soil health.

d) Awareness events (annual information days, field days, cross visits): It seems as if the farmers found the awareness events exciting and successful and that it was a "good learning and awareness opportunity". They became more aware of some of the crucial principles of CA technology and for some farmers a specific field day was a crucial moment in their understanding of the new technology. From the farmers perspective these events were more successful when they were more involved and in control of it. The discussions revealed another major benefit from the field days (organised by lead farmers and extension officers), which was that it involves the extension officers in the project activities much more than normal. These field days seemed to be successful to "motivate the community at large (general awareness), since it motivated people to join the group". The cross-visits (or look-and-learn visits) to other projects and commercial farmers for greater awareness was a positive experience.

e) Farmer-to-farmer extension (FFE): Many of the lead farmers used group activities as the basis for learning new CA technology, which seemed to be relatively successful in support off FFE, Farmers said that "people are interested in what they see on their plots, then we will tell them about CA, involve them in the group and work together". Lead farmers also visited individual farmers quite frequently. Extension officers also played a role in FFE, as some of the farmers "got

the basic knowledge from extension staff" and worked together with extension to reach new farmers.

f) Participatory self-evaluation (PSE) tools: Only a few farmers mentioned using PSE tools to facilitate learning in their groups, however, these few were very positive about its worth and usefulness. These farmers thought that "more regular meetings using these learning tools will help them to take ownership of it". It seems as if the use of M&E practices in general improved their awareness and farm management.

g) Local institutionalisation (learning groups): From the interviews it appears that there was a significant increase in farmer group activities induced by the Bergville project. Most lead farmers met with their group of trainees quite frequently, ranging from fixed, weekly meetings during planting to meetings every second month during the off-season. Most farmers found these meetings successful, enjoyable and useful although the activities carried out during the group meetings ranged widely. From the interviews it was difficult to get a better understanding of the **quality** of group activities performed by participating farmers. It was difficult to see whether they were able to 'truly reflect' on their actions/observations and were able to draw out clear and useful 'lessons learned' that would have facilitated the improvement of new plans and future actions.

h) Impact and sustainability: change in attitude, knowledge, skills, behaviour and practice: From the discussions it became clear that there was a drastic positive shift in farmers' attitude, knowledge, skills and behaviour. The discussions revealed that for some family members, especially the husbands of female farmers' it was difficult to believe in CA, but after seeing the successes they enthusiastically joined and supported it. Many farmers have already changed their whole farm to CA practices, while others are planning to do it. Most farmers appreciate the knowledge and skills they received; almost all farmers mentioned that they gained a lot of technical knowledge and skills, as well as communication and social skills from the project. However, some of the farmers in the group still struggled to implement some of the CA principles. Areas where the greatest gap lies in terms of knowledge and skills are business (financial) management, human-resource and project management, facilitation and marketing.

i) Impact and sustainability: Self reliant / independency: Most farmers feel that their groups are sustainable and very active and that they have a good chance of success - they and most of their trainees will continue with CA, although some will continue on small plots (It is not sure why,

but it maybe due to a labour problem or a lack of implements and inputs). Many farmers appreciate the knowledge and skills gained from the project and see it as an important element of sustainability. Some farmers think CA will expand to the whole area, because it improves the yields.

j) Changes in poverty and food security (including inputs, credit, markets): From the interviews it became evident that most farmers were experiencing significant financial and production benefits induced by project activities, which would most probably have a major impact on the wide-scale poverty and food security problems in the area. The factors farmers perceived to have the most impact were increased yields and lower input costs, especially mechanisation costs.

k) Mechanisation: The interviews revealed a few interesting points with regard to mechanisation aspects, as the Bergville project did have a major initiative to introduce CA implements to the farmers. This initiative was started with the view that a lack of appropriate implements could seriously jeopardise the adoption of CA practices. It came out that some farmers, mostly women groups, are still manually cultivating their land, mainly due to poor access to the new implements and oxen. Even some of the male farmers had initially done it with hand hoe's, while some used hand hoeing and oxen (with McGoy ripper), but complained about the high labour requirement to plant (by hand) in the furrows formed by the ripper. Some farmers have expressed the need for more knapsack-sprayers and other lead farmers (and their trainees) are using their implements effectively.

l) General problems: At the start of the interviewing process a few issues were identified which were further explored in order to get agreement or disagreement. This helped to test convergent information and explore and explain divergent information. One of the problems that was raised was that female farmers' husbands do not give their full support and cooperation in experimenting with the new CA technologies. This issue was tested during all the other interviews and it was found that the contrary was actually true. The husbands of all the other female farmers were very supportive and interested in the CA practices and results. It would be naïve, however, to claim that there will be no traditional and cultural conflicts brought forward by the new technology. It is well known that the roles of males and females in these mixed resource-poor farming systems are clearly defined and deeply rooted in cultural habits. The impact of changing their practices, for example males who were traditionally using large spans of oxen to plough and plant now having to use their hands for planting, must be carefully evaluated.

However, no other serious issues of this nature were revealed during the interviews. Other problems that could threaten the expansion of CA in these communal farming areas were a problem with stray animals and the high demand for labour.

m) Final remarks: In general, there was sufficient indication that farmers have had an enriching experience with the Bergville Landcare project. As a way of giving an account of unexpected changes (outcomes), **Insert 4.3** gives a deeper insight of observed *significant social changes* among the farming communities influenced by the Bergville Landcare project.

Insert 4.3. Significant unexpected social changes among farming communities influenced by the Bergville Landcare project

Domain of change	Significant changes in project	Examples of changes in project
Changes in the quality of people's lives	<ul style="list-style-type: none"> ▪ Higher status of lead farmers ▪ Better self-image and confidence among farmers ▪ Higher income ▪ Less risk prone environment 	<ul style="list-style-type: none"> ▪ Lead farmers are selected for leadership positions in community, e.g. chairman and committee members of ward and district farmers association and local cooperative ▪ Lead farmers take the initiative and lead in various activities in Emmaus area, e.g. forming and facilitating access to inputs and credit, communicate with input suppliers in town
Changes in the nature of people's participation in development activities	<ul style="list-style-type: none"> ▪ Higher level of involvement of lead farmers and farmer groups ▪ Increased exposure to empowerment opportunities 	<ul style="list-style-type: none"> ▪ Lead farmers are seen as key change agents by other stakeholders, such as ARC, KZN-DAEA and UKZN staff ▪ Lead farmer is used as local project coordinator and technical supervisor by UKZN, Potshini ▪ Lead farmers and their groups are used as 'learning groups' in research project of UKZN and Water Research Commission ▪ Lead farmers take initiative to get funding for new projects, e.g. funding of Landcare project for a youth group in Potshini community ▪ Lead farmers (and sometimes their groups) are send by KZN-DAEA on training courses and cross-country visits
Changes in the sustainability of people's organisations and activities	<ul style="list-style-type: none"> ▪ Improved organising of local farmers institutions; ▪ Better local networking and communication; ▪ Strengthening of extension activities and linkages with farmers organisations 	<ul style="list-style-type: none"> ▪ Lead farmers are very creative to organise and manage their groups, especially big groups, e.g. selecting new leaders to facilitate smaller groups ▪ Emmaus farmers have improved networks and communication to other stakeholders in district and province, e.g. have direct contact with national and provincial Landcare coordinators; have personal relationship with local input suppliers ▪ Departmental extension staff have better understanding and relationships with farmers, e.g. they have frequent field days in cooperation with lead farmers

The Bergville Landcare project certainly brought new insights and opportunities to these farmers who are facing many risks and are in a daily battle for survival. The exposure of farmers to a wide range of stakeholders, something which they never experienced before as even the sight of an extension officer was a rare occasion, was mentioned as one of the most valuable unintended outcomes. One farmer, for example, is now the local community coordinator of a multi-national water harvesting research project run by the UKZN, a key research partner introduced through the Bergville Landcare project.

4.14.5. RECOMMENDATIONS FROM M&E FINDINGS – SEPTEMBER 2005 (PHASING-OUT STAGE)

Late in 2004, when the project had received notice of the termination of funds, it was believed what was most needed at that stage was to prioritise the project strategies in order to improve the chances of long-term sustainability. M&E findings were primarily used to identify and prioritise the following key strategies:

- i) Farmer-to-farmer extension (or scaling-out), i.e. wider dissemination of knowledge and skills on best practices, which would lead to increased adoption,
- ii) Local institution-building, especially empowering small farmer groups with adaptive management abilities and create better access to credit, inputs and markets,
- iii) Scaling-up, i.e. to communicate project findings to higher-level stakeholders.

In support of the above-mentioned strategies, a number of recommendations, which were also derived from the M&E findings, were made in the 4th annual progress report (see **Annexure 1**). These recommendations were made by the research team, of which I was the coordinator. My concern with this approach, which should most probably be widely supported, was simply how much impact these recommendation made at the end. See my personal view on this aspect in **Excerpt 4.15**.

The following recommendations were made by the research team in the 4th annual progress report (see **Annexure 1**):

- Due to the illustrated and potentially highly positive impact of conservation agriculture (CA) practices on crop production profitability, soil health, household food security and social wellbeing of the Emmaus farmers, it was recommended as preferred best practices for resource-poor farmers in the Emmaus area without any reservations.

Excerpt 4.15. Research diary - a personal reflection on the use of M&E recommendations

Date	Activities / events / incidents	People present	Critical reflection
October 2004	Writing of 4 th annual progress report; making recommendations based on M&E results.	Myself.	I understand this report should be done to improve the auditing trail of the project, but how could I make it more useful to end-users? Is there a way that they can contribute in writing these reports? I think they should at least participate in generating the data, results and recommendations written here, otherwise it won't be useful to them, they would never 'own' it.

- ❑ In view of sustainability, the dissemination of knowledge and skills to the broader farming community must be continued through farmer-to-farmer extension (FFE). The M&E process initiated to focus FFE (i.e. the theory of practice) worked well and must as far as possible be used to improve and focus the process.
- ❑ It was recommended that the assessment of training and developmental needs be done on a continuous basis during monthly forums. This platform could also be used to communicate and coordinate most of the agricultural matters in the area.
- ❑ Due to financial risks and constraints faced by local resource-poor farmers, it was recommended that the use of external inputs, mainly because of their high costs, unavailability and consequent increasing risks to resource-poor farmers, should be minimised. It was recommended that the promotion of *low external input sustainable agriculture* (LEISA) practices, using CA principles, should continue.
- ❑ The formation and empowerment of small learning groups among farmers should be emphasised. These learning groups need to be able to learn and adapt and, furthermore, they need to be trained in certain project and financial management skills required, such as bookkeeping. The success of this process could play a major role towards the sustainability of agriculture in the area, which include the provision of credit, agricultural inputs, storage facilities, milling services and value adding. KZN-DAEA extension agents would have to play a prominent role in supporting this process.

4.15. SUMMARY AND CONCLUSION

The sections above are an attempt to describe the 'action research process' followed in the study area, which was used as the 'Act' phase of the research process followed in this thesis. In that respect it forms a primary source of data and references are made to the various documents and data used, i.e. project reports, my personal research diary, significant changes and M&E findings. Firstly, this chapter describes the application, assumptions and intended outcomes of the action research methodologies (forming the major strategies) selected for effective platform development in the Bergville Landcare project. This chapter is showing how M&E findings were used by the Bergville project team to describe and illustrate the performance and impact of these major strategies, which formed the pillars of the soft system platform in the project. Finally, the vision of the project team was to use a *convergent interviewing* process to get an indication of how sustainable the activities that were introduced by the soft systems platform are. This would again provide an indication of the extent of sustainable land management induced by the project.

In the 3rd and 4th annual progress reports the project research-team could not accurately conclude whether the project had sufficient impact to be sustainable. Their view was that the large study area and potentially huge number of end-users could mean that many more resources (expertise, time and money) were needed to achieve the end-goal of the project, or at least to change the behaviour and practices of a critical number of end-users (medium-term outcome) in the Emmaus ward. At that point they argued that one more season was needed to guarantee the long-term sustainability of the project. I believe that this issue needs further investigation, since it is difficult to assess what and when that 'critical mass' should ideally be in this specific setting. From the M&E findings, however, it is clear that some of the strategies were successful, while others were less successful. Furthermore, the *convergent interviewing* results were quite convincing as they indicated that the impact of the project was positive and that most of the activities and initiatives would be sustained. However, final impact and sustainability is always a contentious issue and this and other data described in **Chapter 3** and **4** will be analysed in **Chapter 5** to generate theoretical and practical insights (implications), which are synthesised in **Chapter 6**.

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CHAPTER 5. DATA ANALYSIS AND LESSONS LEARNED FOR THEORY DEVELOPMENT

5.1. INTRODUCTION

This chapter outlines the data analysis and lessons learned for the theory development process used in this study, as well as the results and discussion thereof. In order to implement a process that fits the situation and nature of the data sources used in this thesis, I used a combination of SSM, action research and grounded theory interchangeably. After a brief overview of the research methodology, the following methodologies, which were seen as the most important in the development of the soft systems platform, were subjected to the data analysis and theorising process: on-farm experimentation, training-of-trainers, farmer-to-farmer extension, local institutionalisation and monitoring and evaluation.

5.2. AN OVERVIEW OF THE RESEARCH METHODOLOGY

The research approach selected for this study was described in **Chapter 2** and advocates the use of multiple methodologies, being a combination of grounded theory, action research and SSM. The design of the research process resulted in effectively using and analysing the different data sources within the following four phases: a) theory as an initial guide to design and data collection; b) application of initial theories in a Landcare project; c) an iterative process of data analysis and theorising; and d) synthesis of theoretical and practical insights into the focal research problems. This chapter deals with 'an iterative process of data analysis and theorising'. My choice of a data analysis and theory development methodology was Chekland's (1985) general SSM research framework, in combination with action research and cognitive mapping (see **Figures 2.1 to 2.4, Chapter 2**).

By using the SSM framework in combination with an iterative action research process for data analysis, a number of lessons learned could be formulated. These lessons learned were further used, and supported by literature, to develop new theories and ideas for practical application. To narrow down the scope of the study, only the following methodologies, which were seen as the most important in the development of the soft systems platform, were subjected to the data analysis and theorising process: on-farm experimentation, training-of-trainers, farmer-to-farmer extension, local institutionalisation and monitoring and evaluation. This local theory on using

these methodologies to facilitate action research among resource-poor farmers in South Africa is represented by a number of key concepts and ideas identified and linked in a cognitive mapping exercise. One of the major insights was that **all the project activities are interlinked with each other - they are all attached, integrated and guided by the main chain, which is the M&E process** flowing from the project strategic plan. This phenomenon was found to be an important feature of all the theories which are illustrated in the cognitive maps shown in **Figures 5.2, 5.6 and 5.10**. The sections below outline discussions of the key concepts and ideas forming these theories in the cognitive maps. Since the cognitive map is a structuring (conceptualisation) of a messy or complex situation or data, the discussion below was an attempt to improve its understanding. My idea was at every step to explore and to improve the initial assumptions (or theories) by describing the new theory with its key concepts, ideas and the processes underlying it.

5.3. LESSONS LEARNED AND A LOCAL THEORY FOR ON-FARM EXPERIMENTATION

5.3.1. OVERVIEW

The applications, assumptions and intended outcome(s) of on-farm experimentation in the pilot study are discussed in **Section 4.6.2**. Ultimately, on-farm experimentation aims to contribute to the generation and adoption of new, appropriate technologies by small, resource-poor farmers. The framework of concepts and ideas (F), the method applied (M) and the area of application (A), which were analysed using the SSM framework are illustrated in **Figure 5.1**. Two types of on-farm experiments were applied in the Bergville study. Firstly, a **researcher-managed (RM)** trial at the Potshini trial site and secondly, **farmer-managed (FM)** trials on 20 lead farmers' fields. As described in **Section 4.7.2** the objective of the RM trial, also classified as an exploratory experiment, was to determine whether the new technology, which was based on Conservation Agriculture (CA) principles, would function, in a technical and biological sense, in the physical environment of a farmers' farm. The objectives of the twenty FM trials (as described in **Section 4.7.2**), also classified as adaptation and/or verification trials, were to improve experiential learning, improve modification and dissemination of technologies to local farmers, increase awareness among farming communities and facilitate farmer-to-farmer extension and training. Below follows a discussion, aiming to improve the understanding of the key concepts and ideas forming the local theory on on-farm experimentation, shown in the cognitive map (see **Figure 5.2**).

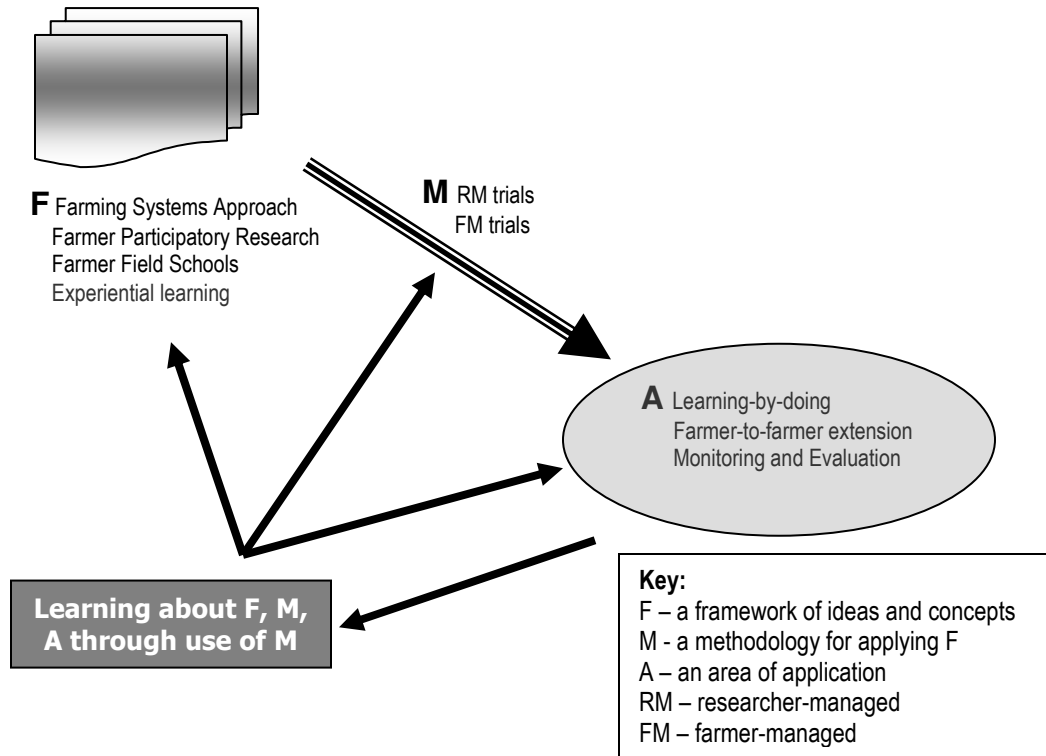


Figure 5.1. The research framework for on-farm experimentation

5.3.2. CLARIFY METHODOLOGY: EXPERIMENTAL DESIGN AND TYPE OF TRIALS

During the planning phase of the Bergville study, a number of proposed solutions as thought to be acceptable for on-farm experimentation were included in the list of experimental factors. The factors listed were consequently used in the design of the experiments on the **RM trial** at Potshini. The following factors (problems) were listed: weeds, pests and diseases, soil acidity, Phosphorus deficiency and Nitrogen deficiency. The planning and design of the first set of experiments went fairly smoothly as the methodology used (Tripp and Woolley, 1989) was specifically developed for that purpose, i.e. 'to identify factors for experimentation during the planning stage of on-farm research'. Although this methodology was able to facilitate and integrate the planning stage and the design of experiments *per se*, it lacked the elements needed for the design of a strategic project (development) plan, which would allow better design, implementation and management of various project strategies (logic models or processes) in an adaptive manner (see middle bottom of **Figure 5.2**). This emerged as a weak chain in the project management process during the implementation phase and will be discussed in more detail later in this chapter (see **Section 5.7** below).

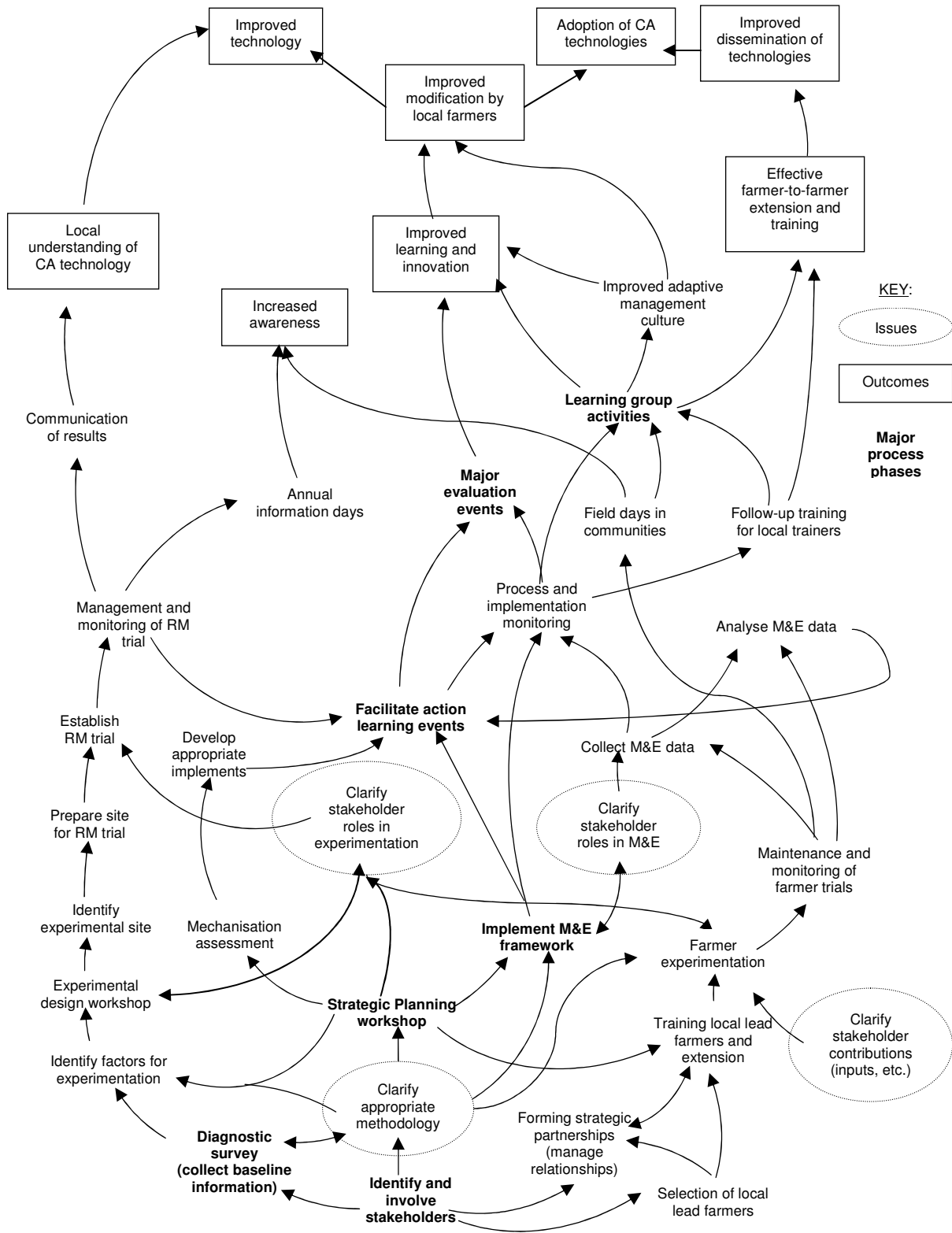


Figure 5.2. Cognitive map and local theory on on-farm experimentation

Secondly, the experimentation design process did not involve farmers and did not attempt to design FM trials. In fact, my view is that the project team did not have a good theoretical understanding of the role of FM trials at that stage (September 2000); those insights were only developing in the months following the start of the project. Later I became fully aware how crucial it is to involve farmers at all the stages, including experimental design. Johnson, Lilja, and Ashby (2003), for example, found that farmers' input (in all project phases) did lead to changes in types of technologies tested, the protocols for testing and the way the results were evaluated. So, it would be a change in the chronological sequence of events if farmers, or farmer representatives, are during the diagnosis and planning and then still go into a training process before they start with their experimentation (see bottom right corner of **Figure 5.2**).

The middle bottom of **Figure 5.2** indicates the importance of clarifying the issue of *appropriate methodology*, which includes the type of experimentation. My theory on experimentation at that stage, i.e. at the start of implementation or soft-systems platform formation, was firstly influenced by the Farming Systems Approach (FSA), as described by Matata *et al.* (2001), Norman *et al.* (1995) and Anandajayasekeram and Rukuni (1989). FSA promotes two major categories of agricultural experiments: a) technology generation experiments and b) technology testing experiments. The purpose of the former is to serve as a vehicle for the generation of agricultural technologies while the latter aims to adapt, modify, tailor or fine-tune technologies. These two ideas of experimentation are the basis of what we attempted to implement in the Bergville study. Realising that on-farm experimentation was on the table for us, far removed from research stations with highly controlled and favourable conditions, increasing attention was given to the design, analysis and interpretation of on-farm experiments. According to Matata *et al.* (2001), on-farm research is a production-problem-oriented approach to technology development and transfer. The type of on-farm experiment to be implemented will depend on the type of intervention, the potential solutions to be tested or evaluated as well as the level of confidence one has on the repeatability of the technical performance. Matata *et al.* (2001) also distinguished five types of on-farm experiments that are normally conducted: diagnostic or investigative experiments, exploratory experiments, determinative or levels experiments, adaptation experiments and verification experiments. What started to occur to me at that stage is that the testing of proven, field tested technologies by farmers was going to be a high priority activity in the Bergville project. At that stage a number of other sources emerged from literature which had an influence on my theoretical understanding of on-farm experimentation. Norman *et al.* (1995), for example, classified on-farm trials into different types according to the degree of farmer involvement. The following are the common classifications:

- ❑ Researcher Managed and Researcher Implemented (RMRI)
- ❑ Researcher Managed and Farmer Implemented (RMFI)
- ❑ Farmer Managed and Farmer Implemented (FMFI)

Selener (1998) classified research conducted on farms according to the level of control and management exercised by farmers and researchers. This classification includes the following four categories (See **Figure 5.3**):

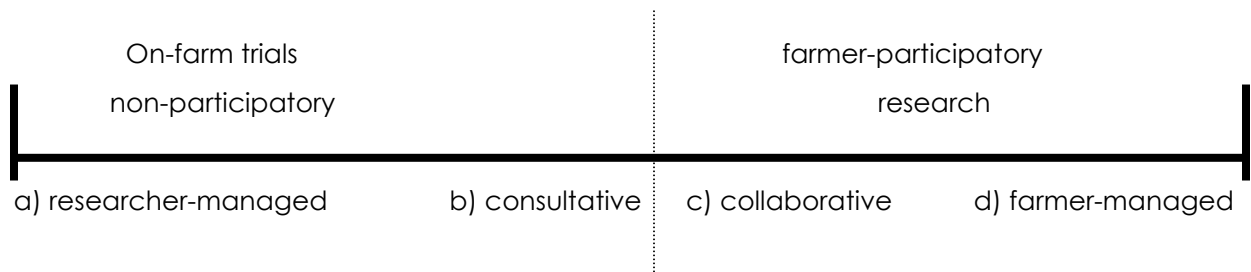


Figure 5.3. Types of on-farm research (Selener, 1998)

a) Researcher-managed on-farm trials

Researchers manage trials in farmers' fields to develop technology for farmers or to test and validate research findings obtained at the research station. However, farmers do not participate actively in this process

b) Consultative researcher-managed on-farm trials

Although farmers may be consulted at the beginning of the research process, such consultation is aimed primarily at assisting researchers to interpret farmers' circumstances, problems or needs and to arrive at experimental designs for trials which often will not include farmer participation at the initial (i.e. planning and design) stages of on-farm testing. Technology is developed for farmers based on the researchers' understanding of their farming systems.

c) Collaborative farmer-researcher participatory research

Farmers and researchers work together on problem definition, design, management and implementation of trials as well as evaluation. Ideally, a collaborative relationship means

balanced participation in and control over the research process in order to achieve the objectives of both farmers and scientists.

d) Farmer-managed participatory research

Farmers are the main actors and decision-makers in this approach, developing technology through a process that includes problem definition, trial design, implementation of experiments in farmers' field and the evaluation of results by the farmer.

The first two types are not seen as farmer participatory research, but simply conventional on-farm research. The last two types are forms of participatory research and, as such, reflect and are based on the characteristics and assumptions of farmer participatory research described in this thesis. On the left side of the spectrum are the non-participatory on-farm trials conducted by researchers in farmers' fields; on the right side, the forms of farmer-participatory research in which farmers are the decision-makers. Between these poles, there exists a range of possibilities, combining farmer and researcher participating in the control and management of the research process.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Mother-Baby (MB) trial model is an upstream participatory research methodology designed to improve the flow of information between farmers and researchers about technology performance and appropriateness under farmer conditions (Snapp and Heong, 2003). The trial design consists of two types - mother and baby trials. The mother trial is researcher-designed and conforms to scientific requirements for publishable data and analysis. A baby trial consists of a single replicate of one or more technologies from the mother trial. A single farmer manages each baby trial on his or her own land. A typical implementation of the methodology would include a single mother trial and numerous baby trials within a village. The MB trial methodology has three goals. The first is to generate data on which to assess technology performance under realistic farmer conditions. The second is to complement the agronomic trial data with farmers' assessments of the adoption potential of technologies. This information helps researchers understand how the technologies fit into farmers' broader farming and livelihood strategies. The third goal is to encourage farmers to actively participate in the trials and is expected to stimulate farmer experimentation with, and adoption of, new technologies and practices (Johnson *et al.*, 2003). According to Norman *et al.* (1995), all of the work in researcher-managed trials, at least with reference to the treatment variables, is handled by researchers. The trial can

be as large and complex as is needed to answer all the relevant questions. Generally, formal, replicated designs are used in this type of trial.

Saunders and Kellner (2003) proposed two types of trials that were used in a case study in Zimbabwe. The first, Adaptive Research Trials (ARTs), were typically investigating one factor only. They were researcher-managed and replicated, but one replication is not randomized, the treatments being laid out in a systematic manner. This gave the trials a better technology transfer function in that the farmers could see the response surface (in a fertilizer rate experiment, for example) without researchers or extension having to be present to explain where the treatments were. This layout is believed to be responsible for adoption of technology, in numerous cases, without an extension step. The second type of trials were Participatory Adaptive Trials (PATs), usually of 2-4 treatments, un-replicated, and managed by farmers. The subjects of the PATs could be derived from the replicated ARTs, or could be best bet solutions for farmers' problems or needs, or could offer an opportunity to test and spread local or indigenous knowledge. The concepts of PATs were introduced to farmers, generally at field days centred on ARTs. Potential treatments for the PATs were discussed by the farmers and a consensus (usually but not always) reached on what should be included in the trials that season. There was no restriction on the number of farmers to implement the trials – the more the better as it gives farmers hands-on opportunity for experimentation.

In the case study discussed above by Saunders and Kellner (2003), farmers were supplied with the inputs required for the treatments only, with no attempt to effect change to any other management practice. The inputs were sufficient for relatively small plots, usually 100-200 square meters, significantly smaller than traditional extension demonstrations. The participants were trained in site selection and trial monitoring, utilizing simple data sheets to record their management practices (when/what/how). Near the end of the season they were trained in harvesting methodology. Yields were weighed together with extension and research personnel. The farmers' groups together with extension and research personnel visited most of the individual sites monthly. They all compared results and analyzed the differences between individual farmers and they evaluated opportunities for improving their own management. Harvest field days were held, results compared and discussed, and options for PATs for the next season were then considered.

According to Saunders and Kellner (2003), participatory monitoring and analysis of PATs (social, economic and biophysical indicators) is seen as part of action research. PATs perform the following functions:

- ❑ Verify results from Adaptive Research Trials
- ❑ Determine the stability of the technology to farmer's individual management systems and hence the risks involved in adoption
- ❑ Identify farmer management practices which best exploit the technology
- ❑ Can develop a questioning, analytical "research mentality" in farmers
- ❑ Are a powerful extension tool

According to Scoones *et al.* (1996) three broad types of farmer experimentation can be identified which are based on organised testing of options. These are curiosity experiments, problem solving experiments and adaptation experiments. In addition, fortuitous experimentation may arise because of unforeseen circumstances, where farmers must respond to events and improvise. A brief discussion of each type follows:

- ❑ **Curiosity experiments:** Very often learning arises through curiosity. Farmers may try something out just to see what happens.
- ❑ **Problem solving experiments:** Experiments are often designed to address problems related to a specific farming system, dependent on such factors as local soil fertility or moisture conditions, pest or disease incidence or labour availability.
- ❑ **Adaptation experiments:** Farmers may adapt new technologies to known environments or known technologies to new environments. A classic case is the testing of crop cultivars in different environments.
- ❑ **Fortuitous experimentation:** Experimentation may happen by chance. Events may dictate changes in practice that result in new learning experiences, such as a farmer who learned a lot about transplanting sorghum as a result of disruption of planting by mid-season drought and a funeral.

Although it is quite evident from the above discussions that scientists have a strong, but relatively wide ranging view on the different types and purposes of on-farm experimentation, the question emerged: 'How do farmers view experimentation? How do they behave when they experiment?' From my experiences in the Bergville study, there is still a huge gap and opportunity to investigate how resource-poor farmers in Southern Africa are doing experiments

in their own way, but also how they can grow and empower themselves through the development of experimentation skills. I do reflect on these aspects elsewhere (see **Section 5.7**), but for now I would like to make the following statements, which seem to be a good summary of the approach that merged from the experiences in the Bergville study:

- ❑ There are usually a [small] number of innovative farmers within each community that do have a natural ability or skill in experimentation. By identifying those farmers early in the project, their approach or 'models' can be investigated and they could be fruitfully used to lead the way for other farmers in experimenting with new technology and adapting it to local conditions.
- ❑ Farmers need to be assisted in the following sequence of activities: a) designing their own experiments, b) selecting experimental factors and treatments from 'a basket of technological principles' that fits within their 'socio-agro-economic conditions', and c) guiding them through implementation, monitoring and evaluation.
- ❑ Experimentation should 'smoothly jell into everyday farming or field activities' and become part of their way of thinking and doing their farming. It should become a habit, or [permanent] cultural behaviour, but in getting there it must not build resistance or hostility towards the practice [of experimentation] or the technology or the people introducing the idea.

From literature (e.g. Hagmann, Chuma, Murwira and Connolly, 1999; Rhoades and Booth, 1982; Scoones *et al.*, 1996), I learned that farmers' experimentation is very similar to that of scientists: there are a variety of ways of going about experimenting, there are a range of different ways of testing the validity, and the process of experimentation is part of a continuous and progressive learning experience conditioned by social forces and cultural norms. Thus farmers carry out both exploratory, inductive experiments and deductive, hypothesis-testing experiments. They usually establish their experiments in sites where regular observation is possible: around the homestead or in the home field or garden. Plots dedicated to experiments shift depending on the nature of the inquiry, but they are usually small in size, reducing the risk of failure of any experimental innovation. Replications tend to be limited within years, but may occur over a number of years. Adjustments of treatments also occur over time, as progressive learning takes place. But, according to Scoones *et al.* (1996), the objectives and actual practice of experimentation often differ. From my experience in Bergville, scientists can introduce general concepts and options, or, what I call a 'basket of technologies' or principles, to farmers to select from for experimentation. According to Hagmann *et al.* (1999) farmers choose the options and ideas

they think are most relevant to their individual problems and try them out. They are also actively encouraged to come up with their own ideas. Conducting simple comparisons between conventional practices and new techniques can be a powerful tool for learning. For example, in the case of water harvesting techniques or pest management, a simple paired design – where the new technique is placed alongside the conventional one in the same field – has proven to be a very practical and simple way of comparing the performance of the two by farmers. If researchers or extension workers want to join the farmer in this type of experimentation, they can put in 'check plots' in pairs to measure yield and growth parameters in detail. The Bergville study showed that the simple paired design, however, enables farmers to observe, compare and analyse by themselves. It helps them to understand factors which contribute to differences, which in turn enables them to improve on these factors in future. Farmers often try traditional practices which have been ignored for a long time, sometimes with positive results, where the traditional practices perform better than the modern practices. Often an integration of the two is needed. Farmers share their experiences informally amongst each other. If the 'spirit of experimentation' is successfully created, this triggers a collective learning process. The extension worker should keep track of all new developments in the area and encourage farmers to share any new ideas. Learning through practical experience and experimentation, as well as information sharing, are critical to the success of participatory extension and necessary to encourage more widespread trying and testing of ideas and innovative practices.

Farmers have a primary responsibility towards their own families for maintaining livelihood through agricultural production. Success and failure are often judged by immediate, short-term outputs. The practice of experimentation [by farmers] is also, in some respects, different. Experimentation is bound up with action and implementation is part of the process of inquiry. Scoones *et al.* (1996) concluded with the statement that farmers gain knowledge through this process of 'reflection-in-action'. Unlike in the formal descriptions of science, theory and practice are not separated. Scoones *et al.* (1996) quoted Stolzenbach (1994), who pointed out:

"The management of a farm can be seen as a continuous series of experiments, by which, through the labour itself, the agricultural performance improves. It therefore becomes difficult to talk of an 'experiment' as a special action, separated from activities. We should aim to concentrate on 'experimenting' as a continuous and innovative element in the craft of farming."

This interpretation of experimentation, where learning is bound up with action, is an important departure from experimentation as usually described by researchers. However, it closely relates to my understanding of experimentation as it emerged from the Bergville study. The challenge, maybe for future research, is to test this theory among farmers in practice, because what we have seen in Bergville more than anything else was a lack of practical tools (e.g. a simple guideline or 'rule of thumb') that farmers can use to facilitate this process of active experimentation.

5.3.3 FORMING STRATEGIC PARTNERSHIPS

The bottom right corner of **Figure 5.2** indicates the idea of the *formation of strategic partnerships*. In the second year of the RM trial in Potshini, more factors (or principles) of Conservation Agriculture (CA), especially that of crop diversity (i.e. crop rotation and intercropping) were included for experimentation. With that came new partners (ARC-RFI and ARC-PPRI) and new technology, which changed and improved the focus and quality of the experimentation, at least in terms of sustainable land management. The focus of the RM experiments shifted slightly from the investigation of soil related problems (e.g. soil fertility and acidity) towards practical solutions that were centred within the CA principle of 'crop diversification'.

The researchers involved built valuable experience from collaborating and working as colleagues on experiments, trying to find solutions in a new environment, under less than favourable conditions. Without good collaboration and strong partnerships among researchers, successful implementation and management of the on-farm RM trial would have stayed a remote goal. **Box 5.1** shows my own perspectives on a number of aspects that were contributing to the successful collaboration of researchers from different ARC institutes in the on-farm, RM trial in Potshini.

Box 5.1. Steps leading to successful collaboration among researchers in the RM trial, Bergville pilot study:

- Continuous communication and negotiations (lobbying) before the commencement of the partnerships
- Drafting of a comprehensive business-plan and project proposal that spelled out the activities, resources and responsibilities
- Securing funds for long-term (3-4 years) collaboration
- Proper coordination and communication of operational activities during implementation and management of experiments
- Efficient control over collection, analysis and management of data (include statistics)
- Effective management of reporting and dissemination of results
- Continuous communication and coordination

5.3.4. CLARIFYING STAKEHOLDER ROLES IN EXPERIMENTATION

One of the less satisfactory aspects around the implementation and management of the on-farm experiments in the Bergville study that needs to be pointed out is the *clarification of the role of different stakeholders* (see issue indicated in middle of **Figure 5.2**). Certainly, research staff cannot be constantly in the field, and most community-level activities like the management and monitoring of experiments, for example, must fall to local stakeholders, such as farmers with extension and other district departmental officers. On the other hand, farmers cannot always meet with stakeholders at a national level to discuss, for example, research funding strategies and opportunities. However, one of the experiences from this study was that the involvement of the departmental extension technicians responsible for agricultural extension in the study area was poor. This could be attributed to a few factors, namely: a) poor ownership of the project or certain activities of it; b) overloading with too many 'other' activities (a claim that is often heard), or c) simply a lack of interest and commitment. Because these aspects are seen as important project outcomes, it is necessary to investigate some of the possible causes for the purposes of this study.

One of the most important lessons learned during the lifetime of the Bergville project was to deal with 'ownership' right from the start of the project, i.e. during the stakeholder analysis. At first, the negotiation and elaboration of stakeholders' information needs, interests, fears and aspirations should be done. Secondly, detailing their *roles and responsibilities* right at the onset of the project, are of critical importance. The follow-up (management) of these roles and responsibilities emerged as one of the critical success factors in the Bergville project. This should continue during the implementation and management phase, as well as the learning and adapting phase. What was first needed was a systematic, comprehensive and participatory planning methodology applied during the planning phase, which would have allowed effective process monitoring and adaptive management during the implementation of the strategic plan. This process should also address the implementation of an experimentation strategy. The development of such a 'strategic plan' or framework at the start of a project might be the most effective way to ensure proper participation and ownership by important stakeholders, such as the extension technicians. However, other options and incentives for participation should also be considered. According to Johnson *et al.* (2003), different types of farmer participation at different stages of the innovation process can lead to different impacts. For example, participation [by farmers] at the design stage can influence overall project priorities and help ensure that a project is appropriately focused from the start. Because of the implications for

activities and budgets, sharing authority with users at this stage could enhance users' sense of empowerment and ownership of the process. Participatory research at the implementation stage (e.g. of FSA process) can help identify the best option from a pre-defined set of solutions to a given problem. If farmers gain training and experience in the design, implementation and evaluation of experiments, their capacity for innovation can be substantially increased.

The second area of concern that emerged from the Bergville study was *the role of farmers* in the RM trial. What should really be expected from farmers? Are they only bystanders or casual labourers for researchers trying to 'find solutions' in farmers' 'backyards', or should they play a much more active and constructive role in the implementation and management of RM trials? In the Bergville study, farmers were 'actively' involved with routine maintenance work, such as planting, fertilising, weeding, spraying, and harvesting. But what did they really gain apart from a small amount of money? Did they learn something and was that really the purpose?

It emerged that the role of the various stakeholders (i.e. researchers, farmers, extension agents and others) will depend on the stage of technology development and testing, and the type of on-farm experiment as well as the primary objectives of each of these groups. It is argued that in some cases, such as the RM trial in the Bergville project at Potshini, the researchers will manage and implement the experiments. In these cases, researchers usually have the tendency to allow as little other involvement as possible in order to secure 'standard experimental conditions' with the least external variables as possible. Although this might be a valid argument, especially when more complex field experiments are conducted, I have learned that it should not necessarily restrain implementing agents from bringing the outcomes of the RM trials in line with the ultimate outcomes and impact of the project, i.e. empowerment of primary stakeholders or end-users. Although this was missing in Bergville, my experiences in the project indicated that it could be achieved by involving lead farmers in RM activities as 'colleagues' or co-researchers, make them part of decision-making, give them more responsibilities, organise feedback and discussion sessions. In this way one moves away from the practice where the farmer only provides the land and may be requested to take part in the technology assessment and at times in implementing certain management practices, to a much more interactive co-learning approach. RM experimentation could now be an extension of the 'training-of-trainers' process, linking farmers to FM experimentation and furthermore add valuable experience to a true experiential (action) learning process.

In FM experiments, there is a huge opportunity for everybody, especially researchers, to learn more about the farming systems and practices. This new knowledge and understanding should lay the foundation for the adaptation, and ultimately adoption, of technology to the [individual] farmer's situation. For that reason such trials are conducted by farmers, with support, cooperation and communication with researchers and extension. From my experience in the Bergville project, the researcher's role in on-farm experimentation should be focused on the following aspects, namely:

- a) to take extensive measurements on all aspects of farmers' practices and use the results to analyse production constraints; in this respect, a simulation model or expert system could be applied to enhance the analysis;
- b) to be involved in and facilitate monitoring, evaluation and data analysis;
- c) to facilitate regular stakeholder field visits as part of 'major evaluation events';
- d) to assist and advise farmers to adapt the technology to their conditions.

Matata *et al.* (2001) gave a very relevant summary of levels of interaction between farmers and scientists and possible outputs (See **Table 5.1**). My indications of where the Bergville project experiments fit in, as well as what I would recommend are also given.

Table 5.1. Levels of interaction between farmers and scientists and possible outputs

Recommendations	Degree of interaction		
	Scientist	Farmer	Possible output for which interaction is appropriate
Bergville RM trial	Design, manages, analysis	Provides the field	An understanding of processes, components
Bergville FM trials	Design, analysis	Manages, provides input into the analysis	An understanding of processes, components of new technology under farmers' biophysical conditions and their management
Recommended RM experiments	Design, manages, analysis	Design, manages, analysis	Joint evaluation and modification of new technology
Recommended FM experiments	Training, guidelines, technical support	Design, manages, analysis	Capacity development, empowerment

5.3.4.1. FARMERS' CAPACITY FOR EXPERIMENTATION

The whole right side of **Figure 5.2** relates to involvement of farmers in experimentation. From literature it became apparent that along with growing recognition of the value and usefulness of indigenous knowledge systems, scientists are increasingly aware of farmers' capacity for experimentation, resulting in the evolution and adaptation of indigenous knowledge systems to production needs. According to Selener (1998), farmers' capacity for research and experimentation generally goes unacknowledged by agricultural researchers and society at large. This was mostly the case in the Bergville study. Although we became aware of the theory about farmers' capacity to experiment and we found a few of them who did it, it was very late in the project cycle and we did not investigate or describe it properly. Rhoades and Booth (1982) argue that for 10,000 years farmers have been experimenting to develop their farming systems and that before the arrival of science "farmers already had an evolutionary impact on plants, animals and the land". He also noted that all theories on the evolution of farming include the view of the farmer as "an active actor in the process: selecting, consciously observing and manipulating and experimenting with plants, animals, tools and the environment to improve the production output". However, based on the situation in the Emmaus area, my conclusion is that farmers appeared to be lacking the ability to escape from the vicious cycle of land degradation and poverty. Although the reasons for this situation is multiple, the fact is that in Emmaus the current status of the natural resources is poor, the observed rates of land degradation are high and the magnitude of problems identified and described during the diagnostic and consequent stages is severe. The farmers somehow survive, but there is very little improvement, if any, in land management practices. This points towards, among other factors, a lack of appropriate technology, sustainable farming systems and a capacity to experiment and adapt to their circumstances. However, the Bergville study showed that various components need to be in place to improve the situation of resource-poor farmers. One component is external support from researchers, extension and other stakeholders, which is directed towards a 'collaborative learning' or action research approach manifesting at grassroots (farmer or group) level. Furthermore, institutional support (i.e. institutionalisation) on higher levels of the stakeholder hierarchy needs to be in place to ensure that the process is sustained. The latter point will be discussed in **Section 5.7**.

According to Selener (1998), farmers experiment in one way or another in order to adjust to changing circumstances. My experiences in Emmaus showed that in this case, farmers' experimentation and innovation alone had not been enough to lift them out of the cycle of

land degradation and poverty. From literature it looks as if farmers' experimentation is a mixture of rigorous comparison and creative play. Similar to those in the Bergville study, Scoones *et al.* (1996) mentioned that comparisons may be carried out with controls adjacent to treatment plots or with controls 'in the head', reinforced by memories of how the plot performed in past years. The comparisons done in the Bergville study seemed to be successful, although no in-depth investigations were done to understand how the farmers really perceived these trials and what really works for them. According to Selener (1998), farmer experimentation has led to the development of productive and sustainable farming systems well suited to their needs, environment and resources. Even today, farmers do not control all aspects of their physical and biological environment and so they must continue to experiment because success depends, to a great extent, on the continuous adaptation of a given practice or technology to changing local conditions. Based on successful experiences in many parts of the world, Bunch (1988; as quoted by Selener, 1998) reported that the emphasis on improving farmers' inherent capacity for experimentation is an important element in the sustainability of agricultural development programs. When an organisation withdraws from a region, farmers continue to conduct experiments and share information with members of farmers' groups and organisations. This was a prime objective strived for by the Bergville project. Johnson *et al.* (2003) found that farmers' capacity to experiment with and adapt technologies is credited with being the key to the success of specific case studies they evaluated. They furthermore found that the intensive and prolonged interaction of farmers with project staff was clearly important for building experimentation skills. They found a major difference between the experience of the farmer researchers who developed technologies for and designed the curriculum of the FFS and the farmers who only attended it. Similar to the Bergville study experience, Snapp and Heong (2003) found that in communities where the implementation of the Mother-Baby (MB) methodology was more flexible and where farmers received 'training-for-transformation' (training-of-trainers in Bergville) parallel to the MB trial activities, impact on local experimentation appears to have been stronger. Johnson *et al.* (2003) also found that **empowering participation (e.g. farmer experimentation) rather than functional participation (PRA and farming systems surveys) at the testing stage (experimentation) made a bigger contribution to impact-oriented R&D projects working with complex technologies (such as CA).**

The examples above demonstrate that rural communities throughout the world are more than 'passive recipients of technology that is transferred to them from Western countries or formal research and development programs'. Biggs (1980) identified three inter-related types of information generated by farmers' informal research: a) technical and organisational

innovations that use scarce resources efficiently, b) signposts for new research that scientists in formal research and development systems might start to work on, and c) methods for conducting cost-effective research and classifying knowledge, with the farmer as principle researcher. Scientists must facilitate farmers' experiments "to bring back or affirm [their] inherent ability to adapt technical options to specific farm conditions" (Lightfoot, 1987), and to improve the transfer of information and technology from the grassroots up to high levels of decision-making (Biggs, 1980).

Through this (thesis) analysis process, I was able to identify other benefits resulting from participation by farmers in the process of technology development and experimentation in the Bergville study. These statements are supported by Ashby (1990) in most respects:

- ❑ Improved understanding by scientists of the needs of small farmers, leading to better identification of problems appropriate for adaptive, on-farm research;
- ❑ Improved feedback on farmers' needs and objectives to guide applied research in research stations;
- ❑ Accelerated transfer and adoption of improved technology by small farmers;
- ❑ Efficient, cost-effective use of scarce resources in on-farm research through better linkages among farmers, researchers and extension agents; (Johnson *et al.* (2003) also found a reduction in research costs when farmers took over some on-farm research activities)
- ❑ Development of organisational models, professional skills and values appropriate for demand-driven, problem-oriented technology design.

5.3.4.2. THE ROLE OF RESEARCHERS IN FARMER PARTICIPATORY RESEARCH

In supporting farmer participatory research, scientists play a new role (Selener, 1998):

"Instead of the missionary role of those who transfer technology, the new role is that of a convener, catalyst, colleague and consultant. The outsider sets up discussions and analyses by farm families and acts as a catalyst, in the strict chemical sense of that term, meaning an agent which speeds up reactions. The outsider is a colleague for farmers in their experiments and a consultant who can search for and supply ideas and technologies".

(Chambers, 1990)

At this point it is appropriate to reflect on and analyse the role that the researchers played in experimentation in the Bergville study. After doing most of the planning and facilitation during the diagnostic and planning phases, researchers were instrumental in the following activities: a) in the design and implementation of the experiments, especially the RM trial; b) the coordination of the monitoring and evaluation events; c) arranging the major group meetings and/or evaluation events, where they asked key questions and promoted discussion and analysis; d) doing most of the planning and facilitation during the training courses and e) organising the annual information days at the RM trial site, which show-cased the new CA technologies and other project activities and results to a wide group of stakeholders. Relatively early-on in the project, we, the researchers, became aware of our role as facilitators and advisors, although we were not entirely sure how and when to engage with farmers in problem definition, experiment design, evaluation and other activities. We mainly facilitated and participated in discussion and analysis of priority problems encountered by the farmers on their experiments. After the problems were identified and discussed, mainly during the monthly action forums, we examined potential solutions raised during the meetings and then farmers went on to implement them. In the beginning, we had to learn not to impose our own research agenda on farmers when working in that collaborative relationship.

According to Chambers (1990), if a solution is not available at the local level, the researcher informs farmers of appropriate, low cost technologies, which may be available and already in use by other farmers in different regions or countries. In the Bergville study, we were quite fortunate to have had access to knowledge and expertise on CA providing answers or solutions to most of the issues raised. As the technology's potential and limitations were analysed, the researcher provided or sought out critical information on planting material, seeds, scientific information and so on. We also arranged for farmers to visit similar projects in other communities where they learned from other farmers' experiences. An example from a Zimbabwe case study, discussed by Saunders and Kellner (2003), was related to the widespread high priority problem of poor crop yields due to low fertility, exacerbated by cost and/or unavailability of fertilizers of smallholder farmers. A low/zero cost option entailed the introduction of cowpeas as an intercrop with maize. Cowpea had been lost in the areas many years earlier due to drought and thus this was considered a technology which could be introduced directly, without an adaptive research trial step, particularly as some farmers were still familiar with the practice. After discussing the various types of cowpea available, the farmers asked to be supplied with a determinate type, an indeterminate prostrate type and an indeterminate climbing type. Even within a small area farmers chose different types – the determinate type because it matured very quickly and gave

the opportunity to have more than one crop per season, the indeterminate spreading type because it gave good soil cover, smothering weeds, or the climbing type to give better quality (maize stover + cowpea) cattle fodder. Taste (palatability) was also a factor for the people.

When we started to be more involved with the FM trials, we became acquainted first hand with the limitations faced by farmers and learned how they cope with risk and ensure family sustenance. By participating in farmer-managed experiments, all the results and evidence showed (especially the results from the convergent interviewing) that we were able to strengthen farmers' capacity for experimentation, which is a prerequisite for them to rapidly and efficiently adapt to changing circumstances. According to Selener (1998), researchers should strive to help:

"... farmers decide what to observe and measure so that they can assess their results in a meaningful way to them and show other farmers how they can obtain information from formal research services to aid in interpreting their results."

5.3.5. IMPLEMENTING FARMER EXPERIMENTATION

After receiving training in CA concepts and practices (see assessment of 'training-of-trainers' in **Section 5.4**), the lead farmers initiated FM trials on their own farms in 2001. The implementation of FM trials was one of their main responsibilities after becoming full members of the 'implementation team'; the other being the training of other farmers in CA practices (see assessment of 'farmer-to-farmer extension' in **Section 5.5**). The design of these trials, which happened shortly before their implementation, was to a large extent a top-down, researcher-driven process, allowing very little input from the farmers. Lead farmers were obliged to use CA principles (because they were 'part of the team') and were allowed to choose the legume of their choice as an inter- (or cover) crop. During the first and to a lesser extent the second season, most lead farmers struggled to implement their trials correctly, most probably due to a lack of understanding and experience in the new CA technology (even though they went through a series of major training events). From the third season the implementation and management of these trials improved drastically. The question is whether this is an indication (or a result) of an effective [experiential] learning process? It could be, but what and how did they really learn? These questions will be investigated in **Section 5.7**.

My experience with the implementation and management process of the FM trials was eventually very fulfilling and satisfactory after a relatively slow start. It very soon appeared that the 'training-of-trainers' process was not enough to ensure a perfect implementation (launch) of the FM trials. The CA technologies were new and complex and much more experience and insight was needed to give farmers enough confidence to use it, for them to take ownership of it, to 'arrive', to trigger the proverbial 'click' of acceptance in the mind. However, in the end we did reach the stage where most of the lead farmers mastered the use of the new CA technology after about 3 seasons of experimentation. Furthermore, hundreds of other farmers joined their lead farmers in experimenting with CA on their farms. What was needed to achieve that? One of the practical 'tools' that we used (facilitated) to accomplish that was a 'continuous cycle of feedback (observe), reflection and planning', discussed on a number of occasions in this thesis. The main event where this process was facilitated was the monthly action forum (see 'action learning events' in centre of **Figure 5.2**). This will be described further in **Section 5.6**. It came out from the *convergent interviews* that in view of the implementation and management of the FM trials, these forums appeared to be a valuable learning event for all the participants, but especially for the lead farmers and their trainees.

5.3.6. MECHANISATION ASSESSMENT

The absence of appropriate conservation tillage implements, especially planters, was soon experienced as a major constraint for effectively experimenting, adapting and ultimately adoption of CA practices in the Emmaus area. This moved the implementation team to launch a mechanisation strategy with available funds (see bottom left of **Figure 5.2** and **Photo 5.1**). The following is a summary of the interactive step-wise implementation



of the strategy: a) conduct a mechanisation survey to identify needs and opportunities, b) design modifications to existing implements, c) purchase modification kits

Photo 5.1. Participating farmers with Saffim planters converted for no-till purposes

from manufacturers, d) conduct hands-on training of lead farmers, e) modify implements of participating farmers, f) monitoring and evaluation to ensure proper implementation, g) handing-over of the planters to the local farmer structures.

By the end of the mechanisation strategy the following results were achieved:

- ❑ 100 Saffim planters and 40 mouldboard ploughs had been converted to conservation tillage implements.
- ❑ 3 two-row tractor-drawn minimum-tillage planters had been introduced.
- ❑ The new implements have performed adequately and increased the adoption of conservation agriculture practices.
- ❑ Many farmer groups/structures in the Emmaus study area now have access to conservation tillage implements.
- ❑ Local input-suppliers are working hand-in-hand with the farmers to ensure continuous availability of parts in the long-term.

5.3.7. CLARIFYING STAKEHOLDER CONTRIBUTIONS

Another issue that concerns many people was *the contribution from each stakeholder group to establish and manage the experiments* (see bottom right corner of **Figure 5.2**). One of the most prominent contributions made in this project, and probably in many other similar projects, is the provision of free agricultural inputs to 'qualified' farmers, i.e. the lead farmers and those trained by them, to establish CA practices on their FM trials (about 1000 m² of land each). The push for this practice partially came from the South African NLP policy that aimed to direct project resources, especially funds and inputs, directly to the farmers. The danger of this practice, of course, is the creation of a 'dependency syndrome' among the receivers of 'handouts' – this syndrome is particularly acute in cases where no development process or counter-performance (contributions from beneficiaries) is implemented in parallel. For that matter the Bergville project implemented the practice of 'starter-packs' for 'qualified farmers' and consequently directed a certain amount of free inputs towards these farmers over a period of four years. These starter-packs enabled farmers to experiment with CA on their farms (on 1000 m² of land) and consisted of appropriate fertilisers, lime, legume seeds, herbicides, pesticides for lead farmers and legume seeds and fertilisers (phosphorous) for trainees.

Clearly, a situation where farmers see it as their right to continue to receive free inputs from the Bergville Landcare project can hardly be viewed as sustainable or even properly economically viable in its own right. Alarming, there were signs of dependency observed during the convergent interviewing among the lead farmers. The inputs the Landcare project provided to its lead farmers and their trainers, however, did serve a valuable purpose in allowing FM trials to run relatively smoothly. These trials in turn proved to be one of the best methodologies to facilitate learning and adaptation of CA practices, as it provided an excellent 'experiential learning' environment. Indeed, the lack and/or affordability of suitable implements and inputs associated with CA are frequently cited [in literature] as one of the main obstacles for farmers to start CA. Without such inputs and implements, weed problems and harder work associated with planting and weeding under unploughed conditions often became major disincentives to the adoption of CA. The Landcare project showed that if qualified (trained) farmers are assisted to enter the CA system with 'starter packs', this type of subsidy could be used in a very effective way (e.g. through FM trials). If this arrangement (starter packs) is used, it should be continued for a critical number of years (preferably 3 to 5 years) to allow farmers to take full ownership of the new (and complex) CA technology. Another practice that could increase the ownership among the farmers, is allowing some contributions from their side, which could be in the form of inputs, labour, money or implements.

It would certainly also make sense to facilitate FM experiments with minimal or no external inputs, i.e. under farmers' real-life conditions using mainly the resources at their disposal. From literature (e.g. Pretty *et al.*, 2003) many case studies are documented illustrating that this approach usually leads to an improved sustainability of project activities after the project ends, compared to those that are subsidised. However, I realise that a trade-off will have to be negotiated between those advocating this approach and the government officials and farmer institutions involved in NLP implementation in South Africa. At this stage, if funding from this or other similar sources is used, it is recommended to use the approach tested in the Bergville project, whereby farmers are supported to establish small FM experiments and, importantly, are guided by a vigorous process of action and research.

5.3.8. LINKING EXPERIENTIAL LEARNING WITH PROJECT M&E AND GROUP LEARNING

The experiential learning process of researchers, extension technicians and farmers working collaboratively in on-farm experiments, was not an end in itself, but a means to an end. It was one of many strategies which were linked to higher-order project outcomes and impact through

the M&E process (see middle and top side of **Figure 5.2**). According to the assumptions spelled-out at the start of the Bergville project, this was viewed as an essential phase in the process of enhancing rural people's problem solving capacity, by sharing ideas and experiences and by reflecting on the successes and failures of the action and the experiments carried out (self-evaluation). This does not imply that the 'process' of experimentation itself was less important – it proved to be a powerful learning experience in itself. At this stage the reader is probably aware that farmers slowly started to accept the new technology (attitude change), then understood it (knowledge and skills change) and later used it (practice and behaviour change). Understandably, there are many strong traditions and values that influenced the behaviour of the local farmers and consequently their resistance to change. My experience was that by creating an opportunity for farmers to experiment and learn, you create an enabling environment where adults will consequently realise and accept by themselves that some of their traditions and values are a constraint for their own development. It would seem that the principles and process of experiential and adult learning played a fundamental role in changing farmers' paradigms and behaviour, a primary project outcome necessary to achieve the goal (impact) of sustainability.

But what about the experiment results? According to Saunders and Kellner (2003), trials need to be formally monitored to understand outcomes, both by the current researchers and others who may access the research. The results of the RM trial in the Bergville study were collected annually, analysed, interpreted and published in annual progress reports (see middle left side of **Figure 5.2**). Researchers working on this trial were the main users of these results. In capturing all the trial results, the establishment of a database seems to be essential from the start-up of a research project to overcome the problems of physical loss or staff turn-over, but also to provide a basis for future projects in order that research is not duplicated unnecessarily. During the five years of experimentation the results were valuable to shape CA technologies into practices suitable for local conditions. Examples of technological advancements identified in the RM trial in Potshini, are the following:

- ❑ Correct planting dates and densities of legumes in maize-legume intercropping systems
- ❑ Rotational (residual) effects of legume (cover) crops in a maize-legume rotational system
- ❑ Seed mixtures for winter cover crops
- ❑ Effect of cropping systems, fertiliser rates and lime levels on soil physical, biological and chemical properties

- ❑ The development and testing of animal-drawn implements used for 'planting without ploughing'
- ❑ The testing of integrated weed and pest management technologies, especially herbicides
- ❑ The influence of CA practices on in-field water conservation and soil health

Saunders and Kellner (2003) proposed that a Research Trial Monitoring System (distinct from the Project Monitoring System) must be designed at the Research Project / Business Plan development stage (or Planning phase). It should chronicle the progress and performance of the trial and its treatments over the life of the experiment, when and how treatments were applied, problems encountered and corrective action taken. Available weather data and climatic events should also be recorded. Frequency of monitoring should be determined by project management during the design phase. The records should be entered on sheets designed to be compatible with, and easily entered into, the database mentioned above. The results of the FM trials in the Bergville study were annually collected by an M&E survey team comprised of researchers and extension technicians working with the local lead farmer. The M&E data was in the form of various performance or sustainability indicators, as discussed in **Section 4.13**. The average maize yields of the lead farmers who participated in FM trials over a period of four years (see **Figure 5.4**), showed a steady increase, passing the target level of 4 ton ha⁻¹ in 2004. These and other M&E findings and theories will be discussed in **Section 5.7** below.

After the collection and analysis of experimental data in the Bergville study, the intention was first of all to use these results to support the evaluation and 'adaptive management' process in the project. This was intended to be achieved by facilitating a learning process among the participants, usually executed during *annual evaluation workshops*, but also during monthly *action forums* and in the farming *learning groups*. The aim with these learning events was

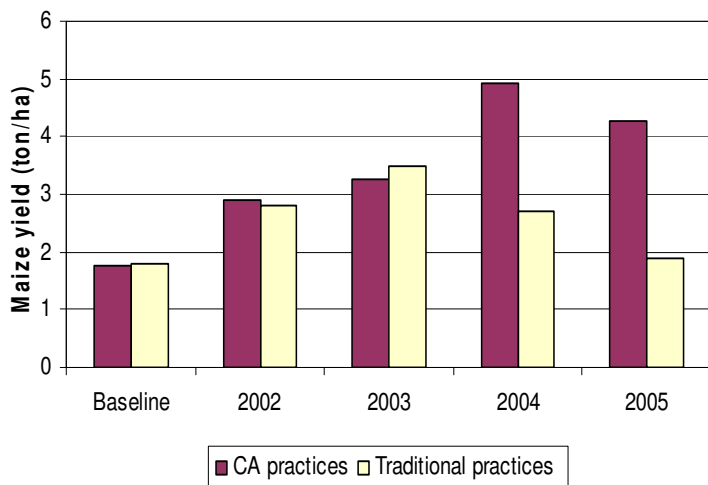


Figure 5.4. Average maize yields of FM trials, Emmaus Landcare: 2001 to 2005

to facilitate the group of primary stakeholders participating in the action forum, i.e. the farmers, the extension staff and the researchers, to reflect on the results, to identify 'lessons learned' and to come up with new ideas for action (implementation) (see middle to top side of **Figure 5.2**).

My experience with the *annual evaluation* events varied. Although I feel positive that we were able to influence and change the culture of the group to start to think critically, it had several practical difficulties. Firstly, it was difficult to compile all the data in an easy digestible format for everyone, but especially for the farmers. Resources (time and expertise) to do it were often limited. A second difficulty was to facilitate the process, to move farmers beyond the point of mechanically listing what they see (the results), but to 'critically reflect' on it and to formulate 'lessons learned'. It was difficult to explain these concepts and it was a challenge to find the appropriate participatory tools and techniques for group work (These aspects will be analysed in **Section 5.7**). In other words, trying to use experimental results, mainly collected, analysed and interpreted by researchers, to facilitate learning and project management in a big group with diverse experiences and values, posed particular practical challenges to the idea of critical reflection. It was even more difficult to bring the RM trial results into a learning process and it would seem that experimental results from both RM and FM trials were in the end more useful for researchers than farmers and extension officers. However, there were a few practical lessons learned that would improve current theoretical understanding on facilitating a good reflection process on experimental results during an annual evaluation event. Firstly, reflect only on those results that are of use to the farmers. It is recommended to involve farmers in the selection of issues around the experiments that they feel are important to discuss - then work from that list. For researchers and extension staff, farmers' evaluations are very important as they reveal knowledge and criteria, often not spoken about in other meetings. Secondly, the results, as well as the reflection process (including the evaluation questions) must be as simple as possible. Farmers won't understand complex statistical terms, and also not difficult questions, such as: "How do you see the change in bacterial populations affecting P level in soils?". Using as many graphical illustrations as possible, e.g. graphs and diagrams, seemed to be the most effective, although many African cultures have a great oral tradition that is still untapped as a more formal 'feed-back mechanism'. Thirdly, working in small break-away groups, which are facilitated by lead farmers and extension officers, seems to be effective and allowed most people to participate. Many rural people are shy and are not used to speak in public or big groups; small groups help them to feel much more relaxed and willing to participate in discussions.

During the *monthly action forums* (indicated as 'action learning events' in the centre of **Figure 5.2**), issues around experimentation were not discussed on a fixed pattern during each event. Usually the agenda for the meeting was developed at the start of the meeting taking input from all the participants. At almost every one of these events the FM experiments were listed on the agenda for discussion. What was usually discussed about experiments during these so-called 'feedback' sessions, were issues around problems, experiences, progress, implements, inputs and results. Again I should highlight the particular practical challenges to facilitate a critical reflection process on these issues. One constraint was a lack of time during a monthly action forum preventing the facilitation of a proper reflection process, which usually need much more time. It was a challenge of its own to keep the meetings and agendas focused on real, important issues that falls within the scope of the project. That is why it is useful to use a *strategic (project) or action plan* (see bottom centre of **Figure 5.2**) to focus and manage weekly and monthly activities; these monthly action forums could be a perfect platform to do it. The agenda of the meetings is then to a large extent determined by the activities, targets and outputs spelled-out in the project plan, although necessary changes and improvements need to be done continuously. A second option to make these events more effective is to list and reflect on specific activities, such as FM experimentation, less frequently in the off-season. For example, every second or third event could be used, and sometimes it is desirable to increase the frequency of meetings (or reflections) on experimentation, e.g. during the growing season. This would help to have more time to deal with a specific activity or issue properly, through interactive small break-away group sessions using a few simple evaluation questions. It is always a good idea to let the farmers determine the issues important to them; as those considered important to researchers might not be an issue for farmers. According to Scoones *et al.* (1996), assessment criteria for farmers' experiments are complex and usually relate to a range of agronomic, economic, cultural and other indicators. The next step would be to facilitate a process (described above) where they arrive at their own conclusions.

The vision (assumption) with the *learning groups* (see middle to top right side of **Figure 5.2**) was to assist lead farmers to reflect more on activities and emerging issues with their groups. Of course, the idea was also to improve their general management skills, to become a more *active-reflective-adaptive problem solver* by using a few participatory self-evaluation tools. Experimentation was in this light seen as the 'area of application' feeding farmers with a huge number of 'issues', data and experiences to reflect upon, both as a means to an end (i.e. adaptive management), but also to ultimately improve their land management and production (i.e. change in practice and overall community well-being). Data on how farmers were using

these tools (by themselves or in their groups) to reflect on experimentation was poorly collected. The lessons learned around farmer learning groups and monthly action forum are further analysed in **Section 5.5** below.

5.3.9. FINAL COMMENT ON ON-FARM EXPERIMENTATION

It is quite clear that scientists should be encouraged to learn from farmers' experimentation. Firstly, they should realise that all research questions cannot necessarily be reduced to simple plot designs, and secondly, that farmers have a lot to offer to the process of enquiry. There remain many professional biases against such shifts in perspective (Chambers, 1989). Furthermore, effective interaction between researchers and farmers need not be only one-direction. In fact, farmers also profit greatly in learning from scientists' approaches to experimentation. Events where a variety of action research methodologies and tools are used to facilitate this learning are encouraged.

Researchers could provide farmers with a 'basket of technologies and management choices' that they can choose to experiment with and adapt to their diverse, risk-prone farming systems. New roles are emerging for scientists and extension officers that do not focus on pushing particular solutions as pre-defined packages or messages. These roles rather engage with farmers, in the more complex function of diagnosing problems, searching for solutions through experimenting and ensuring sharing and diffusion of technology.

It emerged that the most crucial element that must not be neglected in association with any on-farm experiment, but especially FM trials, is the creation of a learning environment around the technological inputs and interventions. On the one hand a project should provide a facilitating framework for participating farmers, while on the other hand farmers should contribute to experimentation and other activities. It seems as if the action research process has made a great difference in the successes of the implementation and management of the FM trials. It literally focussed the farmers towards their goals of sustainability (i.e. empowerment), rather than falling back into a 'dependency syndrome'. Furthermore, it emerged that projects aiming to implement complex technology, such as CA, over a large area, should be able (through funding) to facilitate such a process for at least 6 to 10 years in order to achieve sustainability.

It emerged, both from my experiences as well as from the literature, that **empowerment participation**, in this case on-farm experimentation, was essential for strengthening the human

capital of farmers, especially experimentation and innovation skills. This has important implications for the development and dissemination of complex technologies such as CA. Experimentation and adaptation are crucial to adoption and impact and since the capacity to experiment mainly comes through empowering participation, impact-oriented natural resource management projects should be very wary of using functional participation. It could increase costs and contribute little to on the ground impact.

5.4. LESSONS LEARNED AND A LOCAL THEORY ON TRAINING-OF-TRAINERS

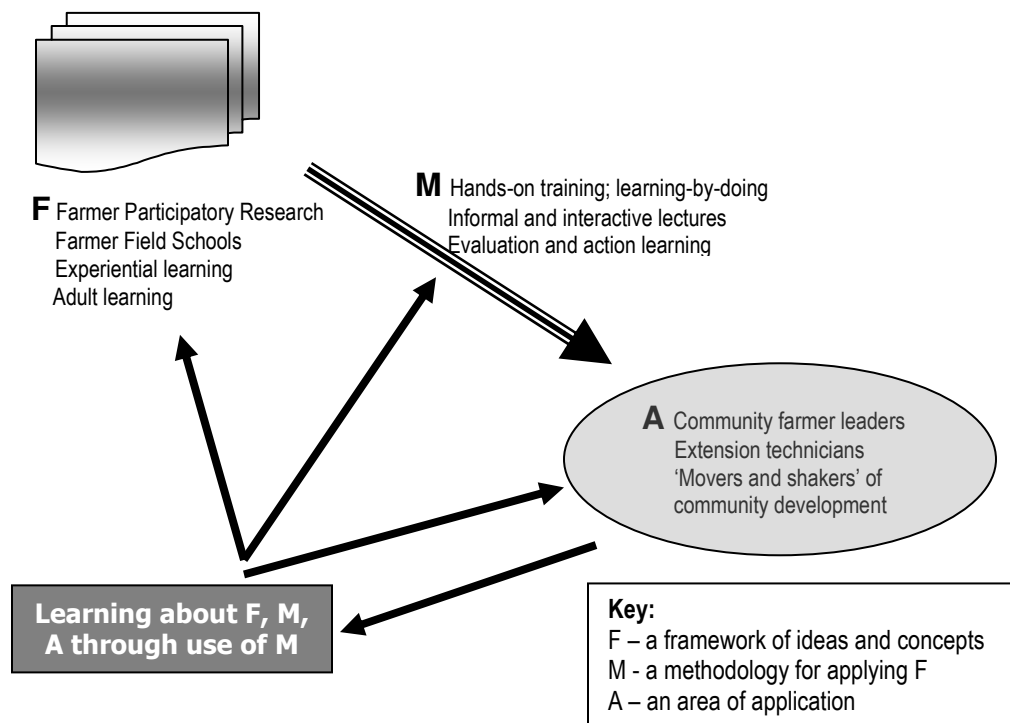


Figure 5.5. The general research framework for training-of-trainers

According to Checkland (1985), in the application of this general research framework to training-of-trainers (see **Figure 5.5**), F is a framework of ideas and concepts; M is a methodology – the way of applying these ideas and concepts; and A is the area they are applied to. Checkland (1985) suggested that A is indicated without sharp boundaries to remind us that when A is about human affairs, the application of F through M may lead us into byways not initially expected.

5.4.1. OVERVIEW

The 'training-of-trainers' approach in the Bergville study was developed on the principles of adult and action learning (Fell, 1986, 1996; Clark and Timms, 2000). The technical outcomes of these courses were firstly, to equip lead farmers with sufficient knowledge and skills to independently implement best practices on their farms and secondly, to engage in farmer-to-farmer extension. In the light of continuous learning the Bergville project created frequent opportunities whereby [mainly] lead farmers were re-trained in various aspects of Conservation Agriculture (CA) or best practices. These training needs emerged from the iterative action learning (M&E) cycle facilitated in the monthly action forums, whereby retraining was consequently done in the forums on any specific topic.

Two major training courses for 'trainers' were held. Lead farmers were taken (with each course) to a training venue outside the study area for five days. These courses were divided into a theoretical 'discovery' of the concepts and principles involved in the implementation of best practice technologies and a practical, hands-on training. A whole series of lectures in life skills were also presented during the first training event, which included topics such as *knowing yourself: self-esteem and confidence, setting of vision and goals and leadership*. These lectures were done in partnership with ACAT and Eagle's Life (two NGO's involved in training and development) and were primarily aimed to equip and prepare farmers for their role and responsibility as leaders and facilitators (movers and shakers) of agricultural development in the Bergville (Emmaus) study area. Frequent evaluation sessions between and after training sessions were held to reinforce the learning. The outcome of the course was also evaluated by participants at the close of each day's proceedings using enjoyable, interactive, but useful evaluation tools, such as the three different faces – smiling, serious and unhappy. This data was used to evaluate the final outcome of the course, which further helped to give participants ownership of the process and also ground any learning that occurred. During the training course, the presentations were also translated into Zulu, the local language. Below follows a discussion of the key concepts and ideas forming the local theory on training-of-trainers, shown in the cognitive map (see **Figure 5.6**).

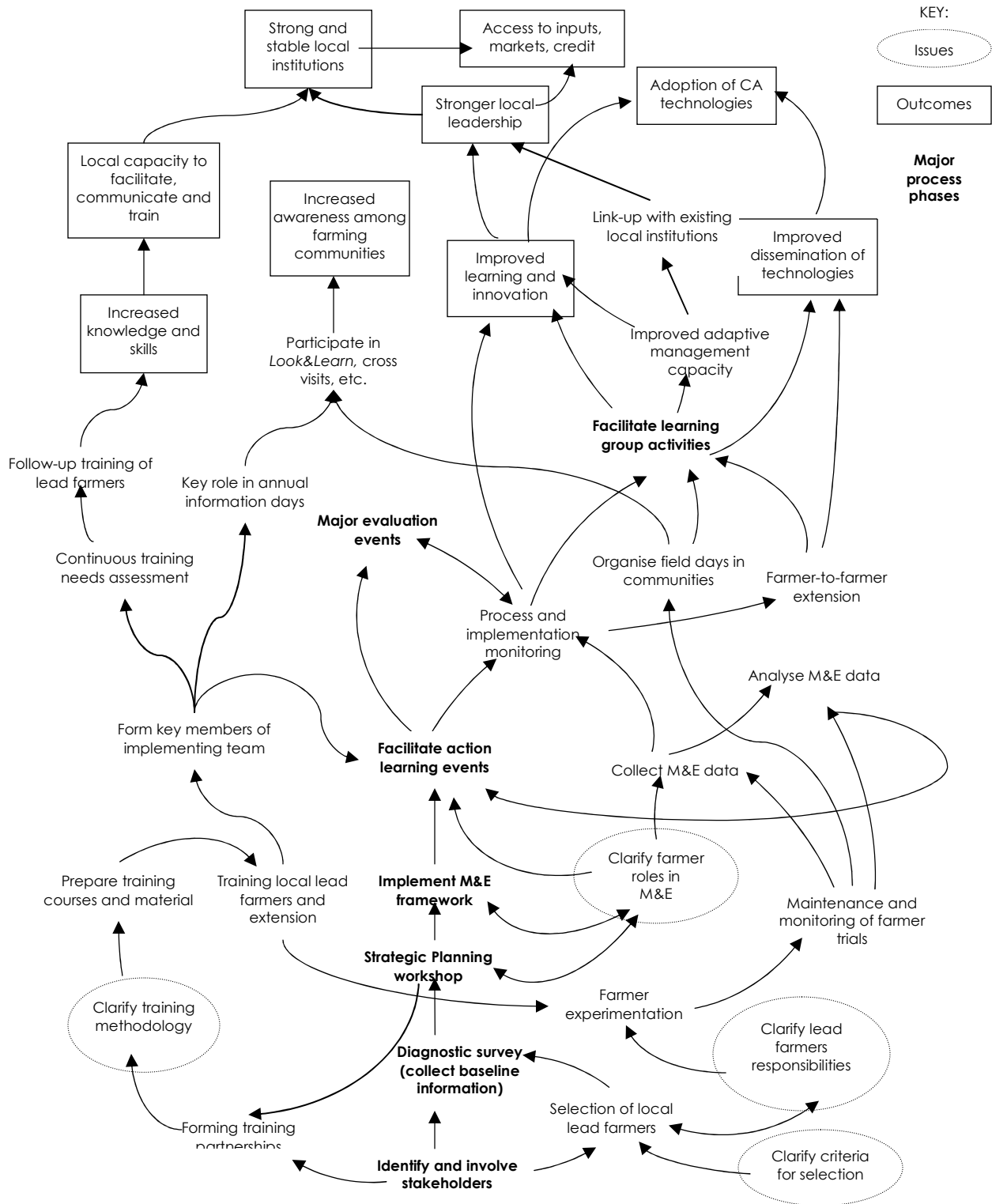


Figure 5.6. Cognitive map and local theory of training-of-trainers, farmer-to-farmer extension and local institutionalisation

5.4.2. CRITERIA FOR SELECTING 'TRAINERS'

In the bottom right side of **Figure 5.6** the issue of the *criteria for the selection of lead farmers* is indicated. The vision of the Bergville project was to have an effective leader or a core group of persons playing leadership roles and forming part of the implementing team. This idea is supported by literature, e.g. Uphoff *et al.* (1998), who stated that leadership training needs to be part of all projects or programmes. The introduction of new or improved technologies is not necessarily conducive to the success of an agricultural enterprise. From literature (Moran, 1997) I realised, perhaps a bit too late, that it is necessary to promote the training and orientation of group participants in the *concepts* and *principles* of the new technology. Furthermore, recent experiences with Integrated Pest Management (IPM) training in several Asian countries have shown the positive impact of involving farmers as trainers and of enhancing farmer networks in order to support farmer-to-farmer dissemination deliberately (Van de Fliert and Braun, 2002).

In the Bergville project, the first step in embarking on the 'training-of-trainers' process was deciding who these 'trainers' would be as well as what their criteria for selection, their responsibilities, their personal benefits and benefits to the community (See **Box 5.2**). According to Van de Fliert and Braun (2002), farmer facilitators must be selected with care and given additional training on facilitation skills. At the same time, a

Box 5.2. Criteria for selecting lead farmers (Smith *et al.*, 2002)

Criteria

- Must be voluntary, willing and enthusiastic
- Must be approved / accepted / selected by community or development committee
- Must be directly and actively engaged with farming
- Must be prepared to spend time on the process
- Must be able to read and write
- Committed to hard work
- Be role models for other farmers
- Ability to demonstrate and teach new techniques to other farmers

Responsibilities of lead farmers

- Must facilitate and support the establishment and management of at least one trial (1000 m²) on his own field
- Must be prepared to attend all training (± 2-3 weeks / year)
- Must be prepared to organize, facilitate and train individual farmers and farmer groups
- To motivate the target group towards an improved quality of life and sustainable agriculture
- To become a role model of sustainable agriculture
- Must be prepared to keep records and give report back to coordinating persons
- Must commit himself to the process for at least the duration of the Landcare project

Benefits of lead farmers

- Improved skills and knowledge on farming, training, facilitation and other related topics
- Inputs for ONLY 1000 m² piece of their field (not all their fields)
- Will be able to play an active leadership role in the agricultural development of his community / region
- Will be able to have the opportunity to work with extension staff and researchers

Benefits for farming community

- Improved access to knowledge
- Improved production and sustainability
- Awareness of alternative technology

training program needs to address farmer interaction/network requirements at the planning stage. In projects requiring considerable problem-solving, decision-making and platform-building capacity (e.g. the Bergville/Emmaus pilot study), farmers need more process-oriented learning opportunities and support. A literature review of self-reliant and self-managed projects (Brekelbaum, 1990, 1994; as quoted by Van de Fliert and Braun, 2002) identified various essential skills for farmers, including:

- ❑ Critical thinking
- ❑ Diagnosing and solving problems
- ❑ Formulating and prioritizing objectives
- ❑ Developing and implementing action plans
- ❑ Communicating effectively
- ❑ Systematizing information and analyzing results critically
- ❑ Identifying indicators for quantitative and qualitative M&E
- ❑ Developing external linkages, both horizontal and vertical
- ❑ Showing solidarity

My experience with the criteria developed by the Bergville project team (see **Box 5.2.**) was quite positive, although one could point out a few areas for improvement. Firstly, because the process of identifying these trainers was left in the hands of the extension staff and the farmer structures, it could be subjected to favouritism, nepotism and power struggles. In general, one could end up working with people not suited for the task if you do not carefully evaluate the candidates according to the criteria listed in **Box 5.2.** It would most probably help if farmers, not only their leadership structures, are more rigorously involved to develop these criteria. At the end there were a few lead farmers that did not perform as they were suppose to – some of them were replaced by the group, but others who were not grossly ineffective, also did not reach the expected standards.

Secondly, candidates must first understand their intended roles and responsibilities as members of the development or implementation team and then they should voluntarily join in. These criteria should also frequently be used during the project cycle to evaluate the performance of the trainers (i.e. lead farmers) in a participatory manner. It was found that lead farmers could easily tend to move into a very passive mode, waiting to see what is going to happen next. What we also found, however, is that these farmers could also change into excellent co-workers if their tasks and performances were focused and improved by a participatory M&E process. If

so happen that a number of the twenty selected lead farmers had to be replaced (by the group itself) during the project cycle due to underperformance. The M&E process will be discussed below.

Thirdly, it is imperative that the selected lead farmers be well supported by the researchers, but especially by the extension staff working with them for the duration of the project and beyond. We found that the monthly action forum worked well as a platform for communication, ongoing 'training' and general project management, using mainly action research methodologies, such as M&E. However, in the communities and farmer groups, researchers were only able to participate on a very low scale, leaving most of the support in the hands of the extension staff. Their support to lead farmers is crucial to ensure proper implementation of the new technology, as well as quality 'training' to other farmers. But, it was found that without a clear description of their roles and responsibilities in the project and without continuous monitoring and evaluation, the extension services stopped short of delivering the expected services.

5.4.3. EXPERIENCES FROM THE TRAINING-OF-TRAINERS COURSES

The bottom left side of **Figure 5.6** indicates a few concepts and ideas on training events. The challenge of organising and facilitating a week-long training course for newly elected, inexperienced and probably pessimistic farmers, together with the equally pessimistic departmental extension officers, can be a daunting task for an inexperienced training coordinator or researcher/facilitator. The adoption of a framework with clearly defined concepts and principles and well-described guidelines to firstly, draw-up a training programme, and secondly, to conduct the event, is a prerequisite for success. Our exposure with the FFS and FPS approaches introduced us to the principles of adult and action learning. According to Fell (1986), there is inherent in these principles an assumption that we are here to help people to learn, not to 'teach' them what they need to know. This does not mean that the use of a lecture or talk is never appropriate; it means that we should be careful to match the learning process with audience needs and learning styles. According to Uphoff *et al.* (1998), more than just helping retain the lessons of training, a participatory methodology evokes in rural people a spirit of innovation and a concurrent capacity to experiment and evaluate. This is more important than any particular knowledge acquired from training. These principles and a few examples guided us, at the start of the Bergville project, in designing a weekly training program that scheduled time for lectures, time for practical hands-on training and time for evaluation. The clarity of each person's role and responsibility and the availability of a few participatory training

tools and techniques were a great assistance for everyone involved. The training events could be approached with much more confidence, not only because of a well-designed programme, but also due to the credibility of the underlying concepts and principles (see bottom left side in **Figure 5.6**).

According to Van de Fliert (2000), the application of novel farmer extension methodologies has implications for training of trainer models to be applied. Promoting people-centred sustainable systems involves facilitation of interactive learning processes rather than simply instruction, as is the case in the transfer of technology paradigm. Developing capacity of facilitators requires a methodology consistent with the approaches future trainers are expected to apply, because we tend to teach the way we have learned ourselves; for most people with a formal education this has been in an instructional mode. According to Chambers (1989) and Van de Fliert (2000), traditional teaching habits need to be unlearned. Instead of eliciting straightforward answers, facilitators should try to raise questions to let farmers think and discover answers for themselves. Instead of classroom teaching, facilitators should set up activities and experiments in the field; this requires thorough planning and accurate season-long implementation and monitoring. Instead of determining the training content, trainers should listen to farmers' analyses, conclusions and needs, and react flexibly. Instead of assuming an expert role, trainers should consider the farmers as the experts and build on the farmers' existing knowledge and experience. From Fell (1986, 1996, undated) and Van de Fliert (2000), trainers need to experience how it feels to learn by discovery, by hands-on field activities, and by building from existing knowledge. They need to go through the experience of carrying out all cultivation practices - essentially to become farmers themselves, in order to build respect for farmers and enhance their own self-confidence in their interaction with experienced farmers. Uphoff *et al.* (1998) mentioned that the trainer assigned to a group of farmers does not teach them so much as encourage them to identify and discuss problems, to experiment and discover and to derive from these experiments some recommended actions. Bunch (1982; as quoted by Johnson *et al.*, 2003) advocated a combination of 80% practical training and 20% theory (see linkage between training events and experimentation in bottom centre of **Figure 5.6**).

One of the (probably) undocumented principles and practices of working with resource-poor farmers, especially during training events, had an influence on our training approach in the Bergville study. I was introduced to it by one of my personal mentors in rural development and it states that 'working with these farmers is like working with a broken bottle - trying to put the pieces together is dangerous, you can cut your fingers' (Johan Adendorf, Golder International,

personal communication). This simply means that most of these farmers are 'broken' in some way, they are filled with many fears and suspicions, they are fragile and unpredictable. Working with them first needs a process of upliftment or healing to restore their self-image and worth. If that does not happen, they could fail to raise to the occasion of meeting their responsibilities of leaders, or 'movers and shakers', of community development. By including 'Life Skills' in the training program, making use of partners equipped for this task, was specifically aiming to address these issues.

In general, the programme used for the two training events went smoothly. The evaluation after each day and at the end of the week revealed that most participants had very positive experiences. There were, however, a few lessons to be learned. Firstly, the training material provided to the trainees was not appropriate for use by these farmers. These manuals were mainly in full text format, not using enough graphical and visual illustrations. It is advisable to invest enough capacity (or resources) to develop living and illustrated training materials, as it was observed only later in the project cycle that the farmers, although able to read and write a little (one of the criteria for selection), are not regular or fluent readers. We learned that in this case, resource poor farmers would much rather use training materials and manuals filled with graphics and illustrative messages.

Secondly, the idea of teaching farmers in concepts and principles of the new technologies, rather than recipes and 'packages' of information, needs further scrutiny. My personal feeling on this matter is that we stopped short of equipping farmers with what is really at the heart of CA technology, i.e. the underlying concepts and principles of plant-soil systems health. The emphasis was too much on providing farmers with a few essential rules and steps to implement CA practices in their own trials, assuming that they would pick up enough of the concepts and principles of the new technologies. I am not implying that nothing was done to achieve that, because we indeed brought that into the lectures, but the emphasis was skew. The emphasis should have been, for example, on illustrating (with pictures, visuals, graphs, stories, etc.) and understanding the concepts and principles of soil health, integrated pest management, cropping diversity, integrated weed management, as well as the complex interactions between plant, soil, pests, soil life, climate and other ecological principles. Thereafter farmers could be assisted in choosing a combination of these principles (factors) for their own experimentation and then be equipped with the necessary farm management skills (e.g. the use of agro-chemicals, planting procedures, maintenance activities, etc.) to implement it (see bottom left side in **Figure 5.6**).

In this case, it is clear that the training events in the Bergville project should have provided skills for farmers to do simple 'adaptive research' activities and experiments in their own fields, such as the testing and refinement of technological guidelines under prevailing conditions. This type of knowledge and skills development would form an ideal platform for interaction in experimentation over a period of time. According to Loevinsohn (1998), an important indicator for sustainability (capacity) is the extent to which farmers are able to apply technological principles and adapt practices *on a continuing basis*. In the Bergville training courses there was not enough emphasis placed on building these skills among the farmers. Equipping farmers with a few simple experimentation skills and ideas would go a long way in that direction.

Adding to the ideas and concepts mentioned above, developing a training course programme that makes the most of [a range of] action learning (research) tools and techniques to facilitate interactive learning, might be an innovative way to advance these training-of-trainers courses. Using these tools to put the process in the hands of the participants, facilitating and allowing them to discover the knowledge and skills themselves, in an interactive, joyful and constructive manner, should fulfill the ultimate expectations envisaged for the theories of adult and action learning. These tools are available and it needs an investment of resources, by thorough investigation, selection, design and facilitation, to unleash their full potential.

I believe one should furthermore pay attention to the idiom and metaphors used by locals to convey messages from one person to another, from one generation to the next. For example, since it seems as if oral or story-telling tradition is much stronger than using the written word in rural African cultures, it might be wise to see how action learning and visual tools can be used in combination with these traditions to strengthen the dialogue and learning process. For example, in the Bergville training courses 'role-playing' was used very effectively on occasions to simulate real-life situations. If approaches such as the 'story-approach' (Davies and Dart, 2005) can be used in combination with similar approaches such role-playing, the exercise can start to form part of a long-term learning process leading right through the life-cycle of the project and beyond.

5.5. LESSONS LEARNED AND A LOCAL THEORY ON FARMER-TO-FARMER EXTENSION

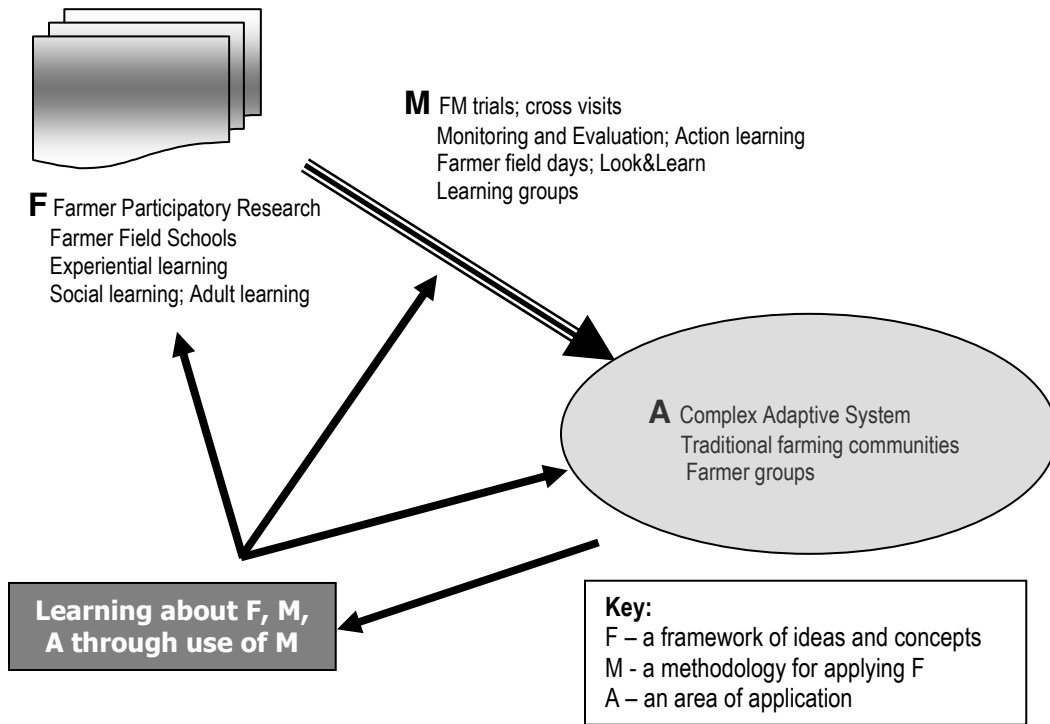


Figure 5.7. The general research framework - farmer-to-farmer extension

According to Checkland (1985), in this general research framework (see **Figure 5.7**), F is a framework of ideas and concepts; M is a methodology – the way of applying these ideas and concepts; and A is the area they are applied to.

5.5.1. OVERVIEW

Farmer-to-farmer extension has been introduced in the pilot project as a means of improving the dissemination of technical improvements at the community and sub-community (farmer group) level. Lead farmers who went through the training-of-trainers process and who are working with researchers and extension personnel, were assisted in sharing their technical knowledge with other farmers and consequently building a learning process or an environment conducive to life long learning.

As described in **Section 4.8**, various methodologies, tools and techniques, such as M&E, were used to focus and improve the farmer-to-farmer extension/learning process. The M&E process, for example, based on a 'theory of action', was used to guide the farmer-to-farmer extension approach in the Project. The lead farmers used this theory of action as a road map towards attaining their goals in farmer-to-farmer extension. The centre and right side of **Figure 5.6** indicate how these concepts are linked.

The farmer-to-farmer extension (FFE) process was managed from the monthly action forum which served as a platform to reflect on the Bergville projects' strategies and actions (see 'action learning events' in centre of **Figure 5.6**). Most actions were also planned and coordinated in the same forums. FFE was the main strategy launched during the off-season, i.e. April to October 2003. During the monthly forums much time was used to evaluate this strategy, which means iteratively *reflecting* on the actual farmer-to-farmer extension *actions*, drawing out the *lessons learned* as well as their *implications* for future action. This was then [continuously] built into the new *action plans*.

Below follows a discussion of the key concepts and ideas forming the local theory on farmer-to-farmer extension, shown in the cognitive map (see **Figure 5.6**). With the description below an attempt was made to improve the understanding of the cognitive map. My idea was to explore and improve the initial assumptions (or theories) and also describing the new theory with its key concepts, ideas and processes underlying it.

5.5.2. DELIBERATELY FOCUS FARMER-TO-FARMER EXTENSION

The FFE strategy was built on the understanding that *informal* sharing of experiences among neighboring farmers is not sufficient to make the information available to everyone in the community. It is generally assumed that trained farmers will soon influence their neighbouring farmers, but from literature (e.g. Mendoza, 1996) this is usually not happening. From his experience, many possible reasons were raised: "Farmers are unsure what to do after the training, other farmers simply wait for the efforts of their fellow farmers, farmers are not that influential, 'You cannot be a prophet in your own place!'" In a way, this is questioning the farmer-to-farmer mode of extension. From that perspective, I believed that a more deliberate and formalized process, based on a suitable M&E framework, was necessary to focus the FFE actions. In general, my experience with the FFE process, facilitated in the monthly forums of the Bergville project, was positive. Using M&E principles and tools (discussed in **Section 4.13**) proved

to be effective in focussing and improving the process. The 'mapping exercise' was an effective participatory tool allowing all the lead farmers to frequently (e.g. every third month) indicate farmers trained by them on the map, allowing for open discussion and reflection and directions for future implementation. Valuable lessons were learned in the group of lead farmers from this process, helping them to improve their own efforts in FFE. **Box 5.3** shows some of the lessons learned during evaluation. The centre and right side of **Figure 5.6** indicate how these concepts are linked.

In literature there are no examples found where the FFE process was deliberately guided with action research tools such as M&E. Normally this process seems to be left in the hands of the farmers themselves, or supported by a few 'institutionalised' approaches discussed below. For example, Scoones *et al.* (1996) advocated that learning about the results of farmers' experiments (or any other source of information) occurs through interaction in *social networks*. Social interaction may both encourage and inhibit sharing of agricultural innovation. In their experience, information on agriculture is shared among farmers in a variety of ways. Knowledge may be gained inadvertently by walking along a footpath through someone's field or by passing fields or gardens on a road. More covert activities are also known, where people may secretly enter someone's field without permission (this, however, carries serious risks). Social networks of kin and friends are particularly important. Social and work gatherings in the rural areas are also good occasions for discussions about agriculture. Beer parties, weddings, funerals, church services and other meetings, related or unrelated to agriculture, may provide occasions for such discussions. Loevinsohn (1998) found that diffusion (of technology) from FFS graduates (similar to lead farmers of Bergville study) was highly stratified: men diffused mostly to men, women to women – this phenomenon also appeared in the Bergville study.

An example of how lead farmers have been able to focus and manage their FFE process more effectively, is illustrated as follows: During an evaluation session in June 2003, the issue of non-performing lead farmers was discussed by the group. Information from the monitoring map was used to evaluate the situation and a decision was consequently made to replace these persons as lead farmers. The following points were discussed and formulated:

- ❑ Trainees who have started to train other farmers could be listed (as first options) as lead farmers, if they perform well.
- ❑ Farmers who participated frequently in forums and have showed an interest and commitment to the project, might qualify to be selected as lead farmers.

- ❑ Replacements should come from the same areas (sub-wards) as the previous lead farmer that is being replaced.
- ❑ The characteristics and criteria for lead farmers (**Box 5.2**) were discussed; a decision was made to continue using it.

The intention of these evaluation sessions was to draw out lessons from the trainers' experiences in the field where they were working among their communities as 'movers and shakers' of agricultural development. This sharing with other stakeholders (researchers and extension) will create an opportunity for collective action in view of improvement. What we aimed to achieve next, was to send these lead farmers back to their communities with a positive message, with new ideas for practical action on how to empower other farmers with new knowledge and skills. This was a bigger challenge – maybe the ideas on how to mobilise neighbouring or interested farmers were not always practical and appropriate, or time to 'train the trainers' in these new ideas was limited. In the end a few action learning and participatory self-evaluation tools and principles (discussed in **Section 5.7**) proved to be the most practical and useful. The concepts in the centre of **Figure 5.6** indicate how M&E and FFE are linked.

Box 5.3. Lessons learned by lead farmers in FFE, Bergville pilot study

Farmer forum, 14 April 2003:

- Leader-farmers are centrally located with respect to other farmers in their areas or sub-wards; thus giving them easy access for training and communication.
- Accessibility of lead farmers is important and has an effect on the success of the farmer-to-farmer extension.
- Still a long way to achieve their objectives; much more effort needed by lead farmers.
- Lead farmers must be retrained during action forums in order to improve their training skills and performance.
- Women perform better in conducting training than men.
- It is easier to train women than to train men.
- Some of the lead farmers have already reached their target of 5 persons trained per year.

Farmer forum, 16 June 2003:

- Progress is visible, although training of people is a slow process. We as lead farmers need to continue and work hard towards the ultimate goal of training people.
- We are better off doing/acting on what we know; continuous acquiring knowledge to be acted upon immediately.
- Interested people are unable to start acting due to lack of basic resources. How can we help them start-up, just like us (lead farmers)?
- The first trainee farmers: is there a way of supporting them in the following growing season (with resources)?

5.5.3. ENSURE HIGH QUALITY INFORMATION FLOW FROM LEAD FARMERS

The next step was the actual training or learning process performed (facilitated) by the lead farmers themselves. My experience here was less satisfactory, but maybe more due to my over-urgency to speed up the process. Most farmers indicated that they did 'train' farmers in quite large numbers (during the map exercise) and that they worked with these farmers individually or in groups on occasions, however, they did not seem to organise themselves properly into 'learning groups' by the 2004/2005 season. Furthermore, it would seem that the quality of the information flow between researchers, extension and farmers was not always of an acceptable standard, jeopardising the quality of the implementation of the new technology. To resolve this matter, it is critical that extension staff should play a very active role to support lead farmers in this process, making sure that the message is transferred effectively and correctly, that technologies are implemented correctly and that learning groups and other farmer structures are created and strengthened. It was interesting to find that extension technicians were quite helpful in organising farmer field days in collaboration with lead farmers. Clearly they do have an understanding and a mandate for performing certain activities – building on that would be recommended. The middle to top right side of **Figure 5.6** indicates how these concepts are linked.

Changing people's attitude, knowledge and skills (short-term outcomes) is commonly known as a relatively slow process, usually occurring only within 1 to 4 years after implementation. Practice and behaviour change (medium-term outcomes) usually follow in about 4 to 6 years. In the light of these assumptions (theory), it would seem that farmers participating in the FFE process in the pilot project were actually progressing quite fast. Most of the trainees were only participating for one or two seasons and it became evident from the above discussions on on-farm experimentation that most farmers need to experiment for at least two or three seasons to master the complex CA technology. Seemingly, it would therefore be very difficult to push the process any quicker, as it is already moving at a reasonable rate. However, certain mechanisms need to be in place to guarantee smooth and quality flow of information and implementation.

Surprisingly, project results (e.g. from the convergent interviewing) showed that there are a number of farmers who are very effectively facilitating and managing their large number of farmer trainees, already starting to break up into more effective smaller learning groups, for example. Furthermore, they are also using the learning tools provided through the project quite

effectively, nurturing a culture of adaptive management, helping farmers to monitor, reflect and plan as a group.

The methods used to improve the outcome of the FFE process are listed in **Section 4.9** and indicated in the middle to top left side of **Figure 5.6**, as well as middle right side. Apart from the learning tools that are discussed in **Section 4.13**, the tools effectively used were farmer field days, also called *Look&Learn* visits, and cross visits. Field days were organised in the communities or sub-wards by the respective lead farmers, sometimes supported by the extension technicians (as mentioned above). It would seem that most lead farmers were quite serious about making a success of the event, but in some cases there was no real effort to use these events as an opportunity to raise awareness and interest of intended users. It is difficult to identify the reasons behind poor organisation of field days, but it would probably be due to a lack of ownership and responsibility. However, in general farmers seemed to think that field days were quite effective and useful in raising the awareness and interest of people and drawing them into the group.

'Cross visits' is when farmers from one area going to farmers from another area to learn from them. This could imply cross visits between communities (i.e. lead farmers or sub-wards), between wards and districts, between provinces and between different countries. It could also mean visiting farmers from a different sector, e.g. commercial farmers. All the above examples, except international cross visits, were attempted in the pilot study. From the feedback of farmers and the M&E results it was clear that they not only learned a lot from these cross visits (they were inspired), but they also enjoyed it thoroughly. My impression is that seeing CA implemented successfully by other farmers and listening to experiences, either from resource-poor or commercial farmers, increased confidence in the new technology.

From literature these *institutionalised opportunities* for sharing information are also recommended. Scoones *et al.* (1996) listed field days, extension group meetings and organised exchange visits. Bembridge (1984) also listed field tours, or Look-and-Learn visits, as a group-based extension method. Farmers like to be exposed to other farmers in their own or other districts or countries. Such a tour [visit] gave local farmers a chance to exchange ideas with farmers in different conditions, to become aware and learn about new technologies, as well as experiences and lessons learned by other farmers. Other group extension methods include the following: a) demonstrations, b) small group (buzz) sessions, c) conferences, workshops, symposiums and seminars, d) drama and theatre. The selection of the particular methods and

techniques to be used at any one time should be determined by: a) the nature of the subject, b) available leadership, c) available facilities and d) the nature of the audience.

Conventional, ministry-driven, technology transfer-oriented agricultural extension has failed to promote rural development in much of the world, particularly in agro-ecologically diverse, resource poor and risk-prone regions (Chambers, 1989, 1990; Marsh, 1998; Stroud, 2003; Pretty and Chambers, 1993; Uphoff *et al.*, 1998; Van de Fliert, 2000). There is an ongoing "search" for institutional arrangements which will foster a) sustainability, b) participation of rural communities, c) capacity to address equity issues within service provision, and d) incorporation of indigenous technical knowledge into agricultural research and development. Examining alternative extension approaches can provide a wealth of lessons for understanding farmer-led extension programs. Using a farmer-led approach:

- ❑ Better integrates research and extension functions, combining knowledge and research capacities of local communities with research and development organizations in an interactive learning process;
- ❑ Involves identifying, generating, testing and adapting new techniques and practices to help solve local agricultural problems;
- ❑ Have the primary goals of strengthening local capacity for experimentation and of supporting the adaptation of technology and its wider dissemination.

According to Horne and Stúr (1998), the selection of sites and farmers is critical and is often not given the attention it requires. Ideally, as all who are involved in developing agricultural technologies, we want to work first with those farmers who are innovative, natural researchers and representative of a broader group of farmers with common problems that might be resolved. Uphoff *et al.* (1998) observed that willingness to participate in farmer-to-farmer extension can be enhanced by program design. One design that can facilitate farmer-to-farmer dissemination is for those farmers receiving training or managing demonstration plots to be chosen by their peers, not by the program or its field staff. Smith *et al.* (2003) described the selection and training of lead farmers in the Emmaus ward, which was based on this principle.

5.6. LESSONS LEARNED AND A LOCAL THEORY ON INSTITUTIONALISATION

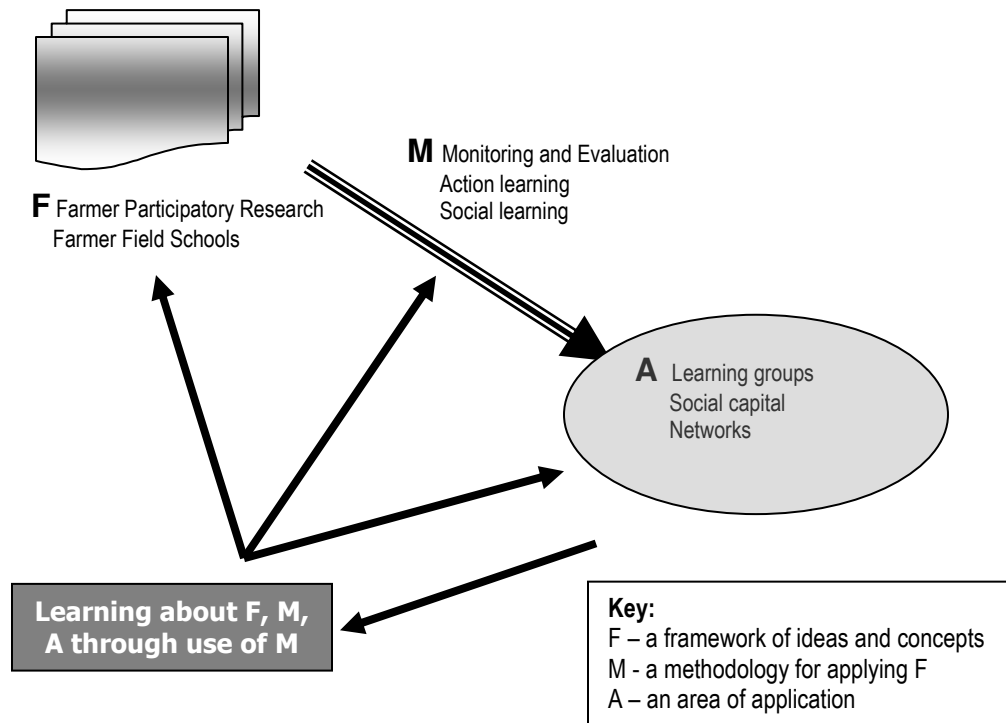


Figure 5.8. The general research framework for local institutionalisation

According to Checkland (1985), in this general research framework (see **Figure 5.8**), F is a framework of ideas and concepts; M is a methodology – the way of applying these ideas and concepts; and A is the area they are applied to.

5.6.1. OVERVIEW

The formation of strong, vibrant and self-reliant small farmer groups was seen as an important element in achieving ultimate sustainability in the pilot project. Firstly, the issue of developing abilities among farmer groups to learn and adapt was emphasised during ‘training-of-trainers’ and ‘farmer-to-farmer’ processes. Secondly, what seems to be a great assistance and support for the sustainability of small farmer groups is to gain increased access to inputs, credit and markets through strategic partnership and good relationships, with e.g. input suppliers, in support of sustainable land management. The argument was that well-meaning and intelligent farmers want credit assistance to be modified to truly help their fellow farmers.

From literature, the use of small informal group approaches to deliver development services to small farmers (provided by government, NGOs and/or the private sector) has proven to be an effective institutional device for lowering the delivery costs of these services, for reducing the expenses small farmers incur in gaining access to those same services, and to markets, and for promoting small farmer self-development. Small farmer groups (SFGs), are also seen as a useful organizational mechanism for mobilizing small farmer collective self-help actions aimed at improving their own economic and social situations and that of their communities. This is the conclusion of FAO after more than two decades of direct project implementation experience in 17 countries (FAO, 1998).

Relatively little experience was built in the formation and functioning of local institutions, or social (farmer) structures, in the Bergville study. This was mainly due to the following reasons: i) the termination of the project funding cycle did not allow the action research process to continue – when working with local institutions (social structures) was only starting; ii) the limited capacity of researchers to work on the community or farmer group (sub-community) level; we did, however, view the development of vibrant, strong and self-reliant social structures as a prerequisite for ultimate sustainability. Shown in **Figure 5.6**, our experience on this matter could be discussed under two distinct methods employed in the Bergville project, namely a) the *monthly action forum* and b) the formation and facilitation of *small learning groups*.

5.6.2. MONTHLY ACTION FORUM

From literature farmer groups can be defined as groups of producers who meet frequently (e.g. on a weekly or monthly basis) to interchange their production experiences, and at the same time analyse and evaluate the development of their enterprises (Moran, 1997). The vision in the Bergville project was that group meetings should be used as a vehicle to interchange the ideas and the experiences of each member of the group (see 'action learning events' in centre of **Figure 5.6**). Moran (1997) further explained that: "A group is like a crew, with a defined course, where each participant has a mission to fulfil in order to reach the goal. Group objectives should be a response to the real needs of all participants. Therefore, all must help to determine the objectives. Only this way will each member be motivated to participate in an active manner. Objectives are achieved through a work plan, a strategy, a project plan, or a theory of action". Again, this point illustrates how project group activities and all the other activities are interlinked with each other - they are all attached, integrated and guided by to the main chain, which is

the M&E process flowing from the project strategic plan, which is illustrated in the cognitive map (see **Figure 5.6**). To the group of key stakeholders in the Bergville project, the monthly action forum, indicated as the *action learning events* in the cognitive map, was seen as the 'heart' of the project from where the different strategies or pillars of the soft systems platform were implemented and managed. To the farmers (end-users) interviewed, it was clearly the most important action carried out by the implementation team (group), i.e. at the project level. My experience was that these meetings were indeed successfully used as a vehicle to exchange ideas and experiences with each participant, a vital platform for collaboration. Most, if not all project activities met in or flowed through this event where the group of key stakeholders could reflect on them and discussed ways of future action – hence it formed an ideal event or vehicle for *process and implementation monitoring* (see cognitive map in **Figure 5.6**).

An essential part of the monthly action forum meetings was the sharing of information between participating farmers with the guidance of a *facilitator* (or chairman). Initially, researchers or extension officers can fulfil that role, but soon farmers need to take over this role, preferably with guidance and support from the others. Lead farmers might usually have some skills in facilitation or chairing of meetings, but in most cases they need to improve, especially in the area of facilitation and critical reflection. This could be done during the training-of-trainers courses and/or continually during the monthly action forums. An area where they (facilitators) could be of great help in future is to maximise the farmer contribution and participation in the meetings, since the accumulative experience of any group of farmers is often quite impressive. Furthermore, as Moran (1997) also implied, it is not a matter of only transferring technology or knowledge. The human contact and, as I found, *relationship development* (and management) is what is fundamental in the groups' activity. The most relevant is the friendship that takes place among the participating farmers, extensionists and researchers. With friendship it is easier to communicate both the failures and successes and agree on the way forward. So, creating an atmosphere in the monthly action forums, using a few action research tools, to enhance this relationship building process, is seen as a valuable concept that emerged from this study.

The attendance at the action forums during the five years of the project cycle showed a sharp increase. On average 70 farmers attended the monthly action forums during 2004 and a bit less during 2005, comparing to 80 farmers in 2003 and 10 in 2002. Participants in the forum were the lead farmers and their trainees, as well as a few researchers and extension technicians. Later on other project partners and new research project teams joined the meeting. Lead farmers themselves showed a much better attitude towards attending forums – by October 2004 all of

them attended regularly. This indicates a high degree of participation, as well as a high morale within the participating farmers' group. Good interaction between farmers, extension and researchers occurred in these forums.

My experience was that those farmers who did not participate in the forums frequently enough, were excluded from some of the new initiatives, ideas and activities. This showed that much of the individual learning was obtained through the group discussions, especially by reflecting on the new technologies and farmer-to-farmer extension. There seems to be a few reasons for non-attendance of which the most critical one for future action is the travelling distance of farmers living in remote areas. It was found that these farmers simply found it too difficult to frequently (i.e. once a month) travel such long distances for a meeting. Absence in these meetings was reflected in the results of their trials, as well as their performance in farmer-to-farmer extension. It was decided in principle at the initiation of the project that no travel allowances would be paid to participants, as it was perceived as a negative impact on the sustainability of the meeting, and the project in total. However, if participation in these meetings is seen as a critical success factor, this policy could be reviewed, or alternative arrangements made, such as rotating the meeting to different sub-wards. Otherwise, the size of the study area (influencing travel distances) could be reviewed.

The increase in the number of participants during monthly action forums was another emerging issue. Originally, only lead farmers were participating in the forums keeping the group to a functional size of around 20 people. Later, farmer trainees started to participate as well, rapidly increasing the size of the group to up to 150 on occasions. The initial idea was to work with the smaller group of lead farmers on a project (ward) level, equipping and focusing them to work on a lower level, i.e. the community and/or farmer group level. The involvement of trainees in the forum was a natural process with no clear rules or directions for it. Farmers experienced the forum as a 'good' place to be and nobody had a strong enough view (or theory, for that matter) to change the situation. My experience was that the big group size did hamper progress – most often we had to break up into a number of small working groups, which was an effective solution, but it did break the speed of the process. What could be a possible viable trade-off between size and effectiveness, is to allow each lead farmer to be accompanied by one farmer trainee for every five (or ten, if the group gets even bigger) trained by him. This might also be another incentive for lead farmers to perform in farmer-to-farmer extension.

5.6.3. FARMER LEARNING GROUPS

From literature it emerged that group dissemination methods are now more frequently used for the dissemination of technologies and practices than the individual farmer methods. Group methods have been especially effective in persuading farmers to try a new technology or practice. Although there are many advantages of group methods to extension, farmers and researchers (Bembridge, 1984), the key element of the farmer learning group approach is the opportunity for farmers to learn from one another. According to Matata *et al.* (2001), the method creates a supportive learning atmosphere where individuals discuss new ideas among themselves hence gaining knowledge and confidence. In the Bergville case the lead farmer acted as facilitator of these learning groups (see 'facilitate learning group activities' in top right side of **Figure 5.6**). The intention was that lead farmers would soon after starting with the FFE process involve enough interested farmers to form small groups. The next step would be to engage this group in various learning activities, aiming to capacitate them with the new CA technologies, but also to foster an adaptive management culture among the group members. This process was supported and evaluated during the last two years of the project cycle, mainly through the monthly action forums. In **Section 5.7** I discuss the learning process in more depth and in this section the focus is on the social capital per se.

From my experiences with this process the following issues could be highlighted. Firstly, although local farmers in the Emmaus area most probably have a 'group culture' that could facilitate this process, they seemed to lack the skills and tools to mobilise and empower the group members effectively and to deal with other group dynamics and social issues, such as conflict. Some of the questions that consequently emerged were: What tools would work best with them? What are the metaphors they are using? There were no resources available to conduct detailed socio-anthropological studies to develop appropriate tools for use by farmers themselves. However, my conclusion (from analysis of theory and action in this study) is that the introduction of tools that are based on universally accepted concepts and principles, such as experiential learning, action learning, adult education, self-evaluation and social learning, was an effective way to address this issue. I personally would have liked to generate more participation of the local users in the development of these tools (to increase ownership), but due to the same obstacle (lack of resources) we had to introduce pre-designed tools to the lead farmers. We did try, however, to allow as much as possible training, as well as continuous feedback and support to facilitate their adoption and use.

My second observation was that farmers do not meet very often, or at least not often enough (from my own theoretical perspective) to allow for continuous learning. Emerging from the convergent interviewing results, they most frequently met during the planting period (maybe every week or two) and then they also operated, in what is apparently a very old tradition among women groups, by planting their fields (by hand) as a group, moving from farm to farm. How effective that is, has not been investigated. It could certainly help for mutual encouragement and support and it should be a good learning environment, but it could become a challenge to coordinate and manage in a big group of trainees. However, this 'cultural practice' should be build-on and it could find a niche in a smaller 'learning group' with about five to fifteen members, working very close together and meeting more frequently during planning, planting, maintenance, monitoring or evaluation. Farmers were continuously reminded in the monthly forums and during monitoring visits to lead farmers' farms, to meet more often with their learning groups, or for that matter, with any other existing group like farmer, church or soccer associations.

It emerged that the formation, facilitation and development, i.e. *institutionalisation*, of farmer learning groups, or a learning culture itself, needs much closer evaluation and facilitation on all levels of the multi-stakeholder process, from both top-down and bottom-up initiatives. New interventions should support the social learning process from top-down, while learning groups could in turn form the backbone of larger farmer (social) structures, from bottom-up. In **Chapter 3** and below I attempted to describe the institutional arrangements necessary to achieve that, especially to fill the gap formed in the middle. From literature it looks like the advantages of small group approaches over larger group (village-based) approaches have much to do with simple principles of small group dynamics. People tend to learn more quickly in small group situations; there is more face-to-face contact and therefore less room for misunderstandings; and decisions can be reached more quickly than in larger group situations (Moran, 1997). My [new] understanding is that extension staff must form a crucial partner to facilitate small learning group activities at the community and district levels. Therefore, organisations that launch new interventions and development projects should recognise this need and empower extensionists with enough skills and resources to rise to the occasion. Vibrant, self-reliant, local institutions (e.g. farmer learning groups) are an important indicator for sustainability, but they should be treated as such in the project cycle and institutionalised higher-up in the multi-stakeholder hierarchy.

Another, poorly investigated issue in the Bergville study, is the process and criteria regarding the composition of these small learning groups. One could not assume that by purely being trained

and getting access to inputs through the lead farmers, would form a strong enough bond for the group over the long term. Clearly, this was not the case. It was noticeable that farmers do use 'some criteria' to select or recruit farmers as their trainees and group members, but it is unsure what these criteria were. Gender definitely plays a role, since women farmers recruit other females much easier than men and vice versa. It was also proven that women are much easier to train than men, which does influence the composition of the groups ultimately. However, it is a proven fact that when small group membership is homogeneous, i.e., when members share some common bond, like locational proximity, a similar income activity, or they come from the same socio-economic background, then there is also less potential for inter-member conflict and consequently more solidarity. So it may be worthwhile and recommendable to allow local participants of projects to discuss and clarify their criteria and process of group formation before one embarks in such an activity, which is ultimately having such a huge impact on long-term sustainability. Literature (e.g. Marsh, 2002; Moran, 1997) revealed that after more than two decades of experience in promoting economic small farmer groups, it can be said that most successful and sustainable economic small farmer groups share a number of common features, vis.:

- ❑ They are small in size, with membership averaging between 5-15 members
- ❑ They are informal, i.e. they operate without need of legal recognition or identity
- ❑ Their membership is homogeneous, i.e. the group members share a common interest or bond and come from similar socio-economic level or neighbourhood
- ❑ Their primary focus is on income generation, rather than other no-economic objectives
- ❑ The group has its own savings or "emergency" fund to which members contribute regularly

From these points the small farmer groups in the Bergville project have a few clear differences which might give an indication on their long-term sustainability. Firstly, some of them are quite large (up to seventy members), although they have started to brake up in smaller manageable groups with their own facilitators. Secondly, their primary focus is on learning and technical aspects, not income generation per se. This aspect is quite interesting, since it might be one of the reasons why [some] farmers did not take ownership of the learning process and associated activities. Maybe the emphasis (goal) should be much more on 'income generation', but using more-or-less the same process and tools to reach it. Then the internal motivation and energy of the group is high, while they also gain the capacity to innovate, which is necessary for self-dependency and long-term sustainability.

5.6.4. FARMER GROUPS AND BUSINESS DEVELOPMENT

Another vision to formalise and strengthen group activities in the Bergville project was the formation or mobilisation of small learning groups to get access to credit (or savings), markets and inputs. The outcome of 'access to inputs, markets and inputs' are indicated in **Figure 5.6**. The most prevalent thinking from literature is that farmers should be organized into cooperatives as a conduit of credit. Organizing farmers in the Emmaus area into a cooperative was achieved with some difficulty, since attaining critical membership numbers from groups was difficult in some areas, seemingly due to poor leadership and communication. The flow of credit assistance and inputs to farmers could apparently only be facilitated when these aspects were in place. I understand that for small-scale farmers, cooperatives will never be irrelevant, but a shift away from the conventional coop-norms and community organizing appeared to be necessary. Furthermore, in order to promote sustainable agriculture, cooperatives and their ensuing organizing strategies, should be oriented towards the adoption of ecologically sound agricultural practices, such as CA. According to Mendoza (1996), the coop management must be prepared to assume a holistic role to adequately address the *production to post-production* aspects and requirements of the agricultural system. Ultimately (by 2005), the formation of a cooperative for the farmers in the Emmaus ward and Bergville district, with the support of an external agent, was not yet successfully achieved. My conclusion drawn from this experience is that for cooperatives to be successful among resource-poor farming communities there need to be good leadership who have the support and trust of the communities in the area. Furthermore, they need to have quite good financial management capabilities and effective communication channels and networks in the communities. Without exception, none of these factors were in place in the Emmaus ward and I would argue that it would probably be difficult to attain and sustain in most resource-poor farming areas. However, I must admit that in this case, poor leadership was probably the main cause of failure.

Due to the difficulties experienced with the development of a larger, more formalised cooperative approach, my attention shifted towards the small learning groups as a conduit to credit, inputs and markets. From the information gathered at the Bergville project (e.g. through the convergent interviewing) there is clear evidence that farmers have had some experience and ideas of doing it in their traditional ways, some quite successful. Field experience (from literature) has consistently shown that communities can be mobilized into sustainable groups if credit and thrift is used as an agenda in their formation and functioning. "Peoples' money in their own hands acts like a glue which keeps them together. Once the solidarity develops

among group members, it becomes easier to promote production / income enhancement enterprises" (Livelihoods Connect, 2004). According to Marsh (2002), micro-financing or other anti-poverty credit initiatives are likely to be more successful when they are based on an understanding of traditional savings and credit arrangements. Marsh suggested the following approach to make the most of it:

- ❑ Investigate how villagers traditionally meet their seasonal cash and labour needs, and how these arrangements are linked to vulnerability, social norms and customs, and the absence of access to formal credit institutions by the poor.
- ❑ Build on existing savings and credit arrangements that are tied to livelihood strategies.
- ❑ Exercise caution not to undermine traditional obligations and norms of reciprocity and redistribution that are an important social safety net for the poorer villagers, through introduction of new credit opportunities.
- ❑ Integrate "reputation-based lending" - reflecting social reputations and obligations, as a legitimate form of collateral and means to improve repayment rates and access to the poor.

According to Marsh (2002), flexibility to borrow small amounts, quickly, with minimal transaction costs, is vital in adverse environments with frequent drought, harvest failure and sickness. Cash-poor farmers may borrow cash for land preparation and repay at harvest time. These arrangements also avoid the need for "disaster selling" of prized savings for every cash need. Formal credit and savings institutions are absent in most rural villages throughout the world, and in any case the terms and requirements are not appropriate for the cash needs of the poor. Under traditional arrangements, the poor can participate as long as they have good social standing. From what was learned in the Bergville project, the ability of SFG's to improve their financial or credit situation, allowing them access to inputs, relies heavily on how successfully they are in achieving the following three actions: a) to, over a short period of a month or two, put money together as a group to buy inputs in bulk, b) over a longer period, e.g. a number of years, open a bank account and save money as a group; and c) have very active and determined leaders that continuously guide their groups towards their goals.

5.6.5. INSTITUTIONAL SUPPORT FROM HIGHER LEVELS OF THE STAKEHOLDER HIERARCHY

The apparent success of small group approaches in facilitating learning and economic cooperation, even evident in the Bergville study, begs a question: Can the same organizational

principles that succeeded at the small group level be applied at higher levels, i.e., in the formation of inter-group associations (associations or federations of small farmer groups)? Most promoters of SFG's acknowledge the following: that small farmers can obtain advantages, in economic and collective bargaining terms, by forming secondary and higher-tiered cooperation networks (such as farmer associations). However, many governments and some donor agencies have been less eager to promote them, either because they are not yet convinced that such organizations are economically useful and sustainable, or because they fear the promotion of informal small farmer associations of this type would disturb the existing socio-political and economic *status quo* (FAO, 1998). In Bergville, the local farmer structures (or associations) at the start of the project were weak, but it could still be a valuable entry point for working with local farming institutions (this was actually not fully exploited at that time or later). Later during the project cycle, the DAEA have initiated the formation of a local farmer association by assisting little more than electing its leadership structures, mostly from the group of lead farmers in the Bergville Landcare project. However, this was a very top-down initiative and it hardly got off the ground.

On the other hand there was still the question on how to link up project structures and activities, especially the lead farmers and their learning groups, with higher-order social and/or organised networks. Is it enough to rely on a natural process where these farmers influence the existing structures and maybe take over some of the leadership or facilitation roles due to their improved [management] capabilities? This is not certain and further studies and impact assessments should be considered, but I would definitely view it as one of the unexpected outcomes of a multi-stakeholder process such as facilitated at the Bergville project. If local stakeholders are empowered to be innovative, they can definitely influence the many existing farmer structures and networks that seem to be poorly organized and led, and are so far unduly dependent on outside support for survival. In spite of these questions and reservations, I would recommend that informal inter-group associations of small farmers are continued to be formed, either spontaneously by groups themselves or externally by outside change agents. The top right side of **Figure 5.6** indicates how this idea of 'link-up with existing local institutions' is linking with other concepts.

According to Livelihoods Connect (2004), the ability of public service providers to respond to the needs expressed by farmers through their organisations depends on the willingness of government, as well as public and private agricultural services, to engage with them. However, in order to be effective, farmers' organisations often need:

- ❑ Capacity building support in technical areas relating to agricultural production, and internal management and organisation (programming, financial management, etc.).
- ❑ Some successful economic activities – as technology generation is not normally a sufficient mobilising force for farmers' groups, but others such as cash crop production or commodity marketing can be good binding forces.
- ❑ Access to funds from diverse sources (membership fees, access to development project and international NGO funds etc.).
- ❑ Commonly accepted ethic for group interaction (either traditional modes of social organisation or clearly stated statutes required by law, or clear rules for group interaction and decision-making).

In **Chapter 3, Section 3.3**, the initial theories on *institutionalisation within a multi-stakeholder process* are discussed in detail. From this it is clear that the main challenges are: a) to use local organisations or (informal) – networks of fora of different stakeholders effectively in the learning process; b) to close the gap (in the middle) between the formal institutions of the state and informal and traditional institutions at the grassroots of society; c) to build up effective middle-level institutions, develop in response to this gap between the demand and the supply of intermediation services; d) to link these new middle-level institutions with what villagers already have in terms of social capital and leadership.

5.7. LESSONS LEARNED AND A LOCAL THEORY ON MONITORING AND EVALUATION

According to Checkland (1985), in this general research framework (see **Figure 5.9**), F is a framework of ideas and concepts; M is a methodology – the way of applying these ideas and concepts; and A is the area they are applied to.

5.7.1. OVERVIEW

For the Bergville project, it was of critical importance to know exactly who the end-user(s) of the evaluation information would be and how the information was to reach them. This determined the entire framework for the evaluation methodology: the indicators, the methods, the timing, the reporting and analysis style, the costs, etc. It was decided that district and community stakeholders should primarily use evaluation findings for learning and decision-making in view of

improvement. Five M&E processes, which were linked to each other, have been initiated. The first one was done with the aim to improve and manage the project (i.e. project or ward level) and involved the developing agents (researchers, extension officers and lead farmers) as primary intended users. The second M&E process involved lead farmers and aimed to focus the farmer-to-farmer extension process. The third process had two different, but related purposes. The first purpose being to facilitate learning and adaptive management among farmer groups on a daily/weekly basis, while the second purpose was to strengthen group management capabilities on an annual or bi-annual basis. The fourth process was aimed to collect information among the farmers on the impact and sustainability of the project through a convergent interviewing process, while the fifth process was aimed to annually aggregate M&E information and indicators to judge the impact of the project in view of accountability to funders.

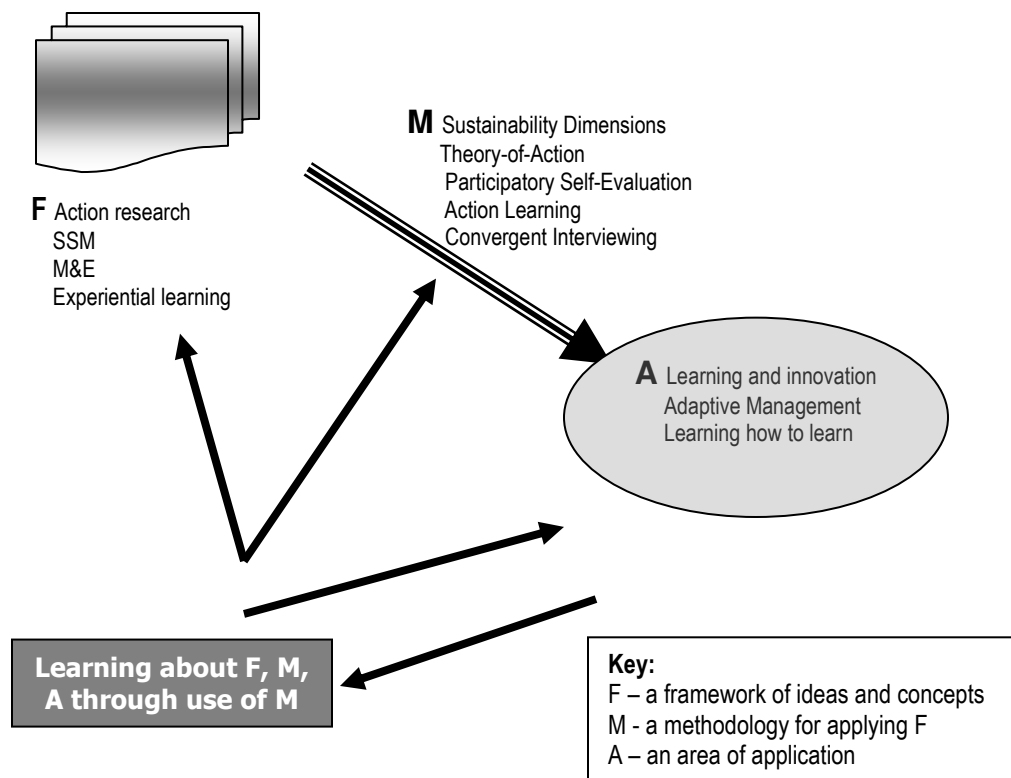


Figure 5.9. The general research framework for M&E

5.7.2. LESSONS LEARNED - USING EVALUATION METHODOLOGY TO SUPPORT DATA ANALYSIS AND THEORY DEVELOPMENT

The same evaluation frameworks mentioned and described in **Section 4.12** can be applied in *evaluating evaluations* with the purpose to ensure evaluation credibility for users (Patton, 1997). I

argued that for that matter, the thesis research process could also use these frameworks to draw out lessons learned and develop new theories for practical application. In that respect the evaluation frameworks, i.e. sustainability dimensions, theory of action and participatory self-evaluation, together with their evaluation criteria and evaluation questions, were used to guide and strengthen the research process. As already described in **Chapter 2**, my aim was quite modest and that is to find reasonable estimations of the likelihood that particular activities have contributed in concrete ways to observed effects, with an emphasis on the word **reasonable**. Not definitive conclusions. Not absolute proof. Evaluation offers reasonable estimations of probabilities and likelihood, enough to provide useful guidance in an uncertain world (Blalock, 1964; as quoted by Patton, 1997). Absolute judgements of a positive or negative nature are less useful than specific, detailed statements about levels of impact, the nature of relationships and variations in implementation and effectiveness. This shifts the focus from whether findings are negative or positive to whether the evaluation results contain useful information that can provide direction for programmatic action. Evaluators can shape the environment and context in which findings are reviewed so that the focus is on learning and improvement rather than absolute judgement (Mathison, 2005). Placing emphasis on organisational learning, action research, participatory evaluation, collaborative approaches, developmental evaluation and empowerment evaluation can diffuse fear of and resistance to negative judgement (Patton, 1997). I thought that ties in quite well with the goal of this study.

I see the *evaluation of M&E methodologies* used in the Bergville project as an important academical exercise that added value to the analysis described in this section. A feature of this thesis, however, is that the reader is not meticulously led through the developmental stages for each theory, but rather focused on a discussion of the refined or improved theories. In that light, the *evaluation of M&E methodologies* were discussed in **Annexure 11**, included on the CD. By using a number of M&E methodologies in combination with the SSM framework, a number of lessons learned could be formulated. These lessons learned were further used, and **supported by literature**, to develop new theories and ideas for practical application. Following this, a number of key concepts and ideas were identified and linked in the cognitive mapping exercise representing the local theory of using M&E methodology to facilitate action research among resource-poor farmers. The theory was developed and illustrated using a cognitive map shown in **Figure 5.10**.

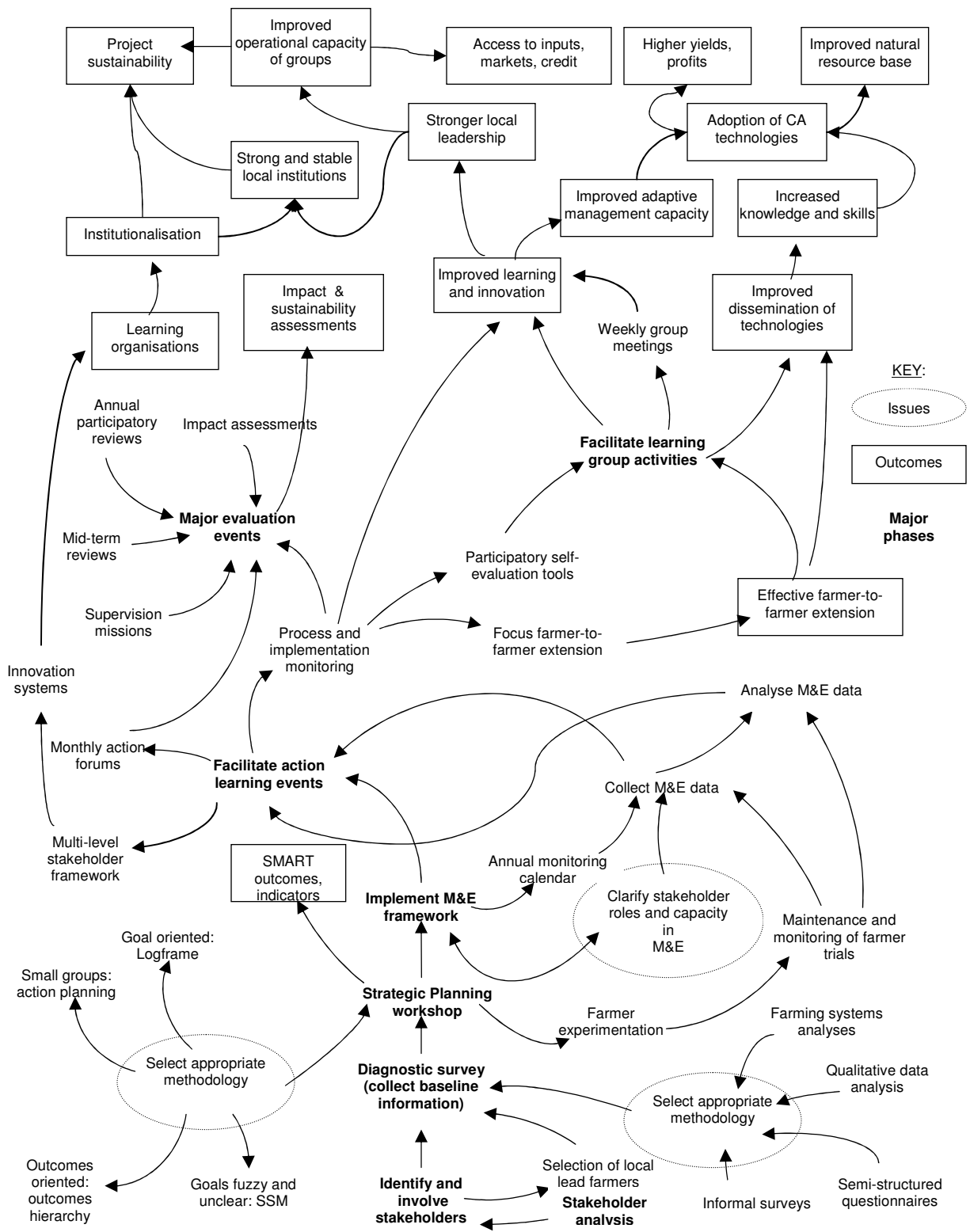


Figure 5.10. Cognitive map and local theory on Monitoring and Evaluation (M&E)

From the lessons learned above, it became clear that a central concept for adaptive (project or programme) strategies and theories, integrating and guiding all the others, is the establishment of an adaptive and continuous monitoring and evaluation system, such as those used in the last two decades to manage some complex environmental systems. This has been emphasised by many authors, such as Allen (1997), Earl, Carden and Smutylo (2001), Ekboir (2003), Herweg and Steiner (2002) and Patton (1997). What came out in the analysis above, shown in **Figure 5.10**, as two essential issues in the design of such an M&E system are:

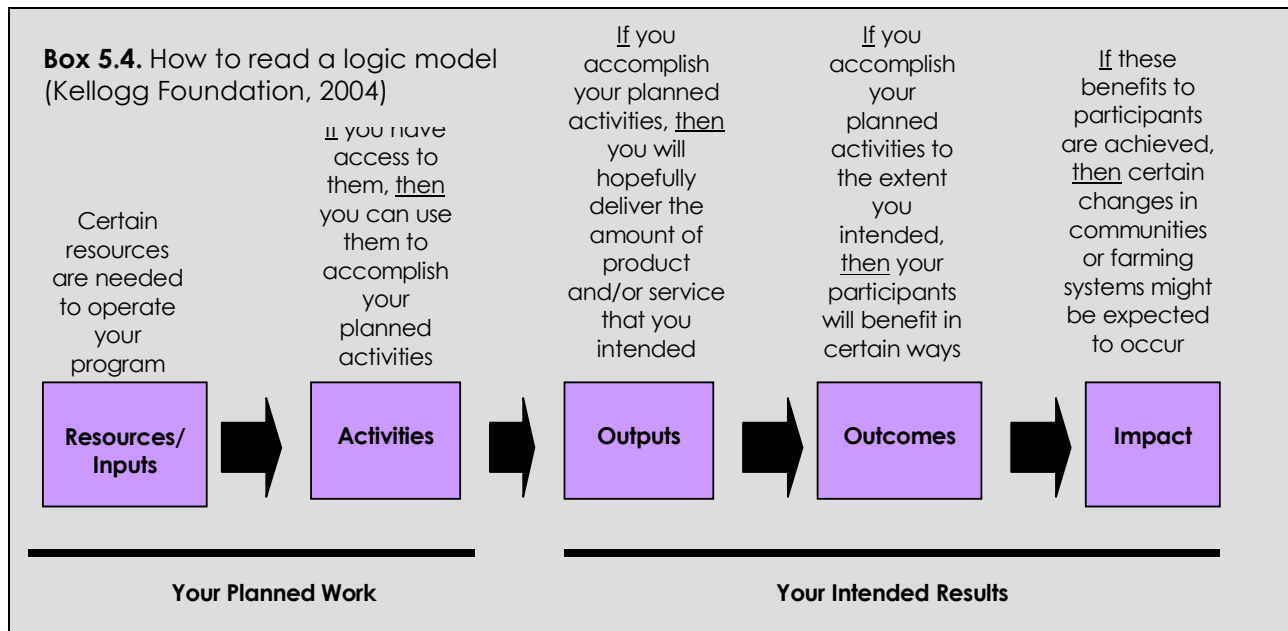
- a) clarification of the M&E methodology to use at a specific stage and with a specific stakeholder group, and
- b) clarification of the roles and capacity of stakeholders in the M&E process.

It was again proved that there is not much expertise in how to set up an effective M&E system, while there is a lot of managerial and political rhetoric to include it. My experiences described in this study highlight the fact that sustaining a monitoring system requires effort and determination. Before developing an M&E system, the project team should assess its readiness and capacity to implement it. This study showed that M&E takes time, resources, commitment, and effort. There is no getting around this — it is true of any [M&E] system or methodology selected. If a process is well organized, it should not be difficult; however, it does take work to design and facilitate it, to gather and interpret the data, and to use the findings. Following below is a discussion of the major concepts and ideas of the local theory represented by the cognitive map in **Figure 5.10**. Literature was used to fill the gaps indicated in my discussions above.

5.7.3. BUILD ON PROJECT LOGIC TOWARDS OUTCOMES

There was clear evidence of the need for a methodology to structure strategic planning and M&E design of projects. From this study it was apparent that the methodology should greatly enhance participation and usefulness of M&E as a planning, management and learning tool. Furthermore, developing and using the methodology should be an important step in building stakeholder capacity and strengthening their ownership. The process of using the methodology must encourage communication among project staff and stakeholders and should advance joint action and sharing of responsibilities. The M&E methodologies should also connect to the mental maps of project managers, which guide their behaviour. In other words, it should form an essential project management tool. This issue is indicated in the bottom left corner of **Figure 5.10**.

From literature (Springer-Heinze, Hartwich, Henderon, Horton and Minde, 2003; Kellogg Foundation, 2004) the best approach would seem to involve a (re)construction of the internal project logic (the 'theories') of project staff and stakeholders by eliciting hypotheses and important assumptions about the proposed change process. The methodology used needs to challenge implicit assumptions, often made by research managers, about how research (and development) will lead to desired impacts and should trigger alternative thinking about the problems to be addressed. The term 'logic model' is frequently used interchangeably with the term 'project theory' in the evaluation field. Logic models can alternatively be referred to as theory because they describe how a program works and to what end. A logic model usually identifies five hierarchical levels, beginning with inputs and activities and proceeding through outputs and outcomes to the ultimate goal, which is to have an impact. Each of the levels is linked by 'if-then' logic. The levels and associated assumptions provide the project logic model or theory-of-action (see **Box 5.4**).



According to the Kellogg Foundation (2004) a project logic model (**Box 5.4**) is a picture of how your project works – the theory and assumptions underlying the project. This model provides a road map of your project, highlighting how it is expected to work, what activities need to come before others, and how desired outcomes are achieved. It is a systematic and visual way to present and share your understanding of the relationships among the resources you have to

operate your project, the activities you plan, and the changes or results you hope to achieve. Map in hand, participants are more confident of their roles and responsibilities and hence, more likely to actively engage and less likely to stray from the course – and when they do, to do so consciously and intentionally.

According to Kellogg Foundation (2004), many evaluation experts agree that the use of a logic model is an effective way to ensure project success. Using a logic model throughout your program helps organize and systematize project planning, management, and evaluation functions as follows (see **Figure 5.11**):

- a) In **Project Design and Planning**, a logic model serves as a planning tool to develop program strategy and enhance your ability to clearly explain and illustrate project concepts and approach for key stakeholders, including funders. Logic models can help craft structure and organization for project design and build in self-evaluation based on shared understanding of what is to take place. During the planning phase, developing a logic model requires stakeholders to examine best practice research and practitioner experience in light of the strategies and activities selected to achieve results. See 'strategic planning workshop' at bottom centre in **Figure 5.10**.
- b) In **Project Implementation**, a logic model forms the core for a focused management plan that helps you identify and collect the data needed to monitor and improve programming. Using the logic model during project implementation and management requires you to focus energies on achieving and documenting results. Logic models help you to consider and prioritize the project activities most critical for tracking and reporting and make adjustments as necessary. These activities would usually happen during the 'action learning events' indicated at middle left side of **Figure 5.10**.
- c) For **Project Evaluation and Strategic Reporting**, a logic model presents project information and progress toward goals in ways that inform and advocate learning for project stakeholders.

In the field of agricultural research, these kinds of basic project logic models (**Figure 5.11**) are already common in the form of *logical framework analysis (Logframes)*. Although the Logframe approach is probably lacking in many ways it is still the most widely used methodology for project planning and M&E. One reason might be the unavailability of appropriate alternatives, but more recently there have been a number of innovative adaptations to the Logframe for pragmatic applications. Most of these changes have been poorly documented, however, those

proposed by Butcher (2001), IFAD (2000), Douthwaite *et al.* (2003), Pasteur (2001a) and Smith and Jansen van Rensburg (2004) seem to fit with sound M&E principles, particularly with respect to participation, partnership, dynamism and sustainability (through ownership).

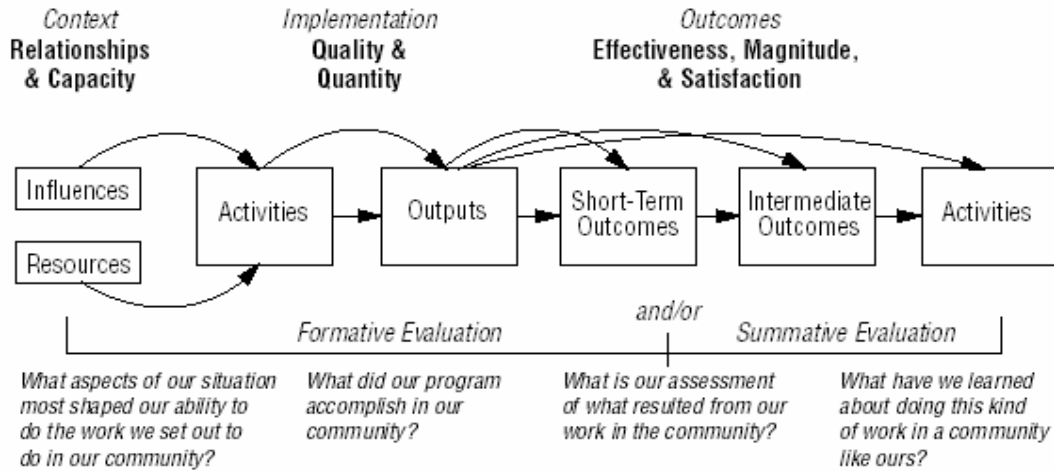


Figure 5.11. Utilisation of a logic model in project M&E (Kellogg Foundation, 2004)

Practical implications emerging from this study, as well as my personal experiences with the Logframe, are echoed by IFAD (2000), which stated that, when facilitated well, the Logframe is generally seen as very valuable by project stakeholders and leads to a better quality and shared understanding of needs, objectives and strategies by all involved. IFAD recommended, for example, that one needs to try and follow the basic ideas without forcing everyone to understand the full detail of the Logframe matrix and henceforth promoting a much more flexible use of it. From the lessons learned in this study, as well as my personal experience with the Logframe, it would seem that the framework proposed by Smith and Jansen van Rensburg (2004), which has been tested in practical settings with large groups of resource-poor farmers, proved to be more flexible and pragmatic than the conventional Logframe. **Box 5.5** shows the frameworks that have been quite successfully used as an action research methodology during planning, implementation and learning (M&E) stages of big multi-stakeholder projects for resource-poor farmers in South Africa. A comparison of the processes and steps for developing the 'frameworks' proposed by Pasteur (2001a) and Smith and Jansen van Rensburg (2004) is shown in **Table 5.2**.

Box 5.5. The M&E framework proposed by Smith and Jansen van Rensburg (2004)

a) Implementation and process monitoring framework modified from Logframe

OBJECTIVE :					
Strategies	Activities (Processes)	Outputs	Responsibility	Target date	Resources

b) Impact (outcomes) monitoring framework modified from Logframe

OBJECTIVE :						
Outcome	Indicator	Threshold (Benchmark)	Targets	Method of Measurement	Responsibility	Date/Frequency of Measurement

Table 5.2. Processes and steps for developing frameworks as alternative to the Logframe

Alternative framework (Pasteur, 2001a)	Framework adapted from Logframe (Smith & Jansen van Rensburg, 2004)
1. A participatory analysis of livelihood needs to feed into planning and generation of a framework	1. Brainstorm all the problems, needs and issues identified and experienced
2. Agreeing commitment to common goals and common principles	2. Identify 3 to 5 'key' problems, causes and effects
3. Negotiation of objectives and parameters	3. Develop objectives, strategies, outputs and outcomes
4. Negotiation of process stages and indicators	4. Develop a monitoring plan for the strategies and activities (implementation & process monitoring)
5. Co-learning processes	5. Develop a monitoring plan for higher-order outcomes (impact monitoring)

5.7.4. EXPLORE THE USE OF ALTERNATIVE METHODS IN THE DESIGN OF AN M&E SYSTEM

From the lessons learned a need emerged to explore the use of alternative methods for the design of an M&E system. This *issue*, shown in bottom left corner of **Figure 5.10**, corresponds in principle to the methodological approach followed in this thesis, which uses a 'triangulation' or

'multi-methodology' approach to capture and optimize the strengths of alternative methods in design, data collection and analysis. Apart from the Logframe approach there are many alternative methodologies to design and implement project M&E systems. What emerged from this study is that the use of a specific [M&E] methodology is determined by the situation, which is influenced by a variety of factors. The factors which seemed to have the largest influence were a) the purpose of the exercise; b) the size, dynamics and level of operation of the stakeholder group involved; c) the operational resources, i.e. time and funds, available; and d) the available expertise. A short deliberation on the insights gained from the data analysis on each of these factors follows below:

- a) **The purpose of the exercise:** Essentially the two main purposes of M&E (as defined by Patton, 1997) mostly determined the methodology used. This study revealed that M&E exercises which have a *formative* evaluation purpose, i.e. those focusing on continuous improvement, can use different methodologies than *summative* evaluations, i.e. judgement oriented evaluations. The Bergville project showed how a *formative* evaluation effectively used a system or framework that, instead of policing and judgement, build a culture of learning and reflecting, and aims to provide information relevant to planning, management and adaptation. On the contrary, a summative evaluation for the Bergville project used a framework, such as Sustainable Dimensions, that allow the aggregation of data, especially those on the impacts of project activities over different scales, quite effectively. However, what we essentially need is a broader, more dynamic view of project impacts throughout the project lifetime, rather than a once-off, *ex poste* assessment. The M&E framework should link the context with the outcomes and impacts – helping to explain 'why' and 'how'.
- b) **The size, dynamics and level of operation of the stakeholder group involved:** The stakeholder group, its role in the project, its literacy level, and other socio-political issues have an influence on the methodologies used. On more than one occasion it was experienced that there is to some extent uneasiness in the group of farmers we worked with when certain methodologies were used to facilitate M&E processes. Although it was a very intuitive approach of 'feeling my way around' that was followed in the Bergville study, a more constructive action research process, where 'critical reflection' would help to inform and improve the use of methodologies with a specific group, will most certainly yield better results. It was also found that the use of local metaphors and idioms and in some cases their 'own' tools and techniques, would increase the effectiveness of methodologies used. When

the situation is fuzzy and unclear, or with multiple goals and perspectives, a methodology such as SSM would be more suitable.

- c) **The operational resources, i.e. time and funds, available:** The time and funds available have a major influence on the choice of methodologies. When enough operational resources are available, as much effort and expertise as possible should be employed to investigate and design the methodology to be used. However, when little operational resources are available, methodologies should be adopted that are quicker and simpler in design. For example, it is not foreseen that a Logframe approach should be used with a small group when only a few days are available. Rather, one would look towards a methodology such as 'outcomes hierarchy or mapping', which is much quicker and simpler.
- d) **The available expertise:** The ability of project personnel, or the availability of external people, will probably have the greatest influence on the methodologies used and the extent and quality of the M&E system. It was revealed that even with some M&E expertise in the project team, further support is needed at lower levels for data collection, capturing and analysis and for mentoring purposes on higher levels. Experience from this study also supports the idea of the formation of an evaluation unit within the organisation, which is furthermore needed to be supported by long-term programmes or initiatives that promote the development of 'innovation systems' and/or learning organisations. The latter point will be discussed further below.

As an alternative to the Logframe approach for project-level M&E design, the use of a results-based M&E system shows promise. Although experts vary on the specific sequence of steps in building a results-based M&E system, all agree on the overall intent. Regardless of the number of steps, the essential actions involved in building a normal M&E system, listed by Kusek and Rist (2004), are compared with those results-based M&E systems presented by Patton (1997) and Kusek and Rist (2004) (See **Table 5.3**). Patton (1997) presented a framework for conceptualising outcomes that are meaningful and measurable for use in facilitating an outcomes-oriented management and evaluation system. This system distinguishes six separate elements that need to be specified for focussing an evaluation on participant or client outcomes. Kusek and Rist (2004) introduced a 10-step model for building a results-based M&E system, which also focusses on outcomes.

Table 5.3. A comparison of the essential actions involved in building an M&E system

Essential M&E actions (Kusek and Risk, 2004)	Outcomes-focused framework (Patton, 1997)	Results-based M&E system (Kusek and Rist, 2004)
<ul style="list-style-type: none"> ▪ Formulate outcomes and goals ▪ Select outcome indicators to monitor ▪ Gather baseline information on the current condition ▪ Set specific targets to reach and dates for reaching them ▪ Regularly collects data to assess whether the targets are being met ▪ Analyse and report the results 	<ul style="list-style-type: none"> ▪ A specific participant or client target group ▪ The desired outcome(s) for that target group ▪ One or more indicators for each desired outcome ▪ Details of data collection ▪ How results will be used ▪ Performance targets 	<ul style="list-style-type: none"> ▪ Conducting a readiness assessment ▪ Agreeing on outcomes to monitor and evaluate ▪ Selecting key indicators to monitor outcomes ▪ Baseline data on indicators – where are we today? ▪ Planning for improvement – selecting results targets ▪ Monitoring for results ▪ The role of evaluations ▪ Reporting findings ▪ Using findings ▪ Sustaining the M&E system within the organisation

Another methodology, *Outcome Mapping*, has been developed in organizations where monitoring and evaluation are primarily intended to help with project learning and improvement. It offers a participatory methodology for planning, monitoring and evaluation that can help projects develop a system that can meet both accountability and learning needs (Earl *et al.*, 2001). As development is essentially about people relating to each other and their environments, the focus of Outcome Mapping is on people. The originality of the methodology is its shift away from assessing the development impact of a program (defined as changes in state — for example, policy relevance, poverty alleviation, or reduced conflict) and toward changes in the behaviours, relationships, actions or activities of the people, groups, and organizations with whom a development program works directly.

What seems particularly relevant from Outcome Mapping is that it provides a method for development projects to plan for and assess the capacities that they are helping to build in the people, groups, and organizations who will ultimately be responsible for improving the well-being

of their communities. According to Earl *et al.* (2001), Outcome Mapping does not attempt to replace the more traditional forms of evaluation, which focus on changes in conditions or in the state of well-being. Instead, Outcome Mapping supplements other forms of evaluation by focusing specifically on related behavioural change.

5.7.5. IMPROVE LEARNING DURING EVALUATION EVENTS.

*'One doesn't learn from experience; one learns from **reflection** on experience.'*

(Patton, 1997)

Following from the above quote from Patton (1997), Mezirow (1991; as quoted by Roberts, 1997) provides a definition of learning from one's experiences as a process and not as a conventionally conceived outcome. In his case a learning outcome is guiding future action, but he defines outcome as including "... making a decision, making an association, revising a point of view, reframing or solving a problem." In doing so he too registers the value of learning as a process.

Traditionally M&E has primarily been about providing accountability to funders and assessing the achievement of project outcomes. However, what this study aimed to achieve, is how M&E can make a further contribution to the development process by building capacity for current and ongoing learning beyond the life of the project. Hence, the emphasis shifted from producing 'knowledge products' (reports of process and output indicators), to a goal of strengthening the 'learning process'. A major lesson learned was that establishing a learning process requires building the capacity of individuals, and institutionalising a culture within organisations (or stakeholder groups) for reflecting, learning, communicating and applying knowledge, (i.e. adapting in response to lessons learned). This view was supported by Pasteur (2001b) who emphasised that, in this way, M&E can be an empowering process, facilitating dialogue and mutual learning, and building trust and transparency between project partners.

To stimulate learning in the Bergville study, a number of 'learning events' were implemented. The major learning event for the key stakeholders was seen as the monthly action forum (see 'action learning events' at middle left side of **Figure 5.10**). It was attempted to facilitate a few other learning opportunities, such as learning group meetings (see middle right side of **Figure 5.10**) and annual evaluation workshops (see middle left side of **Figure 5.10**). Although the monthly action forums were found to be quite effective and successful, it is my conclusion that there was a

shortage of good quality learning events on different levels of the stakeholder hierarchy in the project. The design, implementation and facilitation of these learning events as part of the project and M&E phases are essential. I found that this aspect is a prerequisite for learning. In support of this statement, IFAD (2000) mentioned that learning does not happen in one sitting. It evolves, starting with individuals raising important issues and questioning assumptions through group-based analyses that bring out different perspectives and information inputs. So, as learned from this study as well, you will need to plan "learning" as a series of events. In this respect two important aspects emerged that need to be considered, namely: a) a careful structuring of the sequence of events, b) the identification of the stakeholders necessary to participate in each event, and c) the action research methodologies and techniques to facilitate each learning event. These aspects are briefly discussed below.

a) A careful structuring of the sequence of events

To use M&E information most effectively one must think about the key moments during the project life when strategic decisions are made that enable you to move closer to impact. From my experiences in the Bergville project it is clear that monthly, annual and mid-term evaluation events should be viewed as opportunities of strategic importance (see middle left side of **Figure 5.10**). An illustration by IFAD (2000) clearly shows how information from M&E could be most usefully fed into learning events (See **Figure 5.12**). From **Figure 5.12** it is envisaged that project M&E involves an extensive series of potentially reflective events – from weekly team meetings and informal sessions to the more formal supervision missions and mid-term reviews/evaluations. However, IFAD (2000) shared our experiences that knowing how to construct a useful learning sequence is a skill that must be learned. This may require some trial, error and innovation as I experienced. Thinking about these key moments as learning opportunities to manage for impact can reveal their value as strategic steering exercises, rather than as an obligation.

GTZ (1996) mentioned that in an organization, the periods of reflection will vary according to the organization and the decision-making level. For example, each team member probably reflects daily on the activities he performs within the organization. The team may reflect weekly on its duties. Other meetings at departmental level may be held monthly. And once a year, there may be a general review of the long-term concepts of the whole organization (and every 6 years an external evaluation by a funding agency?). Each organization makes its own rules for these reviews; of course, they may also be irregular or have quite different time-spans.

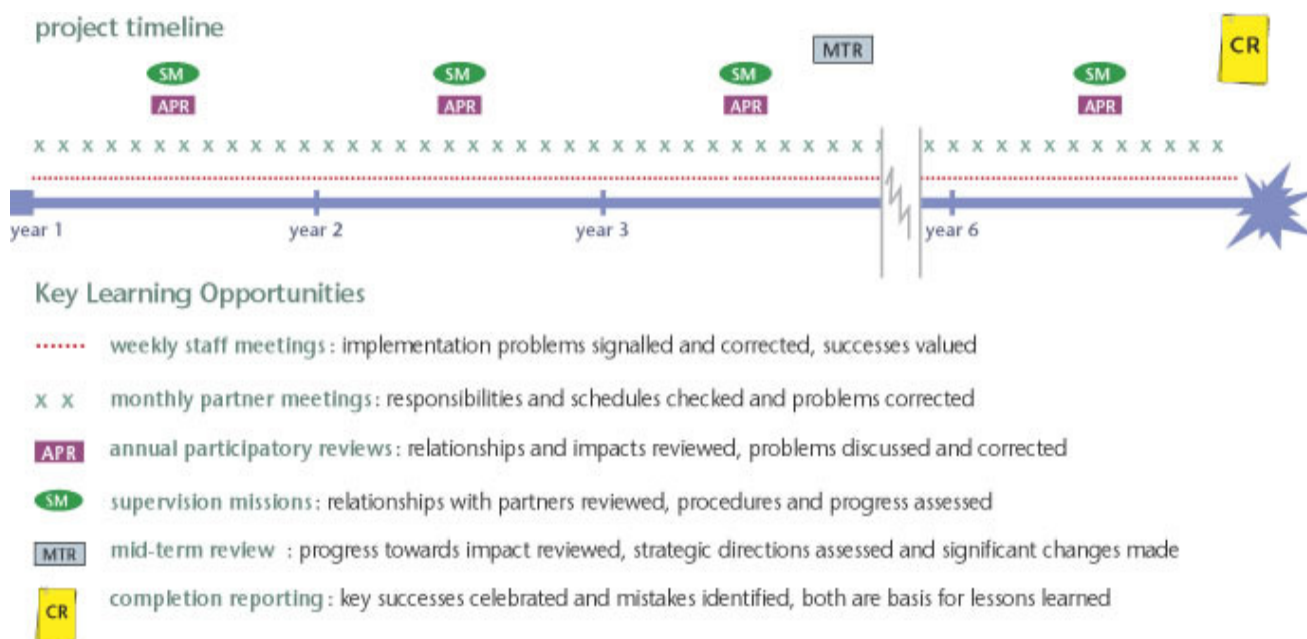


Figure 5.12. The sequence of learning opportunities during the project cycle (IFAD, 2000)

Hagmann *et al.* (1999) described their approach, which could be combined with an annual field visit, to evaluate field experiments as follows: In the middle of the agricultural season before crops mature, farmers, with the help of extension staff, organise an evaluation of the field performance of the different ideas and techniques they have tried out. Before the general field visits, the judging of the 'competition for the best ideas' is carried out by a committee from the neighbouring community. The innovativeness of the idea should be an important criteria, as are the number of trials per farmer, trial management, quality of presentation, etc. In the mid-season evaluation, all farmers in the community are invited to visit the fields to see the experiments and 'trials' – each farmer who is running interesting experiments presents his/her fields, ideas and findings to the group for discussion. The objectives are to:

- ❑ Share knowledge among farmers;
- ❑ Build confidence through presentations; and
- ❑ Encourage more farmer-to-farmer extension.

According to Saunders and Kellner (2003), in smaller communities this 'field evaluation' can take one day, in bigger ones sometimes two days, or on a ward or district level (as with Bergville), it

can easily take a whole week. If there is not enough time, only the best farmers in the group are visited in the field.

b) The identification of the stakeholders necessary to participate in each event

One lesson, which was also reflected on by IFAD (2000), is to keep the level of discussion and type of decisions appropriate to the event. For example, an annual review process is usually not the best moment to discuss how to organise the delivery of stationary supplies to farmer groups. Nor is a weekly farmer group meeting the appropriate place to agree on the new terms of contracts with partners. In the Bergville project, the learning events implemented were there to involve various stakeholders, however, it could have been done more purposefully. In the monthly action forums, for example, too much emphasis was probably put on the relationship between researchers and farmers, missing out on opportunities to involve the extension officers more effectively. Other occasions, such as the annual reviews or steering committee meetings, were opportunities to involve other stakeholders, such as the national and provincial departments, regional and local researchers, input suppliers and others.

c) The action research methodologies and techniques to facilitate the learning event

As discussed above, it is of major importance to select the right tool for a specific event and stakeholder group. If properly done, these learning events could be used as a platform to launch and focus major project strategies, as was done in the Bergville project. In fact, all the major strategies, such as the farmer-to-farmer extension process and farmer-managed experimentation, were either managed, or designed, or monitored from the monthly action forum. In **Chapter 4** there is a detailed deliberation of the tools selected in the Bergville study, as well as their assumptions and intended outcomes. The key ingredient of all these tools was an 'element of learning', which implies an ability to foster a culture of '*critical thinking or reflection*' in these events. According to Roberts (1997), *critical reflection* is a term referred to by a number of authors writing about reflection and learning. They present it as the reflective situation in which the learner explores his or her own role in the situation. In a field of practical applications of critical reflection related to recovery processes Eastland (1994; as quoted by Roberts, 1997) submitted that Habermas' concepts of critical reflection are essential for the higher level learning needed for behavioural change. According to GTZ (1996), *critical reflection* in a project means analysing and interpreting experiences and data to create new insights and agreement on actions. Without critical reflection, your M&E data will not help you to manage for impact.

In the Bergville project I attempted to facilitate critical reflection as part of the active discussions, especially during the monthly action forums and in learning group meetings facilitated by the lead farmers. My vision behind it was to share, analyse and act upon M&E information. However, my personal experience was that, in order to make analysis "critical", which means moving beyond collecting, processing and reviewing data, is practically much more difficult than protruded in theory. This sentiment was echoed by Roberts (1997), who mentioned that the traumatic impact of critical reflection and the difficulty of its application may offer a contributing reason why behaviour is usually difficult to change. I also learned that a critical reflection process is an ongoing developmental process of incremental change in theory, capacity and behaviour, informed by data and judgement, which lead to significant cumulative evolution of the entire project.

Following from the above-mentioned, an issue that frequently emerged during my personal experiences, e.g. in my research diary, was an inability to assess the effectiveness and quality of the learning process implemented in the various events in the Bergville study. I frequently posed the question to myself, e.g. in my research diaries: How do I know if the project (or group) is actively learning? According to IFAD (2000), if you can clearly say "yes, this is happening here" to the following items, then you know that in terms of managing for impact your project is well on its way to having a culture of learning through *critical reflection*:

- ❑ Individuals feel that their ideas and suggestions are valued.
- ❑ Mistakes and failures are considered important by everyone for learning and not shameful.
- ❑ All the key groups involved in project implementation communicate openly and regularly.
- ❑ Project implementers, including primary stakeholders, regularly and informally discuss project progress, relationships and how to improve actions.
- ❑ Managers listen carefully to others and consciously seek solutions together.
- ❑ During regular meetings and workshops, time is set aside for discussing mistakes and learning lessons.
- ❑ The question, "Why is this happening?" appears often in discussions.

The last two points, which deals with the formulation of 'lessons learned', was another difficulty I experienced during the learning events. Although farmers participated in the learning events on many occasions, they did not really understand what was meant by 'lessons learned'. This challenges current theories on critical reflection processes, especially applying it among

resource-poor farmers. My theoretical understanding at that time (e.g. from IFAD, 2000 and Patton, 1997) stressed that an important moment in the learning sequences is when lessons are identified. A *lesson learned* is defined as the 'knowledge derived from experience that is sufficiently well founded and can be generalised so that it has the potential to improve action' (IFAD, 2000). How to best facilitate the formulation of lessons learned and what tools and questions are working the best in this setting, is to my view still in need of more research.

One of my personal challenges, as described in **Chapter 4**, was to make evaluation simple enough and yet constructive and useful for everybody involved. A particular difficulty was to engage in a participatory evaluation process with farmers, which *inter alia* implies working on all the levels of the objective hierarchy and dealing in process- and impact evaluation. What was found to work well, however, was to draw out the lessons learned using a few frequently asked evaluation questions (Dick, 2002; IFAD, 2000), such as:

- ❑ WHAT has succeeded or failed?
- ❑ WHY have we had success or failure?
- ❑ WHAT are the implications for the project?
- ❑ NOW WHAT, what actions will we now take to make improvements?

A challenge is to lead participants away from listing 'observations' of routine operational activities (the WHAT) to identifying and reflecting on deeper social, process and value-driven issues, such as decision-making, group and household dynamics, leadership, capacity to change and politics. In making M&E real simple, these 'core questions' can be applied in almost any evaluation event, at any place in the objective hierarchy. Working with core questions helps to structure the often overly ambitious plans for monitoring large datasets with which projects start, but they are not substituting the major M&E framework, which forms the backbone of projects and programs. However, these questions are still firmly based on the original theories and principles of evaluation, i.e. experiential learning and critical reflection.

According to IFAD (2000), evaluation (or performance) questions do not have to be elaborate – nor do you need many. The most basic types of performance questions are shown in **Box 5.6**. It was also experienced in the Bergville study that working in small breakaway groups increase the effectiveness and productivity of learning events, especially combining it with evaluation questions. After the performance questions are agreed, then you can decide what information the groups need to evaluate. This includes using 'indicators' to stimulate the discussion.

Box 5.6. The basic performance questions per level of the objective hierarchy (IFAD, 2000)

- Activities – What have we actually done?
- Outputs – What have we delivered as a result of project activities (e.g., number of people trained)?
- Outcomes (results) – What has been achieved as a result of the outputs (e.g., extent to which those trained are effectively using new skills)?
- Impacts – What has been achieved as a result of the outcomes (e.g., to what extent are NGOs more effective)? What contribution is being made to the goal? Are there any unanticipated positive or negative impacts?
- Lessons – What has been learned from the project that can contribute to improved project implementation or to building relevant fields of knowledge?

What should be remembered is that the formulation of 'Lessons learned' occurs during the frequent project learning events implemented as part of M&E framework (see middle left side of cognitive map in **Figure 5.10**). Firstly, lessons learned are identified on a weekly learning group or monthly action forum meetings. Secondly, the project team and partners identify lessons at annual project reviews, at mid-term reviews and again on completion of project. If you want to have an active learning organisation, IFAD (2000) thought that including lessons as part of the annual review is a good idea. Waiting until the end of the project will mean wasting many potential learning opportunities.

What seems to be essential, however, is the design of what Patton (1997) calls a *reflective practice* process, which is related to Kolb's (1984) experiential learning cycle and the different phases of action research. This *reflective practice* process would greatly enhance this learning culture. Patton described his practice as follows: i) identifying an issue, interest, or concern; ii) agreeing to try something; iii) agreeing to observe some things about what is tried; iv) reporting back to the group individually; v) identifying patterns of experience or themes across the separate reports; vi) deciding what to try next, that is, determining the action implications of the findings, and vii) repeating the process with the new commitment to action. This kind of reflective practice is cutting across all project phases and activities and if designed properly, involving local people to include their own 'way of doing', in their own language and metaphors, it could go far in changing peoples' attitude, understanding and behaviour through these learning events.

5.7.6. DON'T FORGET ABOUT PROCESS AND IMPLEMENTATION MONITORING AND USE

Another major idea or concept denoted in the centre of **Figure 5.10** is 'process and implementation monitoring'. The term *process monitoring (and/or evaluation)* is used in professional jargon (e.g. Patton, 1997; IFAD, 2000) to denote the *selectively and systematically observing* of processes, so as to *compare* them with others, and *communicating* on that in order to *learn* how to steer and shape the processes. Process monitoring is a management instrument such as strategic planning or results-oriented evaluation. It is there to help steer (focus) those processes in which we participate to achieve common goals (GTZ, 1996). Process evaluation focuses on the internal dynamics and actual operations of a program in an attempt to understand its strengths and weaknesses. Process evaluations ask: what's happening and why? How do the parts of the program fit together? How do participants experience and perceive the program? (Patton, 1997). From the Bergville experience it was learned how important it is to first of all have a tool, or framework, in hand to manage processes and implementation in the project (e.g. a Logframe or project logic model), and secondly, to actually do it on a continuous, frequent basis. Although there were frequent [learning] events to do it, hereby especially referring to the monthly action forums, much time was spend during these events to (re-)design the M&E framework(s) (due to the absence of it at the start). Consequently, this kind of 'process and implementation monitoring', although perhaps not focused and constructive enough, formed an important part of the project M&E activities. This made me realised how important it is to make space for these activities, especially in relatively short development projects of 3 to 5 years. The main reason is that there is much more process and implementation 'data' to work with during the live-cycle of a project, compared to data on project outcomes and impact (because most project outcomes are only realised or achieved after project completion). In other words, your grip on the performance and ultimate success, impact and sustainability of the project can mostly be influenced by how you 'critically reflect' on and 'adaptively manage' your process and implementation. Thinking about it carefully, one understands the consequences of this conclusion – monitoring and management of daily, monthly and annual activities and processes and the shaping of their underlying 'theories', become so much more important and urgent, since that is mostly all you will have to work on during your involvement in the project.

The challenge it brings to the table is how this almost routine management (evaluation) of actions could contribute to the learning process and ultimate project outcomes and impact. In other words, how much of this *process* can be used to influence individual changes in thinking

and behaviour, and program or organizational *changes* in procedures and culture. Patton (1997) refers to *process use*, which occurs among those involved in evaluating as a result of the learning that occurs during the evaluation process. Evidence of process use is represented by the following kind of statement after an evaluation: 'The impact on our project came not just from the findings but from going through the thinking process that the evaluation required.' Patton differentiated four primary uses of evaluation logic and processes: i) enhancing shared understandings, especially about results; ii) supporting and reinforcing the program through invention-oriented evaluation; iii) increasing participants engagement, sense of ownership and self-determination (participatory and empowerment evaluation); and iv) improving program and organizational development. The centre of **Figure 5.10** depicts how process use could occur at any one of the learning or evaluation events, such as the 'action learning events', the 'major evaluation events' and by working with the 'participatory self-evaluation tools'.

According to Patton (1997) it doesn't matter so much what the focus of an evaluation is, or what its findings, some impact will come from engaging thoughtfully and seriously in the process. Referring back to the Bergville project, the very process of formulating a mission and goals (e.g. during the development of the theory of action) so that they can be evaluated could have had an impact, long before data were actually collected to measure effectiveness and impact. However, several factors appear to influence the likelihood that those involved in evaluation processes will learn from their participation. According to Preskill, Zuckerman and Mathews (2002; as quoted by Mathison, 2005), these include factors related to the following: i) How evaluation meetings (events) are facilitated; ii) The extent to which, and the ways in which, management and leadership support participants' involvement in the evaluation process; iii) Participants personal characteristics and experiences with evaluation and the program being evaluated; iv) The frequency, methods and quality of communications between and among stakeholder participants; and v) Organizational characteristics, such as the use of action research.

If process use is supported, nurtured and studied, it may lead not only to individual learning, but to team and organizational learning (Mathison, 2005). Furthermore, process management must also assist in *ensuring effective operations*. According to IFAD (2000) it involves putting in place the practical and operational conditions for carrying out project activities efficiently. Operations are guided by the Annual Work Plan and Budget (AWPB). The project strategy is the basis for the AWPB. How you carry out the AWPB determines whether or not you are ensuring effective

operations. **Table 5.4** lists the key areas of operation management, the main management tasks and the information needs.

Table 5.4. Key areas of operational management, management tasks and information needs (IFAD, 2000)

Operational Management Area	Key Management Tasks	Examples of Information Needs
Staff management	<ul style="list-style-type: none"> ▪ Developing and monitoring staff work plans ▪ Staff performance appraisal 	<ul style="list-style-type: none"> ▪ Quarterly, half-yearly, annual work plans for each staff member ▪ Performance (quantity and quality) of each staff member
Plant, building and equipment management	<ul style="list-style-type: none"> ▪ Purchasing and maintaining equipment ▪ Allocating equipment ▪ Finding and maintaining appropriate work space 	<ul style="list-style-type: none"> ▪ Asset register ▪ Vehicle use ▪ Equipment maintenance schedule, standards, responsibilities
Contract management	<ul style="list-style-type: none"> ▪ Developing contracts ▪ Monitoring delivery of contracts 	<ul style="list-style-type: none"> ▪ Database of all contractors and their contracts ▪ Compliance with contracts (timeliness, quality)
Financial management	<ul style="list-style-type: none"> ▪ Money allocation to activities and tasks ▪ Monitoring expenditure according to budget ▪ Revising budgets as needed 	<ul style="list-style-type: none"> ▪ General project financial management information ▪ Annual audits
Work planning and activity tracking	<ul style="list-style-type: none"> ▪ Annual, quarterly, weekly activity planning ▪ Allocation of resources to activities ▪ Checking progress on activities and responding to problems 	<ul style="list-style-type: none"> ▪ Detailed activity, sub-activity, task lists for achievement of outputs ▪ Lists of required resources per activity ▪ Activity and task progress
Communication management	<ul style="list-style-type: none"> ▪ Keeping stakeholders updated on work and events ▪ Meeting reporting requirements 	<ul style="list-style-type: none"> ▪ Calendar/Responsibilities for deadlines for reports ▪ Database on who should receive what ▪ Database on all documents produced

5.7.7. 'LEARNING HOW TO LEARN' - EMPOWER FARMERS TO LEARN AND ADAPT

This section is an analysis and theorising of the experiences with the PSE and AL tools introduced to the farmers in the pilot study (see **Chapter 4**). This concept forms part of the local theory on using M&E to facilitate action research shown in the cognitive map (see ideas linked to 'process and implementation monitoring' in the centre to middle right side of **Figure 5.10**). In essence, in

the Bergville study my attention shifted towards the use of action learning and action research to go beyond what have been predominantly hard system approaches in the past. This soft system approach explicitly recognise that natural resource management in the context of sustainability is not characterised so much by problems for which an answer must be found, but rather issues which need to be resolved and will inevitably require one or more of the parties to change their views (Bawden *et al.*, 1984; Checkland, 1981, 1985, 1991; Legesse, 2003; Röling, 1997). My vision was therefore to provide lead farmers with a few tools that would assist themselves in facilitating and together with their learning groups engaging in this mediation and learning process. From the Bergville project experiences (or data sources) discussed in **Chapter 4** it is evident that, although my theoretical understanding of these tools were quite sound, there were a number of constraints in applying these tools, as well as their adoption and use by the farmers. It may well look as if the application of these learning-based participatory tools among resource-poor farmers could not really grasp the nature of the social forces that are driving these rural systems. There are also very few references in the agricultural R&D literature to participatory projects that endeavoured in the use of PSE tools to improve the adaptive management capabilities of farmers. From this study, however, two important aspects have been learned. The first is that it takes time to develop, test and adopt these tools among farmers and secondly, one needs a rigorous action research process where theory could continuously be influenced (improved) by practice and practice by theory. There are a few sound existing theories, but they need to be crafted into very practical and simple tools for farmers in a specific context. However, more research is needed to develop or improve the practical aspects of these tools.

For the moment, however, it might be useful to focus on new ideas emerging from the literature and how they could be applied to fill the gaps identified in the Bergville study. First of all, it is clear that 'Learning how to learn' is one of the methods that is gaining increased support as the means of working with or inquiring into the changes needed in contemporary society. While learning how to learn is a natural human ability, in the context of the field of agriculture, for example, it means the explicit development of consciously available learning capabilities. It is the addition at least initially of consciousness of process to counter less effective but practised learning strategies (Roberts, 1997). That less effective strategies are in operation is referred to by Kolb (1984) in relation to experiential learning and by Argyris and Schon (1974, 1978) in relation to the foundation of action science. It might be expected that monitoring and evaluation would be the first and most important goal of M&E framework(s), but in some cases, self-evaluation, self-education and self-improvement came first. In fact, according to Uphoff (1989), these

processes can contribute to more useful monitoring and evaluation from higher levels than the standard evaluation methods because this approach addresses the group's own goals.

A more systemic approach that ties in with the above statement would be to focus group extension activities explicitly on the process of learning how to learn, as a complement to other extension approaches. In gaining these skills, farmers learn how they learn and think so that they can deal with issues as they arise. Such a way of learning from experience produces an increasingly critical approach to thinking and provides alternatives to existing ways of thinking about problematic situations (Roberts, 1997). Hamilton (1995) proved that the reasons why these learning approaches (tools) had such a big impact on a 'complex and messy situation' are multiple: a) these learning tools were used in an andragogical (the art and science of helping adults learn) approach, b) the role of the implementing agents (researchers, extension staff, etc.) changed from being the technical expert to a role of facilitation, c) the process (tools) assist farmers to reflect upon their learning, by providing a feedback loop, with observations and measurements, and, d) the activities matched the preferred learning style and perceptual modalities of the participants, with the learning activity.

Roberts' (1997) aim, for example, was to have pastoralist farmers learn how to learn through acquiring skills in experiential learning. His notion of having pastoralists 'learn how to learn' was to provide them with skills for their use in improving situations. According to him experiential learning would have particular relevance here as it involves learning through real problematic situations and is a process appropriate to both individuals and groups. As such it seemed suitable for use by pastoralists who often have to solve management problems without help from "experts", while they (the pastoralists) do have access to other pastoralists experiencing similar situations. Moreover, experiential learning involves the individuals in the situation giving due attention to an appropriate process to identify assumptions in the situation and develop different perspectives for action. Roberts' notion therefore was that from experiential learning will come a foundation for pastoralists' skills in critical thinking. Rather than defining 'what' pastoralists should think about an issue in any given circumstance, extension delivering experiential learning skills would expand 'how' they learn their way through it.

Another example of a pragmatic 'learning how to learn' tool is the 'Check Approach' that utilises the Kolb learning cycle and could be described as a second loop of learning (Lacey, 1997). In this case it has led to an alternative to the transfer of technology model. The change is from a one way communication flow to a multiple flow model with flow from farmers to farmers,

farmers to extension and researchers and vice versa. The Check Approach is an extension model involving farmers learning and sharing knowledge with one another and with researchers and extension workers playing a key and pivotal role to facilitate the learning. The principle of 'farmer back to farmer' has also been advocated by other authors (Muok *et al.*, 2001; Rhoades and Booth, 1982). The flow of technology and information is as much from farmers to farmers and to researchers as it is from researchers to extension to farmers. The Check Approach has attempted to speed up technology transfer by treating farmers as researchers in their own right and assisting this process through the use of adult education (Lacey, 1997) (See **Figure 5.13**).

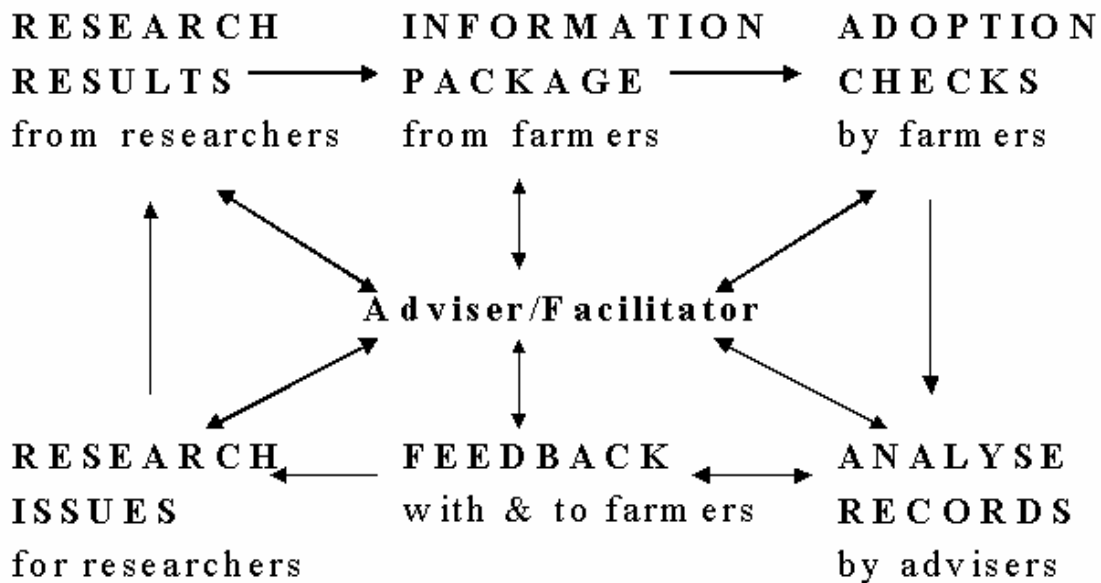


Figure 5.13. Check approach model showing the steps and communication flows (Lacey, 1997)

The features of the Check Approach which are common to existing farmer packages and those under development are (Lacey, 1997):

- ❑ The check title markets the approach and implies action in terms of checking.
- ❑ The setting of either farmer, industry or community targets. These may relate to paddocks or farms for productivity, sustainability, business profitability or market quality.
- ❑ The identification of important factors or checks which must be adopted in order to reach the target.

- ❑ The checks are identified from observing, measuring, recording and analysing farmer paddocks, farms or farm businesses. This gives the checks credibility with farmers since the checks are derived from their own farms.
- ❑ The checks are described simply and objectively. This reduces information overload and aids communication and understanding.
- ❑ The assembly of an objective farmer management package which is based on all the key checks needed. Objectivity of the checks, e.g. 150-200 plants/m² is important, because it results in clear communication to farmers, advisers and researchers and can be readily measured.
- ❑ Education of farmers in the implementation of the checks is very important. This is achieved through progressive learning steps. These are: a) Observing, b) Measuring, c) Recording, d) Interpreting, and e) Acting, which closely relates to the phases of experiential learning.

According to Lacey (1997), the aim of experiential (action) learning tools is to educate farmers to improve their learning and performance at each step as well as moving from step to step over time. For example, observing a crop by walking through it is more effective than driving past in a car. Some farmers may never progress beyond the observation step while others will progress through all the steps. Learning aids can be provided for each step.

5.7.8. THINK CREATIVELY ABOUT INDICATORS

My personal experience around the development and use of indicators in the pilot study varies. It was relatively easy for researchers to identify and measure SMART (Specific, Measurable, Attainable, Relevant, Timely) indicators, but it was much more of a challenge to involve intended users in the whole process of indicator development and use on all the levels of the objective hierarchy (see bottom left corner of **Figure 5.10**). One particular difficulty was to find useful approaches to deal with both quantitative and qualitative monitoring data. According to IFAD (2000) almost any topic that needs to be monitored can be assessed using either quantitative or qualitative indicators, according to the kind of information you need. But, as King *et al.* (2000), commented, indicators do not exist in isolation. They are impacted upon, influenced by and may be dependent upon other internal and external farming system factors. In the Bergville study, only a few indicators were eventually used by the farmers, i.e. changes in crop yields, and changes in the number of trainees. Of those two, only the latter one was used in a learning process to focus farmer-to-farmer extension. As discovered from my personal

reflections in my research diary, crop yield per se is a poor indicator for a resource-poor farmer as aspects such as food diversity and distribution might be much more important.

The development of a comprehensive participatory M&E framework at the start of the project would most probably have influenced the selection and use of indicators in the Bergville project. What was particularly missing were indicators that would have helped in the monitoring and management of processes and implementation, such as input and output indicators. Of course, having outcome indicators that were not selected and designed in a participatory manner was also of little worth for project participants, especially farmers. However, the use, misuse or non-use of indicators is associated with issues much deeper than only applicability and measurability. According to King *et al.* (2000), a number of reasons could be put forward as to why indicators are not being effectively used for the purposes they have been developed for. In agricultural production systems reasons have been primarily focused around farmers not adopting sustainability indicators that have been developed through scientific research. Reasons include the following: a) measurements being meaningless to farmers, b) production agriculture being viewed as separate from conservation agriculture by farmers, c) indicators being regarded as theoretical and not useful, d) lack of enthusiasm by farmers in the support for measuring land degradation on their own farms (Wiley, Patterson and Fievez, 1993; as quoted by King *et al.*, 2000), e) the threatening nature of the land conservation subject, f) monitoring being perceived as a negative process by farmers (McCord, 1996; as quoted by King *et al.*, 2000) and g) a feeling by farmers of being assessed (Williams, 1997; as quoted by King *et al.*, 2000). In a recent review of the sustainability indicator literature, Glenn and Pannell (1998) noted that the criteria used to select indicators appear to have no link to the application of the indicators in management and decision-making.

In the Proceedings of the National Workshop on Indicators of Catchment Health, the workshop summary by Williams (1996; as quoted by King *et al.*, 2000) provides an overview of the issues raised and emerging principles that reflect a current 'indicator school of thought'. Major points illustrated in this report concerned with the use of indicators at a community and on-farm level were,

- ❑ Indicators must have meaning to land users, to local and regional catchment committees and to policy development
- ❑ For any indicator program to be of value, it must be driven by the community of interest, not the academics or the research institutions

- ❑ There is a need to be careful in assuming any given value system in judging response to catchment indicators
- ❑ The research on indicators and the development of tools for monitoring must be conducted within a social context and in a participatory manner if we are to gain progress, ownership and innovation.

As with the monitoring system of the Bergville project used on project level, the indicators of concern were defined by people distant from where the events happen and are monitored. Indicators are often identified by senior executive staff or senior staff specialist research units. Some organisations have tried to improve the situation by taking the indicator identification process down the hierarchy. In some cases this has meant using participatory methods to obtain the views of the beneficiaries themselves. The problem with such an approach is the difficulty the organisation then finds in summarising the information produced by a diversity of locally identified indicators. As was concluded in the Bergville study, King *et al.* (2000) suggested that an alternative process for the development of indicators could be a participatory one, where farmers and scientists work from basic principles to develop more specific and appropriate measurements that are based on a common language and meaning and are relevant to particular situations. For example, scientists can work with farmers to develop indicators at a farming systems level.

According to King *et al.* (2000) there are a number of benefits to understanding the indicators that farmers use, how they use them and why they use them. With respect to the development and use of sustainability indicators, farmer knowledge, both content (i.e. the types of indicators) and process (i.e. how to implement indicators) must be seen as valuable and valid. From the literature it emerged that more qualitative M&E approaches, such as 'storytelling', also called the Most Significant Change (MSC) system (Davies and Dart, 2005), and the intelligent use of indicators are not contradictory. MSC, for example, can suggest and highlight appropriate indicators of impact that could then be employed in a more 'formal' impact assessment, or be built back into the system as new domains." (Wedgwood and Bush, 1996; as quoted by Davies and Dart, 2005). King *et al.* (2000) identified indicators during a participatory workshop that could be grouped into four main categories:

- ❑ Farming system components,
- ❑ Management of these components,

- ❑ Management and decision making within the farming system (ie. the interrelationships between components and the sum of these components)
- ❑ External factors that influence and interact with the farming system.

The first three of these categories included indicators that participants (farmers) use which tell them that they are *being more sustainable*. These indicators are referred to as the 'on-farm indicators' and they reflect participants own farming systems. The fourth category includes indicators that participants use that tell them whether they have the *ability to be more sustainable*. These reflect external factors that influence the farming system. The indicators in this category are referred to as the 'off-farm indicators' and reflect the environment external to the farming system.

King *et al.* (2000) gave examples of indicators in all these categories, but of particular interest to this study, since it also ties in well with the PSE and AL tools introduced to the farmers in the pilot study, are the *indicators that reflect the management of the farming system* (i.e. all components and their interrelationships). At a systems level, the two indicators used reflected changes in the management and decision making involved in the entire farming system. That is, the management of all components and their interrelationship (See **Table 5.5**). To view an example of less sustainable and more sustainable farming systems given by King *et al.* (2000) in relation to indicators and corresponding attributes, one attribute, i.e. 'Critical thinking', has been chosen from the table above and is shown in **Box 5.7**.

Table 5.5. Indicators and attributes for management and decision-making within the farming system (King *et al.*, 2000)

Management	Decision Making
Whole farm planning	Critical thinking
Implementation	Reflection about experience
Monitoring	Use of experience
Timeliness of operations	Experimentation

When working with indicators to assess impact, you are trying to create an overall picture built up of various aspects. In a typical project the impact on "quality of life" or "poverty alleviation" is

important. Yet each project component makes a unique contribution: health activities reduced morbidity/mortality, agricultural development helped increase yields and incomes, functional literacy built self-esteem, etc. Therefore, one indicator, or even several will not be adequate to understand the changes. For impact assessments, a descriptive analysis rather than single indicators often better capture the overall changes (IFAD, 2000).

Indicators are often derived from some prior conception, or theory, of what is supposed to happen (deductive). In contrast, MSC uses an inductive approach, through participants making sense of events after they have happened. So a key gap that MSC fills within a monitoring and evaluation (M&E) framework is that it helps us to monitor the 'messy' impacts of our work – including the unexpected results, the intangible and the indirect consequences of our work. By getting this information on a regular basis, and taking time to reflect on what this means, groups of people can alter their direction of effort so that they achieve more of the outcomes they value (Davies and Dart, 2005).

Box 5.7. Sustainability indicator – Critical thinking (King *et al.*, 2000)

Less Sustainable:

Doing things just because the generations before you did it that way, doing what everyone else is doing, making decisions in isolation of the big picture, no ability to change programs or schedules when situations change, not learning from mistakes and being able to then do it better next time

More Sustainable:

Ability to critically think about advise and its application rather than just accepting it, knowing why you are doing something, having options available and being able to choose the most appropriate one, being able to make decisions in relation to the whole system

From a utilization-focused point of view, sampling methods and approaches have room for creativity and innovation. For example, the MSC sampling technique is selective rather than inclusive. Instead of providing information on the 'average condition' of participants, it provides information about exceptional circumstances, particularly successful circumstances. This is referred to as *purposive sampling* (Patton, 1990). Purposive sampling is a legitimate form of data inquiry in qualitative research and forms a dominant part of the logic of qualitative research. Patton states that: "The logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term *purposeful sampling*." The MSC sampling system uses this approach (purposeful sampling) in capturing significant instances of success or failure. The purpose is to learn from these extreme stories, and

ultimately to move extension practices more towards success and away from failure. Therefore the strategy is to select those stories (best practices) from which the most can be learned.

According to King *et al.* (2000) the challenge for the 'indicator industry' now does not seem to be the implementation of existing indicators. The challenge is rather what processes can be facilitated between researchers and farmers so that the development and implementation of indicators is participatory, applicable and provides ownership to those managing the natural resources. **Table 5.6** illustrates a variety of criteria of indicator development and use and lists subsequent approaches that a) have been used traditionally (and are predominant) in R,D&E, b) are current innovative approaches suggested within R,D&E at present, and c) are being suggested by the authors of this paper as elements for future development.

Table 5.6. Traditional, current innovative and suggested future approaches of research towards the development and use of sustainability indicators (King *et al.*, 2000)

Criteria	Traditional Approach	Current Innovative Approach	Suggested Future Approach
Sustainability	Sustainability viewed as a goal	Sustainability viewed as a goal	Sustainability viewed as a process
Validity of indicator	Scientifically valid	Scientifically valid	Negotiated with farmer & scientist
Context of measurement	Static	Dynamic	Dynamic
Monitoring approach	Absolute terms	Relative terms	Relative terms
Assessment approach	Goal orientated	System orientated	Process orientated
Development context	External to farming system	External to farming system	Internal (ie. on-farm)
Basis for farmer input	Content knowledge (often ignored)	Content knowledge (passive)	Content and process knowledge
Focus of research and development	Single discipline	Multi-disciplinary	Multi-disciplinary
Application in policy	Scientific objectivism	Justification of public funds	Joint ownership
Data collection approach	Collection by scientist	Collection by scientist and farmer	Collection by scientist and farmer
Development of indicators	Development by scientist	Development by scientist	Development by scientist and farmer
Paradigm of Extension	Adoption	Adoption	Negotiated learning and action

Another innovative way of using indicators is to build them into 'Decision Trees' or 'Rules of Thumb' as described by Hamilton (1995) and Robertson, Whitbread, Shamudzarira, Kamanga,

Wall, Waddington and Sakala (2002). Rules of thumb are logical propositions that relate two events in a cause-and-effect relationship: "If this occurs (or if I do this), then that happens." Scientists are now delivering simple rules of thumb and decision trees for farmers for use in decisions about where and how to use scarce resources in a risky, low rainfall environment, for example. These rules could, for example, focus on fertiliser, legume, and weeding decisions, which interact substantially to determine sound investment strategies.

According to King *et al.* (2000) the emphasis now, seems to be placed on developing indicators that can be used by farmers in the paddock (field) where change can occur. Furthermore, the facilitation of participatory processes involving farmers and scientists may lead to a better understanding of the use, appropriateness and development of indicators for monitoring and assessing resource condition. With improved monitoring and assessment, farmers may be able to make more informed choices when selecting farm management options.

5.7.9. INSTITUTIONALISE LEARNING AND INNOVATION

There is emerging concern that the long-term effectiveness of action research and multi-stakeholder approaches is limited by a number of barriers, most of which can be classed as social and institutional rather than technical (Allen, 2000; Farrington, Thirtle and Henderson, 1997). According to Pretty (1996) it is a systematic challenge for agricultural and rural institutions, whether government or non-government, to institutionalise these approaches and structures that encourage learning and sustainable agriculture. According to Stroud (2003), the changes sought in research practice to more directly address local capacity needs and support sustainable, self-led change, require supportive changes in institutional operations, arrangements and values. This path of change should lead to a more 'learning type' research system – one that internalises the necessary changes in attitudes, structures and research practices so as to increase responsiveness to local community development needs, consideration of economic, institutional and social aspects, and the ability to positively influence policy (see middle left side of **Figure 5.10**). Raina (2003) stressed that the impact of agricultural research and development (R&D) on different actors or organisations is a function of the structure (scale and scope) of these organisations and more crucially, the institutions or rules that govern them and their learning capabilities. 'If organisations are the players and institutions the rules, then how are the rules changed to enable the envisaged impact of agricultural R&D?'. Stroud (2003) consequently stated that public organisations are, in fact, currently being challenged to embrace a twofold change: to move towards the use of participatory action

research (PAR) approaches in research practice and to become 'learning organisations' so that they can continue to effectively innovate in the future. **Learning organisations**, as defined by Senge (1990), are:

'Organisations where people continually expand their capacity to create the results they desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning together'.

According to Stroud (2003), the learning organisation concept has a number of underlying values that are very similar to those that participatory methodology is aspiring to meet: empowerment of its members, rewards and structures fostering initiative, to learn from uncertainties and take leaps in experimentation, learning through action and promotion of trust, accountability, equity and quality. Asian experience, for example, has shown success in using the learning organisation model for community development (Korten, 1980; as quoted by Stroud, 2003). Stroud (2003) put forward the hypothesis 'that by employing strategies and processes to create a shared vision of effective research and a learning organisational culture, the development and use of new methodologies, such as action research, will be encouraged'. She discussed two approaches to organisational change, namely a 'structural approach' and a 'process approach', which have slightly different emphases, but are not mutually exclusive. The latter implies the need for a *process* to deal with the whole system and its elements in a logical, but iterative way. In the *Dance of Change*, Senge *et al.* (1999; as quoted by Stroud, 2003) highlighted that 'sustaining any profound change process requires a fundamental shift in thinking'. Senge *et al.* (1999; as quoted by Stroud, 2003) divided the change process into three stages. **Initiating change** occurs as soon as a 'pilot' group(s) begins to conduct its work in unfamiliar ways. In the case of action research, many of the participatory integrated NRM practitioners might identify themselves as the 'pilot' group (or 'change team'). The second stage is **sustaining momentum** within the change team and between the team and the larger organisation. Thirdly, **redesigning and rethinking** at the organisational level refers to the stage when change initiatives gain broader credibility and confront the established internal infrastructure and practice of the organisation. Organisational change also requires various supporting conditions (see **Box 5.8**) (Stroud, 2003).

Box 5.8. Supporting conditions required by organisational change (Stroud, 2003)

- A shared commitment between stakeholders
- A clear vision and shared values
- The skills to facilitate reflection and enquiry or to use a 'reflective-learning' process
- Skills in systems thinking, reflective learning and facilitation
- Good mentoring or facilitation
- A learning cycle that promotes a culture of enquiry

Stroud's (2003) view is that organisational change combines 'inner' shifts in people's values, aspirations and behaviours with 'outer' shifts in processes, strategies, practices and systems. Clearly, she said, the organisation must build capacity doing things in new ways; it just doesn't 'do' something new. **Changed thinking is the foundation** so that new strategies, systems and structures can be implemented. In her summary, Stroud stated: 'change is a process and the various stages need to be iteratively understood and managed'. In order to get a good handle on innovation (and change) in an organisation, Ekboir (2003) suggested that, instead of impact indicators for the design of (research) policies, policy-makers should demand the establishment of strong continuous monitoring systems that track the quality of research programs (or change) and their interaction with other agents. However, Raina (2003) reported that even though agricultural research has made a commitment to an 'evaluation culture', there has not been much progress.

Hall, Sulaiman, Clark and Yoganund (2003) discussed case studies that provided reason to believe that the concept of an '**innovation system**' offers a framework for thinking about research and impact as part of a wider learning process (see middle left side of **Figure 5.10**). This implies that evaluation (or M&E) becomes the principle mechanism for strengthening social learning processes that allow organisations to accomplish new tasks and mandates – such as achieving impact or becoming more poverty-relevant. Horton (1998; as quoted by Hall *et al.*, 2003) pointed out that the evaluation community has a rich array of tools and disciplinary perspectives that enhances learning. Lundvall (1992; as quoted by Raina, 2003) and Ekboir (2003) placed learning and the role of institutions as the critical components of **innovations systems**. Ekboir (2003) is also in favour of a *national innovation system (NIS)* composed by all agents involved in the innovation process, their actions, interactions and the formal and informal rules that regulate the system. Features of successful innovation systems identified by Raina (2003) are:

- ❑ Continuous evolutionary cycles of learning and innovation
- ❑ Combinations of technical and institutional innovations
- ❑ Interaction of diverse research and non-research actors
- ❑ Shifting roles for information producers, information users and a need-based exchange of knowledge
- ❑ An institutional context that supports interactions and knowledge flows between actors.

Another point that Hall *et al.* (2003) add to the list above is that we must accept the need to embed **evaluation as learning** in the day-to-day procedures of research staff and administrators and acknowledging the skill and resource implications of this. This implies the need for greater numbers of social scientists in international agricultural research organisations, but with a hands-on role of facilitating learning in addition to disciplinary research contributions. It also implies the need to build learning skills among all partners and to allocate time within the research process for collective learning and reflection. Hall *et al.* (2003) concluded that without the legitimisation of the innovation systems framework (proposed above) and relating learning-based evaluation approaches, agricultural science will remain stuck in repetitive cycles of project implementation and output evaluation. Bereft of learning, it will fail to find better ways to fulfil the social and economic purpose that its significant potential promises.

Box 5.9. Key areas that will emerge under new institutional behaviour (Stroud, 2003)

- Enhanced participation of farmers and local communities in research, including combined use of 'scientific knowledge', local priorities and local analysis, and in direct application of results
- Increased non-traditional skill areas of researchers, including incorporation of social differences, community mobilisation, facilitation, etc.
- Improved ability of research systems to deal with dynamic, complex systems and social diversity: different scales, hierarchies and ranges of options and management principles for different stakeholders
- Enhanced local and research capacity, and some local institutional change, local empowerment and evidence of faster uptake of appropriate technology
- Enhanced research capacity throughout the research system, through the use of partnerships and networking within and across scales

Stroud (2003), however, predicted that there will be more attention given to organisational change in the near future in NRM research institutions. Self-evaluation of organisations will be more common, including reviewing the leadership style, reward and incentive systems, the M&E system, policies, decision-making mechanisms and other components. Organisations will be viewed as systems with cultures that can be consciously adjusted to achieve more effective outputs. There will be change processes in place based on shared visions of impact and linked to change strategies. We envision that the early momentum for change in organisations will be sustained by the necessary support and

appreciation for the role of change in enhancing effectiveness and efficiency. **Box 5.9** shows some of the key areas that will emerge given the new institutional behaviour, norms and rules. In conclusion, Stroud (2003) stated that in an optimistic future, the islands of action research practice would no longer be isolated experiences but would be linked and used within viable 'learning' research organisations. These in turn would be providing services to communities so as to enhance local initiatives in improving their environment and management of their livelihoods.

5.8. SUMMARY AND CONCLUSION

The data analysis and theory development process followed in this chapter, using a combination of SSM, action research and grounded theory methodology, was successful in leading to lessons learned, local theories and recommendations for practical application. The process cycled the research questions of F and M through A to stimulate reflection and ultimately learning and theorising. **Table 5.7** is a summary to enable comparison of F, M and A applicable to soft systems platform development in the Bergville project.

Table 5.7. Summary of F, M and A applicable to soft systems platform development in the Bergville project

Soft system platform strategies	F – Framework of ideas	M - Methodology	A – Area of application
On-farm experimentation	<ul style="list-style-type: none"> ▪ Farming Systems Approach ▪ Farmer Participatory Research ▪ Farmer Field Schools ▪ Experiential learning 	<ul style="list-style-type: none"> ▪ Researcher-managed trials ▪ Farmer-managed trials 	<ul style="list-style-type: none"> ▪ Learning-by-doing ▪ Farmer-to-farmer extension ▪ Monitoring and Evaluation
Training-of-trainers	<ul style="list-style-type: none"> ▪ Farmer Participatory Research ▪ Farmer Field Schools ▪ Experiential learning ▪ Adult learning (andragogy) 	<ul style="list-style-type: none"> ▪ Hands-on training ▪ Learning-by-doing ▪ Informal and interactive lectures ▪ Evaluation and action learning 	<ul style="list-style-type: none"> ▪ Extension officers ▪ 'Movers and shakers' of community development, i.e. local leadership, lead farmers
Farmer-to-farmer extension	<ul style="list-style-type: none"> ▪ Farmer Participatory Research ▪ Farmer Field Schools ▪ Social learning ▪ Experiential learning 	<ul style="list-style-type: none"> ▪ FM trials ▪ Cross visits ▪ M&E ▪ Action learning ▪ Farmer field days ▪ Look&Learn ▪ Learning groups 	<ul style="list-style-type: none"> ▪ Complex Adaptive System ▪ Traditional farming communities ▪ Farmer groups
Local institutionalisation	<ul style="list-style-type: none"> ▪ Farmer Participatory Research ▪ Farmer Field Schools 	<ul style="list-style-type: none"> ▪ M&E ▪ Action learning ▪ Social learning 	<ul style="list-style-type: none"> ▪ Learning groups ▪ Social capital ▪ Networks
Monitoring and evaluation	<ul style="list-style-type: none"> ▪ Action research ▪ SSM ▪ M&E ▪ Experiential learning 	<ul style="list-style-type: none"> ▪ Sustainability Dimensions ▪ Theory-of-Action ▪ Participatory Self-Evaluation ▪ Action Learning ▪ Convergent Interviewing 	<ul style="list-style-type: none"> ▪ Learning and innovation ▪ Adaptive Management ▪ Learning how to learn ▪ Organisational learning

In combination with the SSM research framework summarised in **Table 5.7**, I used cognitive maps to stimulate data analyses, reflection, learning and ultimately theorising. I found that this approach was quite effective in developing three cognitive maps shown in **Figures 5.2, 5.6 and 5.10**, which represent local theories on on-farm experimentation, training-of-trainers, farmer-to-farmer extension, local institutionalisation and monitoring and evaluation.

The cognitive mapping was furthermore of great assistance to structure (conceptualise) the messy or complex situation or data that I analysed in this chapter. Although the reader is not meticulously led through the developmental stages for each cognitive map or 'theory', I found that the use of cognitive maps, either by individual researchers or by research and development teams, has great value as an instrument to develop new theories, or to improve and/or describe current theories and practices. The idea is to, at every step, explore and improve the initial assumptions (or theories) and also describing the new theory with its key concepts, ideas and processes underlying it. The main aim is to amplify and extend the current understandings of the phenomena in question.

These 'local theories', displayed in the form of a single cognitive map, could be easily and well discussed in an attempt to improve their understanding. I believe that this chapter was a successful attempt to generate and discuss the key concepts and ideas forming these theories in the cognitive maps. Although some theories are still in a very initial stage, it serves as a sound platform for further theorising, preferably through an iterative process of action and research.

Significantly, the cognitive maps illustrated how all the project activities are interlinked with each other and that they are all attached, integrated and guided by the main chain, which is the M&E process flowing from the project strategic plan. This phenomenon is an important feature of all the theories illustrated in the cognitive maps.

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CHAPTER 6. SYNTHESIS OF THEORETICAL AND PRACTICAL IMPLICATIONS

6.1. INTRODUCTION

This chapter is a synthesis of the data analysis and theorising results in **Chapter 5**, which flows from the initial understanding of theory as described in **Chapter 3** and the application of initial theories in a Landcare project described in **Chapter 4**. The most suitable approach that emerged for **Chapter 6** was an integration of all the new theories and their implications developed for practical application into an improved theoretical framework that would address the main research questions of this study. This was not an attempt to redesign and describe the framework in detail, but rather to highlight those aspects, new theories and their implications emerging from this thesis, that would improve the local application of it. Essentially then, this chapter is an attempt to summarise the adaptation of the theoretical research framework and the paradigm, methodologies and tools that can be applied among resource-poor farmers in South Africa. Hence, for practical purposes, I used a basic framework of an iterative multi-stakeholder process (MSP) model for sustainable land management, which includes the major phases of the action research cycle, to describe the recommended methodologies, tools and techniques. Where possible, I include tips and guidelines, as well as other recommended reading for a facilitator (user) and link all the elements in the improved model to specific sections and chapters in the thesis.

6.2. A PROPOSED SYSTEMS MODEL

To me the basic structure of the MSP approach described by MSP Resource Portal (2004) and Woodhill (2004) has the most appeal as a systems model facilitating action research for sustainable land management, since it emphasises a continuum in an iterative learning cycle rather than discrete stages. However, to improve the theoretical and practical applicability of the model in this context, this study has demonstrated that the following additional stages could add great value: a) an initial stage to identify and engage stakeholders, b) a proper diagnosis or situation analysis, and c) an exit strategy at the end. The final systems model that emerged from this study has proved to be much more pragmatic, it is based on the common-sense action research cycle of planning, acting, observing and reflecting, with an additional stakeholder analysis phase at the start of the project and an exit strategy at the end. The proposed six phases of the model (**Figure 6.1**) are as follows:

I. Stakeholder analysis

Identify and involve stakeholders from different levels of the multi-stakeholder hierarchy.

II. Diagnosis (Situation analysis)

Observe and describe the situation or farming systems to improve, which include natural, social, physical, financial and human capital assets; mobilizing community interest, and assessing what organizational and institutional arrangements are needed.

III. Planning strategically

Undertaking the detailed planning and strategy development needed for a multi-stakeholder initiative to be successful.

IV. Implementing and managing

Managing the implementation and ongoing resourcing of the initiative and ensuring continued community input and support.

V. Learning and adapting

Monitoring the impact, the successes and failures, learning from these, and continually improving what is being done.

VI. Exit strategy

A final assessment of the impact and sustainability of the intervention; facilitate scaling-up and institutionalisation.

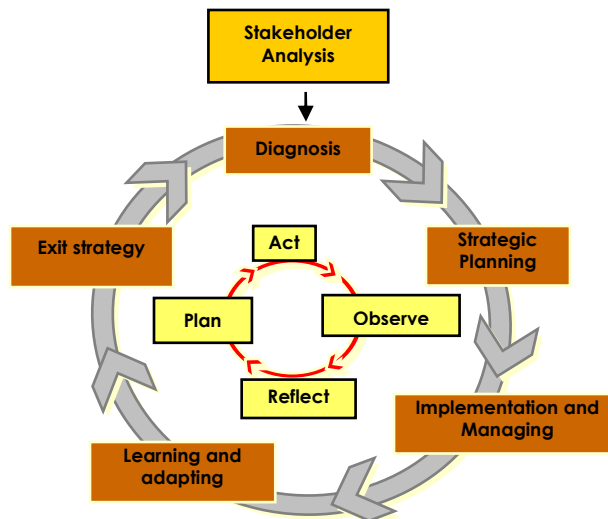


Figure 6.1. The proposed action research model for sustainable land management (Adapted from Woodhill, 2004)

Although the stakeholder analysis, as well as the diagnoses and planning phases were not included in this thesis research process, there have been a number of references to certain important issues at these stages. Hence, I felt it was important to make a few comments and recommendations that address these issues.

6.2.1. STAKEHOLDER ANALYSIS

This study has showed that the **stakeholder analysis** is crucial enough to single out as a separate stage at the initiation of a project. It is at least the point of departure of what an MSP tries to achieve, which is about 'setting up and facilitating long-term processes that bring different groups into constructive engagement, dialogue and decision-making'. It aims to 'get the right people on board right from the start'. Therefore, the key aspect to this systems model should be to place people at "the

starting point, the centre, and the end of each development intervention ... and constructing development projects around the mode of production, cultural patterns, needs, and potential of the populations in the project area". A few vital points that emerged from this study are made that will help to facilitate a **stakeholder analysis** stage, while in **Box 6.1** a few action research tools and techniques are listed that were found to be useful to conduct and facilitate the stakeholder analysis:

Box 6.1. Action research methodologies, tools and techniques useful for stakeholder analysis

Methodologies

- Farming Systems Approach (FSA)
- RAAKS

Tools and techniques

- Classical Brainstorming
- Key informants
- Nominal Group Technique
- Interviews
- Focus group discussion
- Institutional Linkages
- Venn Diagrams
- Matrices

1. Organise a meeting with a small group of stakeholders (key informants) who have a good understanding of the target area and stakeholder situation
2. Brainstorm a list of all possible stakeholders and their position with respect to the project
 - ✓ What are their possible interests and influences?
 - ✓ How do they affect or are they affected (for better or for worse) by what happens in the target community?
3. Identify primary (most relevant) stakeholders and their different levels of operation

- ✓ What and where could they be involved in the [following] stages?
 - ✓ What are their current and potential roles and responsibilities?
4. Make contact with primary stakeholders and invite them to a stakeholder information workshop or focus group discussion
- ✓ Be sensitive about traditional and political protocol
 - ✓ Explain project objectives, impacts, activities, roles and responsibilities
 - ✓ Identify major local or regional issues, official channels and procedures
 - ✓ Identify key partnerships and teams; verify intended roles and responsibilities
 - ✓ Identify target area; discuss tentative target group(s)
 - ✓ Get a broad base of information; make notes
 - ✓ Get the 'feeling' – observe, body language, attitude, etc.
 - ✓ Get the picture or 'photo' of the situation in the target area
5. Develop (and sign, if necessary) a memorandum of agreement and/or a working relationship between different partners.

6.2.2. DIAGNOSIS (SITUATION ANALYSIS)

The diagnostic stage in the proposed systems model leads to the subsequent intervention in the target group. My view is that a wrong diagnosis or inadequate understanding of farm level problems could lead to inappropriate interventions, thus leading to waste of resources which are already limited. Furthermore, this study revealed that the efforts put into the diagnostic stage depend very much on the resources (time, funds, manpower) available, as well as the purpose of the study. If much money and time is available (which is rarely the case), or if the purpose is to design a comprehensive and detailed R&D proposal or implementation plan, such as done through the Agricultural Research for Development (ARD) approach, then the situation lends itself for a very comprehensive and lengthy diagnostic phase. This usually takes anything from a few weeks to a few months. However, if the resources are limited and/or if the study is aimed at the implementation of new interventions and/or the empowerment of end-users (primary stakeholders), then much less time should be planned for and/or required by the diagnostic phase. This could typically be anything from one day to a week or two. Therefore, results of this study imply a careful assessment of what is really required by the project or situation, since it often happens that too many resources are spent on the diagnostic stage, leaving very little for

implementation and empowerment. Furthermore, it is always possible and perhaps more effective to conduct smaller, but more focused diagnostic surveys later on in the project as part of the normal action research cycle. As we experienced in the Bergville project, you normally don't know for certain what to investigate at the start of the project; later-on opportunities emerged that required more focused diagnostic exercises, which should be embarked on within the availability of resources.

Implied by this study, the ideal goal of the diagnostic stage is to analyse, describe and understand the current [farming] system or situation in need of change. The major objectives of the diagnostic phase could be seen as the following:

- ❑ To identify and describe the tentative target group of farmers and the key [farmer] problems and opportunities, which include their socio-economic realities and systems;
- ❑ To collect and study the secondary information related to the target group, e.g. climatic data, land use data, soil and land capability data;
- ❑ To collect, analyse, synthesise and interpret primary data from the target group of farmers through informal or semi-structured survey techniques.

Box 6.2. Action research methodologies, tools and techniques useful for the diagnostic stage

Methodologies	Tools and techniques
<ul style="list-style-type: none"> ▪ Participatory Rural Appraisal (PRA) ▪ Rapid Rural Appraisal (RRA) ▪ Farming Systems Approach (FSA) 	<ul style="list-style-type: none"> ▪ Participatory mapping ▪ Transect walks ▪ Seasonal Calendars ▪ Venn diagrams ▪ Matrix ranking and scoring ▪ Typologies ▪ Timelines ▪ Surveys and questionnaires ▪ Semi-structured interview ▪ Convergent interview ▪ Rich pictures ▪ Classic brainstorming ▪ Nominal group technique ▪ Focus groups ▪ SWOT analysis

Box 6.2 gives an idea of the various action research tools and techniques that were found to be useful in diagnostic stages. Some of the recommended activities of the diagnostic stage that emerged from this study are:

- ❑ Invite relevant stakeholders for involvement in the diagnostic phase; gather at an appropriate, central venue from where the survey will be coordinated.

- ❑ Form data collection (survey) teams, preferably comprised of different disciplines.
- ❑ Identify and design the most appropriate methods of data collection, e.g. the use of checklists or questionnaires or participatory techniques.
- ❑ Conduct a survey to collect the primary data in the target area, which include:
 - ✓ An assessment of the problems, needs, fears and aspirations of the people, as well as their social, economical, physical and human capital assets
 - ✓ The identification and prioritising of the major enterprises in the production system
 - ✓ A description and understanding of the current production system(s) and how they are positioned or operating within the farming system
 - ✓ The identification and prioritising of the major problems with respect to the priority enterprises and an understanding why these problems exist
 - ✓ A definition and analysis of priority problems including establishing causes of these problems and possible systems interactions
- ❑ Development of a *community profile* and/or different farmer typologies among the target group
- ❑ Identify other relevant stakeholders and existing community (social) structures, linkages and/or institutions that should be involved in remaining phases
- ❑ Develop a proposed development structure for the project implementation, communication and management
- ❑ Develop some preliminary solutions/interventions/opportunities on how to solve these problems
- ❑ Facilitate an iterative process with frequent evaluation sessions during the diagnostic phase (event) to identify gaps in the data
- ❑ Orientate and plan the actions of the first/next phase(s)

6.2.3. PLANNING STRATEGICALLY

The strategic planning stage is a crucial step in the systems model. It combines the available new or improved technical knowledge of the scientific community and the indigenous technical

knowledge (ITK) in addressing the identified problems of the target group. For clarity it is necessary to distinguish between the major strategic and spatial planning phase at the beginning of the project and the continuous planning process during the life cycle of the project. Effective strategic planning depends on the information obtained during the diagnostic stage, while continuous planning during the project lifetime depends on the diagnosis and reflection that takes place afterwards (supplementary surveys, observations, crop or soil samples, etc.), the M&E findings and the results of the experiments itself. Planning is like charting out a route to follow on a journey. In the planning step, proper delineation of problems and determination of their causes should lead to identification of potential solutions. So it sets out the steps to follow in order to reach your destination. From the results of this thesis, I recommend the following main objectives for a strategic planning phase:

- ❑ To develop the goal, objectives and outcomes of the project (**Section 4.13.2.3**)
- ❑ To design specific strategies (interventions) on how to reach the project goal and make an impact (**Section 5.7.3**)
- ❑ To develop a monitoring and evaluation (M&E) framework (**Section 5.7.3**)

Based on the results of this thesis, I would like to highlight a number of activities that would make the strategic planning stage more pragmatic and focused. **Box 6.3** gives an idea of the various action research tools and techniques that were found to be useful in the strategic planning stage.

- ❑ Involve all the relevant stakeholders operating on the various levels of the hierarchy in the strategic planning workshop
 - ✓ Make sure all the groups, especially the primary stakeholders, i.e. farmers, extension staff and researchers, are properly represented
 - ✓ Involve subject-matter specialist, e.g. soil scientists, agronomists, economist, M&E specialists, engineers, socio-anthropologists, etc., to improve the quality of the different strategies (interventions)

Box 6.3. Action research methodologies, tools and techniques useful for the planning stage	
Methodologies	Tools and techniques
<ul style="list-style-type: none"> ▪ Participatory Rural Appraisal (PRA) ▪ Logical Framework ▪ Farming Systems Approach (FSA) ▪ Outcomes hierarchy ▪ Soft Systems Methodology (SSM) 	<ul style="list-style-type: none"> ▪ Visioning ▪ Classical brainstorming ▪ Nominal group technique ▪ Decision trees / Flow diagrams ▪ Action planning

- ✓ Use a skilled facilitator with a good understanding of planning methodologies, tools and techniques; clarify the use of these with the stakeholders
- Make sure everybody in the planning team have a thorough understanding of the situation that is in need of change, from data that was collected and analysed during the diagnostic phase.
- Make sure everybody has ownership of the project goal.
 - ✓ Use an appropriate action research technique, e.g. a participatory 'visioning' process, which would give participants 'ownership' of the project goal.
- Clarify and use appropriate methodologies, tools and techniques for the planning process (See **Section 3.7** and **3.8**; See **Box 6.3**).
 - ✓ If many resources are available and/or the purpose is purely to develop a research plan, then a methodology such as a Participatory Rural Appraisal (PRA) or ARD is recommended over an extensive period, e.g. two weeks to three months
 - ✓ If less resources are available and/or the purpose of the study is focused more on implementation and empowerment, the Logframe has proved to be the most systematic and pragmatic methodology (See **Section 5.7.3**; See **Box 6.3**).
 - ✓ If very little resources are available and/or the purpose of the study is focused on implementation and empowerment, something like an Outcomes Hierarchy or a Theory of Action seems to be the most applicable methodology (See **Section 4.13.2.5**; See **Box 6.3**).
 - ✓ If the goals of the project or stakeholders are fuzzy, multiple and/or difficult to agree on, the use of methodology such as SSM is advisable.
- To use time more effectively, facilitate small break-away groups to work on specific tasks
- Allow frequent report-back and evaluation sessions during the strategic planning workshop to improve the quality and feasibility (end-product) of the interventions
- Spend enough time defining the goal and 3 to 5 objectives; make sure the outcomes are clearly defined and SMART (i.e. Specific, Measurable, Attainable, Relevant and Timely) (See **Section 4.13.2.3**)
 - ✓ Define long-term outcomes (i.e. impact) usually achievable within 7 to 10 years
 - ✓ Define medium-term (intermediate) outcomes usually achievable within 4 to 6 years
 - ✓ Define short-term (immediate) outcomes usually achievable within 1 to 3 years
- Develop a comprehensive implementation (and/or process) monitoring framework (See **Section 5.7.3**)

- ✓ List all the proposed strategies necessary to achieve the objectives, which include a sequential layout of the activities or steps involved
- ✓ Develop outputs, assumptions and risks for each of the strategies and/or activities
- ✓ Identify roles and responsibilities for each activity, as well as the relevant timeframe, milestones or frequencies
- ✓ Describe the resources available and/or needed for each strategy/activity
- Develop a comprehensive impact/outcome M&E (or assessment) framework (See **Section 5.7.3**)
 - ✓ List relevant long, medium and short-term outcomes
 - ✓ Develop SMART indicators for each (or selected) outcome(s), as well as thresholds, target values or levels and methods to measure these indicators
 - ✓ Identify roles and responsibilities for implementation (measurement) of the framework, as well as the relevant timeframe and frequency of measurement
- Include sufficient and relevant strategies for effective soft system platform development (see below)
- Facilitate a concise 'action planning' process at the end of the planning workshop to ensure a smooth start (initiation) of the plan, especially in view of the immediate actions that are needed
 - ✓ List the *what, who, how, when, where, with whom* and *outputs* of the actions
- Compile and document the strategic plan, as well as the process(es) followed in the workshop for use as a project management plan, research plan, business plan or project proposal

6.2.4. IMPLEMENTATION AND MANAGEMENT

Implementation and management is from my experience the weakest link in many development projects. The previous stages are usually well executed due to much resources and a great deal of effort put into it, but smooth implementation, especially with regard to the finer and subtler skills of management and facilitation, are usually hard to find.

With respect to the Bergville study, however, implementation and management was relatively successful, which was much needed after a quite ineffective planning process that left the project team with very few tools. If it was not for an innovative methodological design and a commitment to smooth implementation and facilitation, very little impact would probably have been made. The specific methodological design referred to here is that of a 'coupled systems approach', which involves the idea that a system perceived as "hard" (such as natural resources) requires a "soft" platform to manage it in a sustainable manner. The platform development, which implies attention to soft system methodology and action research, was initiated after some disillusionment with the strong linear approach of the FSA, as well as with the lack of a proper 'management framework' for project strategies.

Following the above, I would strongly recommend future practitioners to further exploit action research methodologies for platform development, especially in view of successful implementation and management, but also to scale-out new technology to as many end-users in the target area as possible. The implications that emerged from this study and summarised below are hence based on this concept and include the new theories for local application. I will discuss these improved local theories under the following main headings (methodologies): local institution-building, training-of-trainers, on-farm experimentation, farmer-to-farmer extension, partnerships and awareness-raising. The main methodology, monitoring and evaluation, will be discussed under the learning and adapting stage. **Box 6.4** shows the various action research methodologies, tools and techniques that were found to be useful in the implementation and management stage.

Box 6.4. Action research methodologies and techniques useful for implementing and managing

Methodologies

- Farmer-to-farmer extension
- Farming Systems Approach (FSA)
- Farmer Participatory Research (FPR)
- Farmer Field Schools (FFS)
- Action and adult learning
- Learning-by-doing
- Adaptive management
- Training-of-trainers
- Soft Systems Methodology

Tools and techniques

- On-farm experimentation
- Farmer field days
- Look&Learn Visits / tours
- Institutional linkages / networks
- Hands-on training
- Critical reflection
- Learning events, e.g. action forums
- Action planning
- Media, e.g. radio
- Stakeholder workshops
- Learning groups
- Drama and Role plays

6.2.4.1. LOCAL INSTITUTION BUILDING

The following steps and guidelines are recommended under local institution-building:

- Implement the activities developed in the strategic plan as follows:
 - ✓ Use the process monitoring framework, as well as any additional action planning results, to guide and manage the implementation of these activities
 - ✓ The strategic plan is not 'fixed in concrete' – use it and adapt (improve) it if necessary

- As one of the first steps of implementation and management, design and initiate an extensive series of management (learning) events – from weekly team meetings, informal sessions and monthly action forums, to the more formal annual and mid-term reviews/evaluations (See **Section 5.7.5**)
 - ✓ A monthly action forum, involving at least the primary stakeholders as participants, is a suitable event to identify and coordinate other project related events and activities
 - ✓ Make sure you have learning events on different levels of the stakeholder hierarchy
 - ✓ Participate in (or use) existing events or structures, such as farmer groups/associations, traditional or local authority meetings, departmental research and extension meetings, where it will improve the implementation and impact of the project
 - ✓ Implementing agents can initially take the lead with coordinating and facilitating tasks in these events, but should gradually hand over the responsibilities to local stakeholders, such as farmers and extension officers

- To supplement the above actions, involve the primary stakeholders or project participants in drawing up a comprehensive (diagrammatic) development structure for the project
 - ✓ Indicate all existing or missing/desired institutional linkages, interactions and information flows in the vertical and horizontal levels of the hierarchy
 - ✓ Identify and indicate weaknesses and strengths, i.e. opportunities for capacity building or to learn

- Start to develop facilitation skills among local stakeholders as soon as possible (See **Section 5.4.2**)
 - ✓ Include these topics in training-of-trainers programmes (see below)
 - ✓ Give locals opportunities to facilitate at various learning events
 - ✓ Provide learning tools to farmers and extension officers (see next section below)

- Facilitate the formation of active learning groups among farmers (See **Section 5.6.2**)
 - ✓ Use lead farmers to form small learning groups among their trainees

- ✓ Support lead farmers to facilitate a learning process in these groups
- ✓ Initiate this action when lead farmers have trained enough farmers under them

- Support learning groups to merge with, or influence existing formalised farmer institutions, e.g. farmer associations, or to develop new farmer institutions
 - ✓ Set up meetings and workshops with learning groups and other local social structures to negotiate and develop working arrangements

6.2.4.2. TRAINING-OF-TRAINERS

- Derive criteria for the selection of local (farmer) leaders in collaboration with farming communities, extension officers and other primary stakeholders (See **Section 5.4.2**)
 - ✓ The passion and commitment to get involved with community development should be high on the list of criteria
 - ✓ Work with those farmers who are innovative, natural researchers with an enquiring mind
 - ✓ Farmers should participate voluntarily
 - ✓ Farmers should have the drive and energy to make a difference – people too old or too young usually fall out of the group
 - ✓ Include youth and gender sensitivity in the list of criteria

- Involve various relevant stakeholders to assist with personal interviews and other assessment techniques in selecting a final group of about 20 to 30 farmers during a few evaluation sessions – usually selected from a larger group nominated by the farmers themselves.

- Design relevant training courses (programmes) using the principles of adult and action learning
 - ✓ Include life skills, such as communication, facilitation and training skills, as part of the training programme (See **Section 5.4.3**)
 - ✓ Focus on concepts, principles and practices of the new technology, not only guidelines and packages (See **Section 5.4.3**)
 - ✓ Mostly use visual training materials, as well as activities based on action and adult learning principles

- Organise and coordinate one or two initial major training courses at a venue away from the daily realities of the participants, preferably outside the target area (See **Section 5.4.3**)
 - ✓ Training is continuous, do not assume that all the training needs will be addressed in one or two courses – include a 'training needs assessment' as part of the continuous learning cycle and conduct training courses as need arises
 - ✓ Focus on technical concepts, principles and practices and life skills in the first course and value adding and advanced technical options at later courses
 - ✓ Keep the training courses simple and on the level of the participants
 - ✓ Try to do it in a local language

6.2.4.3. ON-FARM EXPERIMENTATION

- Conduct a participatory planning and design workshop for the on-farm experimentation (See **Section 5.3.2** and **5.3.4**)
 - ✓ Involve all the relevant stakeholders; local researchers experienced in natural resource management issues in the area should form a key component of the group
 - ✓ Communicate and negotiate the purpose(s) of the different experiments; clarify roles and responsibilities, especially those of the primary stakeholders, i.e. farmers, extension and researchers (See **Section 5.3.2** to **5.3.4**)
 - ✓ Clarify the purpose and arrangements (rules) around the provision of land and inputs, both from the farmers and implementing agents' point of view (See **Section 5.3.7**)
- Work through the local extension officers, social and municipal structures and farmers to identify the most suitable site for a **researcher-managed (RM)** trial if this is in the strategic plan
 - ✓ The soil, climate and topography must be representative of most fields in the target area – use available soil maps and selected soil inspections to guide the selection
- If agricultural inputs are used to facilitate **farmer-managed (FM)** trials on farmers' fields, thoroughly discuss and clarify the arrangements with farmers – the development of a 'dependency syndrome' could have a serious negative impact on the sustainability of the project (See **Section 5.3.7**). To minimise any chance of dependency, the following can be considered:
 - ✓ Reduce the size of the FM trials to the minimum; 1000 m² of land might be too big, consider 500 m² or smaller, e.g. 100-200 m²
 - ✓ Mobilise farmers to contribute to the inputs (and overall project) as well – design a model that is acceptable for everyone involved. An example is where the project

- covers about 80% of the cost and villagers cover 10 - 20%, primarily in labour and local materials
- ✓ Facilitate participating farmers to reflect on the purpose of and activities around the FM trials, as well as their roles and responsibilities – frequently discuss it during the project life cycle
- Continually monitor the involvement and interaction of the primary stakeholders, as agreed upon in the strategic planning and experimental design exercises (See **Section 5.3.4** and **Table 5.1**)
 - ✓ In RM trials all primary stakeholders should participate in the design, management and analysis of the experiments
 - ✓ In FM trials, researchers should focus on training, development of guidelines and technical support, while farmers should focus on the design, management and analysis of experiments, extension should provide support and backup throughout
 - ✓ Scientists act as facilitators and advisors when farmers engage in problem definition, experiment design and evaluation
 - Develop farmers' capacity to experiment with and adapt from a 'basket of technologies and management choices' (See **Section 5.3.4.1**)
 - ✓ Facilitate intensive and prolonged interaction between farmers and researchers to build experimentation skills
 - ✓ Facilitate farmers' experiments "to bring back or affirm the inherent ability to adapt technical options to specific farm conditions"
 - ✓ Give farmers training and experience in the design, implementation and evaluation of experiments to increase their capacity for innovation
 - Use simple experimental designs, such as a simple paired design that enables farmers to observe, compare and analyse by themselves
 - Organise and facilitate frequent events (or combine with other events) for everyone to learn and benefit from experimental results and experiences
 - Assist farmers to be equipped to deal with each step of the action learning cycle – include both RM and FM trials
 - ✓ **Observe**, using appropriate and simple field tools and indicators
 - ✓ Analyse through **critical reflection**
 - ✓ Plan, using participatory **action planning**
 - ✓ **Act**, experiment with new ideas, options

- Implement a comprehensive data collection and capturing process to aggregate and analyse experimental results on project level, using computer facilities where possible
 - ✓ On RM trials scientific investigations and indicators could be included
 - ✓ On FM trials, data on human, social and financial capital must accompany indicators on natural capital

6.2.4.4. FARMER-TO-FARMER EXTENSION

- Equip selected lead farmers with the necessary skills to engage in F-F extension exercises with confidence
 - ✓ Use training-of-trainers events to train farmers in these aspects (See **Section 5.4**)
 - ✓ Introduce frequent discussions, reflections and re-training exercises on these aspect during monthly action forums (See **Section 5.6.2**)
- Facilitate a process whereby lead farmers develop a 'model' to conduct their F-F extension process (See **Section 4.13.2.5** and **5.7.3**)
 - ✓ If such an attempt was made during the strategic planning process, revisit and improve the 'logic model' where necessary
 - ✓ If needed, use an appropriate methodology, such as a Theory of Action or Outcomes Hierarchy, to design the model
 - ✓ Ensure that the model consists of at least SMART outcomes, activities to achieve them, as well as indicators to measure and manage the process and outcomes
- Importantly, clearly identify and describe the roles and responsibilities of the primary stakeholders involved in the F-F process (See **Section 5.5**)
 - ✓ Lead farmers' main responsibility is to train/reach as many other farmers as possible and to form and facilitate learning groups
 - ✓ Extension officers serve as trainers, colleagues, facilitators and catalysts, but importantly, they should evaluate the **quality** of the F-F extension and implementation of new technology; they should also assist farmer (learning) groups where necessary
 - ✓ In general, researchers serve as advisors, trainers, colleagues, catalysts, as well as to facilitate project implementation and management, but they could also be involved in support or facilitation of the F-F extension process

- In support of the F-F extension process, implement a series of action research tools and techniques, such as: (See **Section 3.8**)
 - ✓ *Look&Learn* visits, or cross visits and tours, to successful leader or commercial farmers, in other projects in the region, province or country, or even to other countries
 - ✓ Field days, organised by the leader farmers and extension officers
 - ✓ Transect walks through fields/farms of successful groups/farmers
 - ✓ Presentations/talks at social gatherings, e.g. parties, weddings, funerals, church services and other meetings, related or unrelated to agriculture
 - ✓ Radio talks, or newspaper articles
 - ✓ Posters, brochures, pamphlets, booklets
 - ✓ Drama and theatre productions

- Facilitate frequent evaluation events with primary stakeholders, but especially the lead farmers, to improve the F-F extension process (see next section)

6.2.4.5. AWARENESS-RAISING AND PARTNERSHIPS

- Conduct major information days annually as the major awareness raising event for project technologies, activities and achievements
 - ✓ Use the main trial site as venue for these events; plan it properly
 - ✓ Invite important stakeholders higher-up in the hierarchy to attend
 - ✓ Consider a mixture of local (especially farmers) and external stakeholders as speakers; keep to relevant topics and steer away from political rhetoric
 - ✓ Show participants demonstrations of new technologies and practices; involve local/leader farmers to lead the demonstrations/discussions

- Support lead farmers and extension officers to conduct a series of farmer field days in their respective communities (see above)
 - ✓ Supply these groups with small donations (e.g. R200 per group) to organise their field day
 - ✓ Field days should be built around the FM trials

- Develop posters, brochures, pamphlets, booklets and other material to support the awareness raising events/campaign

- ❑ Identify and form relevant partnerships where there is a lack of capacity to perform or improve certain services and actions in the project (See **Section 3.7** and **4.12**)
 - ✓ Use partners with some shared goals and values at international and multi-lateral, regional, country and governmental levels, as well as on district and community levels
 - ✓ Continuously evaluate and manage the partnership and its intended outcomes

6.2.5. LEARNING AND ADAPTING

As I pointed out at a number of occasions in this thesis, I see the Learning and Adapting stage of the action research model as the driving force, the propeller, of the whole process. This stage, which includes a range of action research methodologies, tools and techniques (See **Box 6.5**), is continuously focusing the whole project towards its intended results, through a vigorous learning process that supports (project) management and which results in performance. From my experience, however, there is a general lack of capacity in development projects to execute this stage well. This in turn results in projects that simply 'don't know whether they are doing something good, or not', which summarises a general inadequacy of projects to perform or to make an impact.

Box 6.5. Action research methodologies, tools and techniques useful for learning and adapting

Methodologies	Tools and techniques
<ul style="list-style-type: none"> ▪ M&E ▪ Adaptive management ▪ Outcomes Hierarchy ▪ SSM ▪ Theory of Action ▪ 'Check' approach 	<ul style="list-style-type: none"> ▪ Learning events, e.g. action forums ▪ Action planning ▪ Critical reflection ▪ Stakeholder review workshops ▪ Participatory Self-evaluation ▪ Action learning diary ▪ Story telling ▪ Decision trees or Rules of thumb ▪ Process use ▪ Evaluation questions ▪ Indicators ▪ Participatory mapping

In this light I would strongly recommend to practitioners to invest in either contracting M&E expertise, or over the medium to long term, develop this expertise within the group or institution. Without that it is virtually impossible to claim any substantial successes or impact with development projects. Investing in M&E expertise would change groups or institutions from stagnant to '*active, re-active and adaptive*'. From my experiences and analysis described in this thesis I would like to recommend a number of actions, which I feel are quite critical and would greatly contribute to existing theories in the context of this study. These actions focus on

new ideas and concepts or adaptations of current theories that emerged from this study and I refer interested people to the references listed in this thesis for a more general overview of specific parts. In fact, one of the main reasons why M&E (or evaluation) is used and recommended as such a prominent methodology in this stage is the exhaustive source of literature and guidelines that supports it. From the thesis research results, the following improved or adapted theories have emerged for local application:

- Use the M&E framework(s) developed during the strategic planning stage as basis for learning and adaptive management (See **Section 5.7.3** and **3.7**) – implement all strategies (methodologies) according to the M&E calendar/schedule during evaluation events
 - ✓ Continuously use, evaluate and modify the logic model(s), or theory, created during the strategic planning process - be active, reactive and adaptive
 - ✓ Develop new logic models, if necessary, e.g. on different levels, with different purposes
 - ✓ Link models/processes on different levels of the stakeholder hierarchy
 - ✓ Use implementation and process monitoring to ensure effective operations and execution of activities

- Facilitate a participatory M&E process where all primary stakeholders are actively involved (See **Section 3.7** and **5.7**)
 - ✓ Make sure everyone understands their role and responsibility – do training if necessary
 - ✓ Develop capacity among the local stakeholders to facilitate the process themselves
 - ✓ Design and implement sufficient participatory action research tools and techniques to be used in the process, e.g. participatory mapping, action planning, critical reflection, etc. (See **Section 3.8** and **Figure 6.5**)

- Facilitate a series of frequent evaluation events: (See **Section 5.7.5** and **Figure 5.12**)
 - ✓ **Weekly staff and learning group meetings:** implementation problems signalled and corrected; training aspects addressed
 - ✓ **Monthly action forum:** responsibilities, activities and schedules checked and coordinated; problems discussed and corrected; re-training when needed;
 - ✓ **Bi-annual steering committee reviews:** review of project progress and impact; discussion of results, strategies and improvements
 - ✓ **Annual participatory reviews:** primary stakeholders review relationships and impacts; discuss and correct problems

- ✓ **Mid-term review:** progress towards impact reviewed, strategic directions assessed and significant changes made
 - ✓ **Post-ante impact assessment:** assess impact and sustainability of project; key successes celebrated and mistakes identified, both are basis for lessons learned
- Maximise learning - foster a culture of '**critical thinking or reflection**' during these evaluation events (See **Section 5.7.5** and **Figure 5.12**)
- ✓ Apply appropriate action research tools and techniques, such as a **reflective practice** process
 - ✓ Ask the difficult questions, such as: "Why is this happening?"
 - ✓ Formulate 'lessons learned' properly so that it has the potential to improve action
- Use process monitoring to improve learning and to steer and shape the processes to focus on impact (See **Section 5.7.6** and **3.7**)
- ✓ The following questions will guide the process evaluation: What's happening and why? How do the parts of the program fit together? How do participants experience and perceive the program?
 - ✓ Take stakeholders through the thinking process that the evaluation requires – make use of this 'process' to help stakeholders learn
- Empower farmers with simple evaluation (action research) tools and techniques to 'learn how to learn' and to develop an adaptive management culture among individuals and learning groups (See **Section 3.7** and **5.7.7**)
- ✓ These learning tools should be based on the principles of action (experiential) and adult learning
 - ✓ The following tools and techniques are inter alia recommended: participatory self-evaluation, action planning, action learning diary, 'M&E made simple', story-telling (See **Section 3.7, 4.13.2.6** and **5.7.7**)
- Use indicators creatively (See **Section 3.7** and **5.7.8**)
- ✓ Indicators must be relevant to the decisions made by the various stakeholders in the project
 - ✓ Land managers or communities must be involved in and benefit from any indicator developed or used

- To assess impact or sustainability, or to demonstrate accountability, use a framework or process where indicators on different levels (e.g. community and district) can be aggregated up to levels required for policy analysis at provincial and national levels (See **Section 3.7, 5.7.4 and 5.7.8**)
 - ✓ Use a qualitative framework or structural model for a meaningful linkage (or aggregation) of the indicators
 - ✓ Examples of frameworks that are useful are: Sustainability Dimensions and the 'five capital assets for sustainable development' i.e. natural, social, human, physical and financial capital

6.2.6. EXIT STRATEGY

An 'exit strategy' marks the end of an empowerment process that ultimately leads to sustainability. Although it is unforeseen that a project starts to address sustainability issues and processes only at the end of the project's life cycle, there are certain aspects that need careful attention during the last phase(s) of the project in order to maximise the chances of sustainability after project closure. Usually funding agencies and other clients insist on an exit strategy, perhaps not knowing exactly what it entails. Maybe they simply want to see that they had their money well spend, that the project achieved some impact, or they only want to feed politicians 'some' information that would hopefully satisfy them. I feel, however, there is a responsibility on the implementing agents to maximise impact and sustainability at the end of the project, or at least to assess what the situation is in this regard. One should guard against a quick exit from the project; it should rather be a gradual and smooth 'phasing-out' of activities. What I would therefore like to recommend are a few critical concepts (methodologies and steps) that would, according to my experience and analysis in this thesis, contribute to a proper exit strategy. The following are recommended:

□ **Focus through M&E**

It is essential to focus the last scaling-out (implementation) phases of the project very scrupulously, which is only possible through a sound action research process using a methodology such as M&E. Whatever has been and is being learned through a vigorous process of action, observing, reflecting and planning, must now manifest in clear and

adaptive decision-making on all levels, guiding a meaningful exit strategy. The following strategies proved to be the most important:

- ✓ Handing-over, evaluating and support of project management to local stakeholders, i.e. extension staff and/or farmer leadership or institutions
- ✓ Provision of technical support, e.g. experimentation, land management alternatives, etc.
- ✓ Evaluate sustainability of project – usually a post-ante impact assessment is helpful, using any one or a mixture of the following methodologies: surveys, aggregation of M&E indicators and/or sustainability frameworks
- ✓ Rigorously debate about institutionalisation, scaling-up, organisational learning and innovation (see below)

□ Institutionalisation

The State is not a good manager of natural resources. All the evidence points to the need for active involvement of local people in managing the resources they depend upon, and in planning their own development. But they need institutional support from various levels of the stakeholder hierarchy, including the government. From the analyses and results of this study, the following is recommended as part of, or being influenced by the exit strategy (See **Section 3.4, 5.6** and **5.7.9**):

- ✓ Design and implement institutional change (and social transformation) in terms of larger and longer-term transition processes – use a long-term multi-stakeholder process
- ✓ The development of platforms for decision-making at local and district level – e.g. the monthly action forum, could become the formal communication forum for the local farmer institutions
- ✓ Policies or programmes that help build up effective middle-level (district) institutions, creating strong bridges over the existing institutional gap - new middle-level institutions are more likely to succeed if they are linked with what communities already have, e.g. leader farmers, learning groups, farmers associations
- ✓ Responsive, effective services provided at district level, supported by an increase in human (knowledge and skills in process and technical areas) and social (social networking and cooperation) capital
- ✓ Empower and work with local institutions, such as farmer groups/associations, church groups, and traditional authorities, as local resource management requires significant investment in human capital development, in local education and in building quality partnerships for learning and action research
- ✓ Ensure these local farmer institutions have strong linkages with credit- and input-suppliers, manufacturers and markets
- ✓ In big countries, coordination across districts and provision of specialist services at provincial level. In very small countries, cooperation within the larger region.

- ✓ Strategic direction and redistribution of resources at national level, such as policies, expertise and funding allowing researchers to work collaboratively with primary stakeholders and institutions on district and community level

□ **Scaling-up**

Analysing the issues impacting on long-term sustainability in the Bergville project, I found the institutionalising of participatory action research methodologies, as well as sustainable agriculture technologies (such as CA) necessary on higher-levels of the hierarchy. In this respect, my definition of scaling-up is 'a concerted effort with higher-level stakeholders to assist them in policy, institutional and resource user capacity development'. The following steps are recommended (See **Section 3.4** and **5.6**):

- ✓ Organise a series of workshops with stakeholders on various levels of the hierarchy – share lessons learned in the project, including results and recommendations
- ✓ Identify opportunities for collaboration, consultation, facilitation and technical assistance, e.g. new localities/areas to scale-out
- ✓ Identify and solve problems and agree on a way forward

□ **Institutionalise learning and innovation**

It is a systematic challenge for agricultural and rural institutions, whether government and non-government, to institutionalise approaches and structures that encourage learning and sustainable agriculture. From the experiences and analysis of this thesis I would recommend to public organisations to embrace a two-fold change: firstly, to move towards the use of participatory action research (PAR) approaches in research practice and secondly, to become 'learning organisations' to effectively facilitate innovation in the future. This 'learning type' research system is one that internalises the necessary changes in attitudes, structures and research practices so as to increase responsiveness to local community development needs, consideration of economic, institutional and social aspects, and the ability to positively influence policy. To sustain this profound change process, the following three stages are recommended (See **Section 5.7.9**):

- ✓ **Initiating change** as soon as a 'pilot' group(s) begins to conduct its work in innovative ways. In the case of action research, many of the participatory integrated NRM practitioners might identify themselves as the 'pilot' group (or 'change team').
- ✓ **Sustaining momentum** within the change team and between the team and the larger organisation using action research tools at frequent learning events.

- ✓ **Redesigning and rethinking** at the organisational level - change initiatives gain broader credibility and confront the established internal infrastructure and practice of the organisation.

Organisational change combines 'inner' shifts in people's values, aspirations and behaviours with 'outer' shifts in processes, strategies, practices and systems. To achieve that, organisations must build capacity doing things in new ways. The following is recommended to develop this 'changed thinking' so that new strategies, systems and structures can be implemented (See **Section 5.7.9**):

- ✓ An 'innovation system' that offers a framework for thinking about research and impact as part of a wider learning process
- ✓ Introduce evaluation (or M&E) as the principle action research methodology for strengthening social learning processes that allow organisations to accomplish new tasks and mandates
- ✓ Involve more social scientists in agricultural research organisations, or people equipped for a hands-on role of facilitating learning in addition to disciplinary research contributions
- ✓ Build action research or learning skills among all partners and allocate time within the research process for collective learning and reflection.

6.3. RECOMMENDED READING AND REFERENCES

DEFOER, T. & BUDELMAN, A., 2000. *Managing Soil Fertility in the Tropics. A Resource Guide for participatory learning and action research.* ISBN 90-6832-128-5. *A very practical guide that provides detail descriptions and illustrations of participatory tools used during each phase. Emphasise the use of resource-flow maps with farmers.*

HERWEG, K. & STEINER, K., 2002. *Impact Monitoring and Assessment. Instruments For use in Rural Development Projects with a focus on Sustainable Land Management.* Buri Druck AG, 3084 Wabern, Switzerland. ISBN: 3-906151-58-1. *Provides a simple and practical approach and discussion of various tools for M&E, specifically aiming at impact.*

IFAD, 2000. *Managing for impact in rural development: a guide for project M&E.* [Online] <http://www.ifad.org/evaluation/guide/index.htm> [Date of access: 11/10/2004]. *A very comprehensive guide for project and programme managers giving detailed information on*

many important issues during each phase. M&E specialists, especially those that use Logframes, will find it very useful.

KELLOGG FOUNDATION, 2004. Logic model development guide – using logic models to bring together planning, evaluation and action. [Online] <http://www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf> . *A very unique way of using 'logic models' – I found the description of various M&E principles and concepts most useful.*

MATATA, J. B. W., ANANDAJAYASEKARAM, P., KIRIRO, T.N., WANDERA, E.O. & DIXON, J., 2001. Farming Systems Approach to Technology Development and Transfer. FARMESA, Harare, Zimbabwe. ISBN 0-7974-1981-0. *Gives a good insight of what is required during some of the phases, but I found the discussion of the diagnostic and experimentation methodologies most useful.*

NORMAN, D.W., WORMAN, F.D., SIEBERT, J.D. & MODIAKGOTLA, E., 1995. The Farming Systems Approach to Development and Appropriate Technology Generation. FAO, Rome. ISBN 92-5-103644-6. *Very similar to the latter reference.*

PATTON, M.Q., 1997. Utilization-Focused Evaluation: The New Century Text. Third Edition. Sage Publications, Thousand Oaks, California. ISBN No. 0-8039-5265-1. *A very informative book on various M&E concepts and uses - easy to read and, of course, focused on the usefulness of M&E processes and findings.*

SELENER, D., 1998. Participatory Action Research and Social Change. Global Action Publications, Quito, Ecuador. ISBN 9978-95-130-X. *I found this book a very good theoretical account of participatory action research within agriculture – provides and describes the linkage to farmer participatory research, especially with regards to the role of the researcher.*

STRINGER, E.T., 1999. Action Research. Second Edition. Sage Publications, Thousand Oaks, California. ISBN No. 0-7619-1712-8. *I found this book makes the relevant concepts and methods*

very accessible to practitioners and students. Every procedure described is accompanied by step-by-step instructions, making it very useful in practice.

UPHOFF, N.T., ESMAN, M.J. & KRISHNA, A., 1998. *Reasons for Success: Learning from Instructive Experiences in Rural Development*. West Hartford, Conn: Kumarian press. ISBN 1-56549-077-0. *If you have doubt on any aspect of your own rural development approach, there is a good chance that this book will enlighten you.*

WOODHILL, J. & ROBINS, L., 1998. *Participatory evaluation for Landcare and Catchment groups: a guide for facilitation*. Greening Australia, Yarralumla ACT. *Perhaps one of the most practical and simplest M&E (and project management) guides for practitioners - highly recommendable, especially for beginners.*

6.4. SUMMARY AND CONCLUSION

It is challenging to design and implement an action research process that lives beyond a project, once funding and technological and human resource support is withdrawn. However, I believe that the 'systems model for sustainable land management' described in this chapter, would contribute to such a process. This chapter synthesise a few essential 'ideas and concepts' that emerged from this thesis, which improves or adapts current theories for the design and implementation of an action research process among resource-poor farmers in South Africa. The most important outcomes of this model are that it provides a means to create a culture of learning that would allow people to be innovative and interactive and to change among changing circumstances, to bring individuals and groups with similar goals and values together, to change the behaviour of farmers, practitioners and politicians, and to collectively care and manage the highly threatened and degraded, but in some cases underutilised natural resources.

CHAPTER 7. POSTSCRIPT

In **Chapter 1** I discussed my personal journey and discovery of a new approach using a family of methodologies dealing with complex and fuzzy rural situations in need of change. Looking back at this journey, I can truly say it was eventful and exciting, but sometimes painful and disheartening. My experiences were mostly incredibly challenging and enjoyable, but sometimes frustrating and frightening. Learning from these experiences was unavoidable and it continuously emerged in various forms and occasions, like a river steadily feeding the ocean. My main belief at this stage is that one should *make the most of every learning opportunity*. Creating (new) opportunities, using existing platforms and rebuilding old social (communication) networks, should be high on your agenda in designing a long-term learning process with a multitude of stakeholders.

I realise that my own role in the Bergville project was to some extent influenced by my personal values and intuition. I have a passion for the plight and challenges of rural people in South Africa, and I believe that many of the root problems and solutions to the poverty issue lie in these areas. At the start of the project, I had few preconceived ideas and little knowledge about the final outcomes, but I was excited and positive and believed that the solution lay in following the 'correct approach', which is built on sound principles and theories. I did not put everything in a box and did not get disillusioned (or excited) at every deviation. My natural (intuitive) approach allowed me to *deal with things as they 'emerged'* and I now realise that this philosophy fits in well with this type of work. To my own surprise the end-result has proven how well it actually worked – an innovative methodological design, able to change the livelihoods of people, developed through a process of action and research. I also realised that intuition, together with a passion for the cause, are important elements, but you need more than that for success. You sometimes (probably more often than not) *must allow the methodology to guide your thoughts and actions*. Apart from methodological design, my own ideas and values have also been shaped (and changed) through frequent critical reflection.

Following from the above-mentioned, I believe one should as far as possible use methodologies and techniques that fit well with your personality and style – don't use theatrical and comical role-plays when you are an introvert or more reserved type of person. I think there are options (techniques) that can work for each one of us. Since time was of the essence to achieve all the intended outcomes, I sometimes perhaps played too strong a role just to 'get things done'. I

realise that the issue about the nature and place of the facilitator in this specific context need further debate. But I intuitively believe that the ideal would be to 'hand over the stick' as much as possible in order to develop the much needed ownership and capacity in the group. Perhaps one needs to be even more innovative and experiment with different techniques to facilitate learning over a short period.

By working in this environment, it is a given that you will meet different kinds of people and personality types. With most people I built healthy relationships, but with a few it was really difficult to find my way. Sometimes I felt totally incompetent by not being able to reach out to certain people. I now realise that it is in fact impossible to personally satisfy everyone – trying to do that is a certain road to failure. On other occasions I had to resist myself to get involved with personal problems, for example people who wanted to borrow money from me. Firstly, I would like to suggest to people finding themselves in these situations to focus on the bigger picture of community wellbeing rather than personal gain. One could easily aggravate the 'dependency syndrome', rather than helping to resolve it. Secondly, since we do need to be people-oriented (i.e. dealing with people's real issues), I believe the solution lies in creating an atmosphere of trust and understanding within the group; it ultimately influences group dynamics and inter-personal relationships to a great extent. Although most people (in the Bergville project) were willing to participate freely, they also wanted to have a nice time, relax and enjoy themselves. Trying to push people too hard or too far, being too serious about your objectives and methodologies (task driven), could create some tension and conflict. One should somehow be able to read the mood of the group and use an innovative approach to engage with them and facilitate the learning process. For example, by using diverse or specific 'personalities' in the group (e.g. people that can make others laugh and relax) and a combination of appropriate tools (e.g. an ice-breaker together with a song), can help to 'make the most of the opportunity'. The point that I want to highlight here, is that *it is critical to influence the morale and manage relationships in the group*, since it is the foundation of the whole project.

Finally, I realise that the impact of the Bergville project might be small in view of the broader picture of sustainability in South Africa. The human and social capital, as well as the conservation agriculture practices developed might even disappear due to one or another shortcoming of the project, or perhaps due to a lack of institutional support afterwards. However, I am content realising that this thesis will carry on the message and lessons learned in Bergville, inspiring and guiding other passionate practitioners in rural development around the world, hopefully giving them the courage to change many more communities in need of change.

CHAPTER 8. REFERENCES

- ABBOT, J. & GUIJIT, I., 1998. Changing views on change: participatory approaches to monitoring the environment. SARL Discussion Paper No. 2. ISBN No. 1560-2192.
- ACKERMANN, F. & EDEN, C., 2001. SODA – journey making and mapping in practice. In: Rosenhead & J. Mingers (eds). *Rational Analysis for a Problematic World Revisited*. John Wiley & Sons, Chichester.
- ACKERMANN, F., EDEN, C., & CROPPER, S., 1992. Getting started with cognitive mapping. Published as a tutorial paper at the 7th Young OR Conference, University of Warwick, 13-15 April. [Online] <http://www.banxia.com> [Date of access: 29/06/2006].
- ALLEN, W.J., 1997. Towards improving the role of evaluation within natural resources management R&D programmes: the case for 'learning by doing'. *Canadian Journal of Development Studies* 80, 629-643.
- ALLEN, W.J., 2000. Future directions for research into collaborative learning – helping people maximize the use of technical information within multi-stakeholder environmental management contexts. NRM-Changelinks Working Paper No. 2. [Online] <http://nrm.massey.ac.nz/changelinks/directions.html> [Date of access: 23/02/2004].
- ALLEN, W.J., 2001. Working together for environmental management: the role of information sharing and collaborative learning. PhD (Development Studies), Massey University.
- ALLEN, W.J., KILVINGTON, M., NIXON, C. & YEABSLEY, J., 2002. Sustainable development extension. MAF Technical Paper No: 2002/03. Prepared for New Zealand Ministry of Agriculture and Forestry. ISBN: 0-478-07663-0.
- ANANAJAYASEKERAM, P. & RUKUNI, M., 1989. Institutionalisation of on-farm research with Farming Systems Perspective in eastern and southern African region: achievements and future directions. *Zimbabwe Journal of Agricultural Research* 29, 67-82.

- ANANDAJAYASEKERAM, P., TORKESSON, A. & DIXON, J., 1999. Emerging participatory approaches to technology development and transfer – what is new? Paper presented at the 7th regional Farming Systems Symposium, Gaborone, Botswana, December 14-17, 1999.
- ARGYRIS, C., 1983. Action science and intervention. *Applied Behavioral Science*, 19, 115-140.
- ARGYRIS, C. & SCHÖN, D.A., 1974. Theory in practice: increasing professional effectiveness. San Francisco, CA.: Jossey-Bass.
- ARGYRIS, C. & SCHÖN, D.A., 1978. Organisational Learning: A Theory of Action Perspective. Reading, MA: Addison-Wesley.
- ARNON, I., 1989. Agricultural research and technology transfer. Elsevier Science Publishers LTD, London and New York.
- ASHBY, J.A., 1990. Small farmers' participation in the design of technologies. In: M.A. Altieri and S.B. Hecht (eds): Agroecology and small farm development. CRC: Florida. pp. 245-253.
- BASKERVILLE, R.L. & PRIES-HEJE, J., 1999. Grounded action research: a method for understanding IT in practice. *Accounting Management and Information Technologies* 9, 1-23.
- BASKERVILLE, R.L. & WOOD-HARPER, A.T., 1996. A critical perspective on action research as a method for information systems research. *Journal of Information Technology* 11, 235-246.
- BAWDEN, R.J., MacADAM, R.D. & VALENTINE, I., 1984. Systems thinking and practices in the education of agriculturalists. *Agricultural Systems* 13, 205 - 225.
- BELIN, R. & BOXELAAR, L., 2001. Rethinking action research: theory and extension practice. APEN International Conference. University of Southern Queensland, Toowoomba, Australia, 3-5 October 2001. ISBN 1 920842 11 X.
- BEMBRIDGE, T.J., 1984. A Systems Approach Study of Agricultural Development Problems in Transkei. PhD Thesis. University of Stellenbosch, South Africa.

- BENOR, D. & HARRISON, J.Q., 1977. *Agricultural Extension: The Training and Visit System*. The World Bank: Washington.
- BIGGS, S.D., 1980. Informal research and development: the failure of farmers to adopt new technological packages entirely may be a sign of creativity rather than backwardness. *CERES* 13, 23-26.
- BURROUGH, P.A., 1997. Geo-information needs: effects of scale. In: *Proceedings of the International Conference on Geo-information for Sustainable Land Management*, 17 – 21 August, Enschede, The Netherlands. *ITC Journal* 1997 – 3/4.
- BUTCHER, M., 2001. LogFrames made easy. *PLA Notes* 41, 51-52.
- CAMP, K.G.T., 1995. *The Bioresource Units of KwaZulu-Natal*. Cedara Report N/A/95/32. KZN Department of Agriculture. Pietermaritzburg.
- CAMP, K.G.T., 1999. *Guide to the use of the Bioresource Programme*. Cedara Report No. N/A/99/1. KZN Department of Agriculture. Pietermaritzburg.
- CARTER, M.R., 1996. Concepts of soil quality. *Proceedings International Symposium. Advances in Soil Quality for Land Management: Science, Practice and Policy, 1996*. Centre for Environmental Management, University of Ballarat. pp 5-9.
- CARR, W. & KEMMIS, S., 1986. *Becoming Critical: Knowing Through Action Research*. Melbourne: Deakin University.
- CHAMBERS, R., 1989. Reversal, institutions and change. In: R. Chambers, A. Pacey and L.A. Thrupp (eds): *Farmer First: farmer innovation and agricultural research*. Intermediate technology publications, London.
- CHAMBERS, R., 1990. Farmer-first: a practical paradigm for the third agriculture. In: M.A. Altieri and S.B. Hecht (eds): *Agroecology and Small Farm Development*. CRC Press, Florida, pp. 237-244.

- CHAMBERS, R. & GHYLDYAL, B.P., 1985. Agricultural research for resource-poor farmers: the farmer-first-and-last-model. *Agricultural Administration* 20, 1-30.
- CHECKLAND, P.B., 1981. *Systems Thinking, Systems Practice*. Wiley, Chichester.
- CHECKLAND, P.B., 1985. From optimizing to learning: a development of systems thinking for the 1990's. *Journal of the Operational Research Society* 36, 757-767.
- CHECKLAND, P.B., 1991. From framework through experience to learning: The essential nature of action research. In: H-E Nissen, H.K. Klein & R. Hirschheim (Eds.). *Information Systems Research: Contemporary Approaches and Emergent Traditions*. Amsterdam: North-Holland.
- CHECKLAND, P. & HOWELL, S., 1998. *Information, Systems, and Information Systems: Making Sense of the Field*. Chichester, UK: Wiley.
- CHECKLAND, P. & SCHOLE, J., 1990. *Soft Systems Methodology in Action*. Wiley, Chichester.
- CLARK, R. & TIMMS, J., 2000. *Continuous improvement and innovation – the Better Practices Process*. The Rural Extension Centre, Gatton, Australia.
- COGLAN, D., DROMGOOLE, T., JOYNT, P. & SORENSEN, P., 2004. *Managers Learning in Action*. London: Routledge.
- CONWAY, G.R., 1994. Sustainability in agricultural development: trade-offs between productivity, stability and equitability. *Journal for Farming Systems Research-Extension* 4, 1-14.
- DALAL-CLAYTON, B., DENT, D. & DUBOIS, O., 2003. *Rural Planning in Developing Countries – Supporting Natural Resource Management and Sustainable Livelihoods*. London: Earthscan Publications.
- DAMES & MOORE, 1999. *National Heritage Trust mid term review of the National Landcare Programme*. Department of Agriculture, Fisheries and Forestry, Australia. Dames & Moore – NRM, Australian Capitol Territories (ACT).

- DAVIES, R.J. & DART, J.J., 2005. The 'Most Significant Change' (MSC) technique – a guide to its use. Version 1. [Online] <http://www.mande.co.uk/docs/MSCGuide.htm> [Date of access: 20/07/2005].
- DAVIES, L. & LEDINGTON, P., 1991. *Information in Action: Soft Systems Methodology*. Basingstoke, Hampshire: Macmillan.
- DEFOER, T. & BUDELMAN, A., 2000. *Managing soil fertility in the tropics. A Resource Guide for Participatory Learning and Action Research*. ISBN 90-6832-128-5.
- DENT, M.C., 1995. Strategic issues in water resource modelling in southern Africa. *Agricultural Engineering in South Africa* 27, 31-38.
- DENT, M.C., 1996. Individual and organisational behavioural issues relating to water resources simulation modelling and its role in integrated catchment management in southern Africa. M.B.L Thesis, UNISA, South Africa.
- DEPARTMENT OF AGRICULTURE (DoA), 2005. Comprehensive Agriculture Support Programme (CASP) and Landcare business plan for the Department of Agriculture, 2005/2006. National Landcare Secretariat Help Desk. [Online] <http://www.nda.agric.za/docs/landcarepage/landcare.htm> [Date of access: 25/11/2005].
- DFID (Department of Foreign and International Development), 2001. Sustainable Livelihoods Guidance Sheets. [Online] http://www.livelihoods.org/info/guidance_sheets_pdfs/cover.pdf [Date of access: 20/09/2005].
- DICK, B., 1990. *Convergent interviewing*. Version 3. Brisbane: Interchange.
- DICK, B., 1991. *Helping Groups to be Effective – Skills, Processes and Concepts for Group Facilitation*. Interchange, Chapel Hill, Australia. ISBN No. 1 875260 099.
- DICK, B., 1993. Thesis resource paper. You want to do an action research thesis? [Online] <http://www.scu.edu.au/schools/gcm/ar/art/arthesis.html>. [Date of access: 15/06/2004]

- DICK, B., 1997a. What is "action research"? Occasional pieces in action research methodology, No. 2. [Online] <http://www.scu.edu.au/schools/gcm/ar/arm/op002.html> [Date of access: 03/11/2005].
- DICK, B., 1997b. Approaching an action research thesis: an overview. [Online] <http://www.scu.edu.au/schools/gcm/ar/arp/phd.html> [Date of access: 16/03/2006].
- DICK, B., 1998. Convergent interviewing: a technique for qualitative data collection [Online]. <http://www.scu.edu.au/schools/gcm/ar/arp/iview.html> [Date of access: 08/04/2005].
- DICK, B., 1999a. Action research and publication. [Online] <http://www.scu.edu.au/schools/gcm/ar/arp/research.html> [Date of access: 15/03/2006].
- DICK, B., 1999b. Grounded theory revisited (1). Occasional pieces in action research methodology, No. 25. [Online] <http://www.scu.edu.au/schools/gcm/ar/arm/op025.html> [Date of access: 02/11/2005].
- DICK, B., 2000a. Grounded theory revisited (3). Occasional pieces in action research methodology, No. 27. [Online] <http://www.scu.edu.au/schools/gcm/ar/arm/op027.html> [Date of access: 10/11/2004].
- DICK, B., 2000b. Grounded theory revisited (4). Occasional pieces in action research methodology, No. 28. [Online] <http://www.scu.edu.au/schools/gcm/ar/arm/op028.html> [Date of access: 02/11/2005].
- DICK, B., 2001a. A participative community planning process including a participant workbook. Search, Version 7. An Interchange resource document. ISBN No. 1 875260 145.
- DICK, B., 2001b. Making the most of emergent methodologies: a critical choice in qualitative research design. A paper prepared for the association for Qualitative Research Conference, Melbourne, 5-7 July.
- DICK, B., 2002. Questions for critical reflection. [Online] <http://www.scu.edu.au/schools/gcm/ar/arp/reflaques.html> [Date of access: 10/11/2004].

- DICK, B., 2003. What can action researchers learn from grounded theorists? Paper prepared for the research symposium at the Australian and New Zealand ALARM/SCIAR conference, Gold Coast, 4-5 May 2003.
- DICK, B., 2005. Grounded theory: a thumbnail sketch. [Online] <http://www.scu.edu.au/schools/gcm/ar/arp/grounded.html> [Date of access: 21/09/2005].
- DICK, B., 2006. What can grounded theorists and action researchers learn from one another? In: Bryant, A., and Charmaz, K. (Eds.), *The Sage handbook of grounded theory*. Thousand Oaks, CA: Sage.
- DOUTHWAITE, B., DE HAAN, N. C., MANYONG, V. & KEATINGE D., 2001. Blending "hard" and "soft" science: the "follow-the-technology" approach to catalyzing and evaluating technology change. *Conservation Ecology* 5(2): 13. [Online] <http://www.consecol.org/vol5/iss2/art13>. [Date of access: 02/04/2004].
- DOUTHWAITE, B., KUBY, T., VAN DE FLIERT, E. & SCHULZ, S., 2003. Impact pathway evaluation: an approach for achieving and attributing impact in complex systems. *Agricultural Systems* 78, 243-265.
- DWAF (DEPARTMENT OF WATER AFFAIRS AND FORESTRY), 1996. The philosophy and practice of integrated catchment management: Implications for water resource management in South Africa. WRC Report No. TT 81/96.
- EARL, S., CARDEN, F. & SMUTYLO, T., 2001. Outcome Mapping - Building Learning and Reflection into Development Programs. International Development Research Centre, Ottawa, Canada. ISBN 0-88936-959-3.
- EDEN, C., 1988. Cognitive Mapping. *European Journal of Operational Research* 36, 1-13.
- EDEN, C., 1990. Strategic thinking with computers. *Long Range Planning* 23, 35-43.
- EDEN, C., 2004. Analysing cognitive maps to help structure issues or problems. *European Journal of Operational Research* 159, 673-686.

- EDEN, C. & ACKERMANN, F., 2001. SODA - The principles. *In*: J. Rosenhead & J. Mingers (eds). *Rational Analysis for a Problematic World Revisited*. John Wiley & Sons, Chichester.
- EKBOIR, J., 2003. Why impact analysis should not be used for research evaluations and what the alternatives are. *Agricultural Systems* 78, 166-184.
- FAO, 1989. *Farming Systems Development: Concepts, Methods, Applications*. Agricultural Services Division, FAO, Rome, Italy.
- FAO, 1993. FESLM: an international framework for evaluating sustainable land management. *World Soil Resources Report No. 73*. FAO, Rome, Italy.
- FAO, 1997. *Negotiating a sustainable future for land – a structural basis for land resources management in the 21st century*. Rome, Italy.
- FAO, 1998. Small farmer group associations: Bringing the poor together. E-mail conference 24 September-11 November 1998. [Online] <http://www.fao.org/SD/PPdirect/ppfo0003.htm>. [Date of access: 17/09/2003].
- FAO, 2000. *Guidelines and reference material on integrated soil and nutrient management and conservation for Farmer Field Schools*. FAO Report No. AGL/MISC/27/2000.
- FAO, 2001. *Conservation agriculture: Case studies in Latin America and Africa*. FAO Soils Bulletin 78.
- FAO, 2004. *Intensifying crop production with conservation agriculture*. [Online] <http://www.fao.org/waicent/faoinfo/agricult/ags/AGSE/Main.htm> [Date of access: 23/11/2004].
- FARRINGTON, J. & MARTIN, 1988. *Farmer participation in agricultural research: a review of concepts and practices*. ODI Occasional Paper No. 9, London.
- FARRINGTON, J., THIRTLE, C. & HENDERSON, S., 1997. Methodologies for monitoring and evaluating agricultural and natural resources research. *Agricultural Systems* 55, 273-300.

- FELL, R.F., 1986. The adult education approach to agricultural extension. Extension and Communication Skills Course Manual. Queensland Department of Primary Industries, Brisbane, Australia.
- FELL, R.F., 1996. Application of learning theory to extension. IPM tools for implementation course manual. Cooperative Research Center for Tropical Pest Management, University of Queensland, Brisbane, Australia.
- FELL, R.F., Undated. Action learning and the application of adult learning principles give meaning to accredited training for extensionists. Rural Extension Centre, University of Queensland Gatton College, Q 4345.
- FREEBAIRN, D.M. & KING, C.A., 2003. Reflections on collectively working towards sustainability: indicators for indicators. *Australian Journal of Experimental Agriculture* 43, 223-238.
- GAMEDA, S. & DUMANSKI, J., 1994. Framework for evaluation of sustainable land management: case studies of two rainfed cereal-livestock land use systems in Canada. Proceedings 15th World Congress of Soil Science 6a, p410-421.
- GILBERT, E.H., NORMAN, D.W. & WINCH, F.E., 1980. Farming systems research: a critical appraisal. MSU Rural Development Paper No. 6, East Lansing, Michigan, Department of Agricultural Economics, Michigan State University.
- GLASER, B.G., 1978. Theoretical Sensitivity: Advances in the Methodology of Grounded Theory. Mill Valley, Ca.: Sociology Press.
- GLASER, B.G., 1982, 1992. Basics of Grounded Theory Analysis: Emergence vs Forcing. Mill Valley, Ca.: Sociology Press.
- GLASER, B.G., 1998. Doing Grounded Theory - Issues and Discussions. Mill Valley, CA: Sociology Press.
- GLASER, B.G., 2001. The Grounded Theory Perspective: Conceptualization Contrasted with Description. Mill Valley, CA: Sociology Press. [Online] <http://www.groundedtheory.com/soc14.html> [Date of Access: 15/03/2006].

- GLASER, B.G., 2002. Constructivist Grounded Theory? *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 3(3). [Online] <http://www.qualitative-research.net/fqs-texte/3-02/3-02glaser-e.htm> [Date of Access: 15/03/2006].
- GLASER, B.G. & STRAUSS, A.L., 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Weidenfeld and Nicholson, London.
- GLENN, N.A. & PANNELL, D.J., 1998. The economics and application of sustainability indicators in agriculture. Contributed Paper at the 42nd Annual Conference of the Australian Agricultural and Resource Economics Society, Armidale, NSW, 19-21 January, 1998.
- GTZ, 1996. Process Monitoring (ProM) – work document for project staff. Report No. 402/96 22e NARMS, Department 402, Bonn, Germany.
- GUBA, E.G., 1990. *The Paradigm Dialog*. Newbury Park, CA: Sage.
- GUBA, E.G. & LINCOLN, Y., 1989. *Fourth Generation Evaluation*. Newbury Park, CA: Sage.
- GUMMESSON, E., 1991. *Qualitative Methods in Management Research*. Newbury Park, CA: Sage.
- GUY, R.M. & SMITH J.M.B., 1995. A land potential classification for KwaZulu-Natal. KwaZulu-Natal Department of Agriculture, Cedara Report No. N/A/95/12.
- HAGMANN, J., CHUMA, E., MURWIRA, K. & CONNOLLY, M., 1999. Putting process into practice: Operationalising participatory extension. The Agricultural Research and Extension Network. Network Paper No. 94. ISBN 0 85003 425 6 [Online] http://www.odi.org.uk/agren/papers/agrenpaper_94.pdf [Date of access: 20/09/2005].
- HAIG, B.D., 1995. Grounded theory as scientific method. *Philosophy of Education*. [Online] http://www.ed.uiuc.edu/EPS/PES-Yearbook/95_docs/haig.html [Date of access: 04/04/2006].
- HALL, A., SULAIMAN, V.R., CLARK, N. & YOGANUND, B., 2003. From measuring impact to learning institutional lessons: an innovation systems perspective on improving the management of international agricultural research. *Agricultural Systems* 78, 213-241.

- HAMILTON, N.A., 1995. Learning to Learn with Farmers: an Adult Learning Extension Project. PhD. Thesis. Agricultural University of Wageningen, The Netherlands.
- HARWOOD, R.R., 1990. A history of sustainable agriculture. *In*: C.A. Edwards, R. Lal, P. Madden, R.H. Miller & G. House (Eds). Sustainable agricultural systems. (pp. 3-19). Soil and Water Conservation Society, Ankeny, Iowa.
- HERWEG, K. & STEINER, K., 2002. Impact Monitoring and Assessment. Instruments for use in rural development projects with a focus on sustainable land management. Buri Druck AG, 3084 Wabern, Switzerland. ISBN: 3-906151-58-1.
- HERWEG, K., STEINER, K. & SLAATS, J., 1998. Sustainable Land Management: Guidelines for Impact Monitoring. Centre for Development and Environment, Berne, Switzerland.
- HORNE, P. & STÜR, W., 1998. Participatory approaches to agricultural technology development in sloping lands. [Online] www.agnet.org/library/article/eb462.html. [Date of access: 10/10/2004].
- HORTON, D. & MacKAY, R., 2003. Using evaluation to enhance institutional learning and change: recent experiences with agricultural research and development. *Agricultural Systems* 78, 127-142.
- HOWARD, J., 1998. The relationship of water quality and land use planning in the Mgeni catchment management plan. *Imiesa*, January, p 3-8.
- HUGHES, I., 1996. How to keep a research diary. Action research electronic reader. [Online] <http://www.scu.edu.au/schools/gcm/ar/arr/arow/rdiary.html> [Date of access: 05/04/2006].
- HUGHES, R.T., 2005. The use of causal mapping in the design of management information systems. [Online] <http://www.cmis.brighton.ac.uk/research/cig/papers/ECRM-2005.pdf> [Date of access: 10/05/2006].
- HURNI, H., 1997. Concepts of sustainable land management. *In*: Proceedings of the International Conference on Geo-information for Sustainable Land Management, 17 – 21 August, Enschede, The Netherlands. ITC Journal 1997 – 3/4.

- HUTCHINSON, C.F. & TOLEDANO, J., 1993. Guidelines for demonstrating geographical information systems based on participatory development. *International Journal of Geographical Information Systems* 7, 453-461.
- HUXMAN, C., 2003. Action research as a methodology for theory development. *Policy and Politics* 31, 239-248.
- IAC, 2004. Building capacity for sustainable development - Innovation systems and institutional development. [Online] <http://www.iac.wur.nl/iac/index2.htm?themes/innovations.htm> [Date of access: 25/10/2005].
- ICSA, 1996. Seeds for the future. Sustainable agriculture and natural resources in the Americas. Inter-American Council for Sustainable Agriculture, Mexico.
- IFAD, 2000. Managing for impact in rural development: a guide for project M&E. [Online] <http://www.ifad.org/evaluation/guide/index.htm> [Date of access: 11/10/2004].
- IK Notes, 2004. Building multi-stakeholder partnerships to promote farmer experimentation and innovation in Ghana. IK Notes No. 74. [Online] http://www.prolinnova.net/iknote/iknote_74.pdf [Date of access: 27/05/2005].
- ILEIA, 1989. Participatory technology development in sustainable agriculture. Proceedings ILEIA Workshop on Operational Approaches for Participatory Technology Development in Sustainable Agriculture. ILEIA: Leusden, The Netherlands.
- ISON, R.L., MAITENY, P.T. & CARR, S., 1997. Systems methodologies for sustainable natural resources research and development. *Agricultural Systems* 55, 257-272.
- JICK, T.D., 1979. Mixing qualitative and quantitative methods: triangulation in action. *Administrative Science Quarterly* 24, 602-611.
- JOHNSON, N.L., LILJA, N. & ASHBY, A., 2003. Measuring the impact of user participation in agricultural and natural resource management. *Agricultural Systems* 78, 287-306.

- KELLOGG FOUNDATION, 2004. Logic model development guide – using logic models to bring together planning, evaluation and action. [Online] <http://www.wkcf.org/Pubs/Tools/Evaluation/Pub3669.pdf> [Date of access: 10/10/2005].
- KEMMIS, S. & McTAGGART, R., 1988. *The Action Research Planner*. Melbourne, Deakin University.
- KERLIN, B.A., 1998. Pursuit of the PhD: Is it good for your health? Paper presented at the 4th International Multidisciplinary Qualitative Health Research Conference. Vancouver, British Columbia, Canada, February 19-21.
- KING, C., GUNTON, J., FREEBAIRN, D., COUTTS, J. & WEBB, I., 2000. The sustainability indicator industry: where to from here? A focus group study to explore the potential of farmer participation in the development of indicators. *Australian Journal of Experimental Agriculture* 40, 631-642.
- KING, C., GAFFNEY, J. & GUNTON, J., 2001. Does participatory action learning makes a difference? Perspectives of effective learning tools and indicators from the Conservation Cropping Group in North Queensland, Australia. *European Journal of Agricultural Extension and Education* 7, 133-146.
- KILVINGTON, M., NIXON, C. & YEABSLEY, J., 2002. *Sustainable Development Extension*. MAF Technical Paper No: 2002/03. Prepared for New Zealand Ministry of Agriculture and Forestry. ISBN: 0-478-07663-0.
- KOCK, N., 2002. The three threats of action research: a discussion of methodological antidotes in the context of an information systems study. Research report No. ERC-2002-3. [Online] http://ecrc.cc.lehigh.edu/kock_t/Publications/2002ReportERC1/kock2002.pdf [Date of access: 22/06/2006].
- KOLB, D.A., 1984. *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.
- KRISHNA, A., 2004. Understanding, measuring and utilizing social capital: clarifying concepts and presenting a field application from India. *Agricultural Systems* 82, 291–305.

- KUSEK, J.Z. & RIST, R.C., 2004. Ten Steps to a Results-Based Monitoring and Evaluations System. The World Bank, Washington DC. ISBN 0-8213-5823-5.
- LACEY, J.M., 1997. Learning from farmers - the check approach. Proceedings of the Australian Agronomy Conference, Australian Society of Agronomy. [Online] <http://www.regional.org.au/au/asa/1998/plenary/lacy.htm> [Date of access: 22/09/2005].
- LEGESSE, B., 2003. Risk, risk information and eventual learning of smallholder farmers in eastern Ethiopia. [Online] <http://www.jsai.or.jp/afita/afita-conf/2002/part1/p114.pdf> [Date of access: 22/09/2005].
- LEWIN, K., 1946. Action research and minority problems. *Journal of Social Issues* 2, 34-46.
- LEWIN, K., 1947. Dynamics of group action. *Educational Newsletter* 1, 195-200.
- LIGHTFOOT, C., 1987. Indigenous research and on-farm trials. *Agricultural Administration and Extension* 24, 79-89.
- LIVELIHOODS CONNECT, 2004. Farmers' Organisations and Agricultural Technology: Institutions that Give Farmers a Voice. A website supported by the United Kingdom - Department for International Development (DFID) and the Institute of Development Studies (IDS). [Online] <http://www.livelihoods.org/pip/pip/refo1vr.html>. [Date of access: 10/10/2004].
- LOEVINSOHN, M.E., 1998. Practicing evolution: theory for understanding and evaluating participatory research. Discussion Paper No. 98-14, presented at the International Seminar on Assessing the Impact of Using Participatory Research and Gender Analysis, organised by System-wide Program on Participatory Research and Gender Analysis, Quito, Ecuador, September 6-9.
- LOPEZ-RIDAURA, S., 2005. Multi-scale sustainability evaluation: a framework for the derivation and quantification of indicators for natural resource management systems. *Tropical Resource Management Papers*, No. 68. ISSN 0926-9495.
- LOPEZ-RIDAURA, S., MASERA, O. & ASTIER, M., 2002. Evaluating the sustainability of complex socio-environmental systems. The MESMIS framework. *Ecological Indicators* 2, 135-148.

- LOW, A.B. & REBELO, A.G., 1996. Vegetation of South Africa, Lesotho and Swaziland. A companion to the vegetation map of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.
- MacKAY, R. & HORTON, D., 2003. Expanding the use of impact assessment and evaluation in agricultural research and development. *Agricultural Systems* 78, 143-165.
- MARQUARDT, M.J., 2004. Optimizing the power of action learning: solving problems and building leaders in real time. Palo Alto, Ca.: Davies-Black.
- MARSH, S.P., 1998. What can agricultural researchers do to encourage the adoption of sustainable farming systems? Paper presented at the CLIMA/ASSSI (WA Branch) Forum, *Sustainability of Farming Systems with a Focus on Future Management of Water and Nutrients*, CSIRO, Perth, Western Australia, August 13-14, 1998. [Online] <http://www.general.uwa.edu.au/u/dpannell/dpap987f.htm>. [Date of access: 23/03/2004].
- MARSH, R., 2002. Working with local institutions to support sustainable livelihoods. Sustainable Development Department, FAO, Rome, Italy. [Online] http://www.fao.org/sd/2002/PE0702a_en.htm [Date of access: 25/10/2005].
- MARTIN, P. & TURNER, B., 1986. Grounded theory and organizational research. *Journal of Applied Behavioral Science* 22, 141-157.
- MATATA, J. B. W., ANANDAJAYASEKARAM, P., KIRIRO, T.N., WANDERA, E.O. & DIXON, J., 2001. Farming Systems Approach to Technology Development and Transfer. FARMESA, Harare, Zimbabwe. ISBN 0-7974-1981-0.
- MATHISON, S., 2005. Encyclopedia of Evaluation. Sage Publications. Thousand Oaks, California, USA.
- McKAY, J. & MARSHALL, P., 2005. Reflecting on the efficacy of SODA and cognitive mapping for problem analysis in information requirements determination. Presentation at the Fifth Annual SIG IS Cognitive Research Exchange Workshop, Sunday, December 11, 2005, Las Vegas, NV. [Online] <http://www.ou.edu/is-core/Papers/McKay-Marshall.pdf> [Date of access: 22/06/2006].

- McNIFF, J., WHITEHEAD, J., & LOMAX, P., 2003. *You and Your Action Research Project*. London: Routledge.
- MENDOZA, T.C., 1996. Upscaling the adoption of ecologically sound agriculture in the Philippines. Sixth International Permaculture Conference & Convergence. Perth & Bridgetown, Western Australia, September 27 to October 7. [Online] <http://rosneath.com.au/ipc6/>. [Date of access: 17/02/2004].
- MINGERS, J., 2000. An idea ahead of its time: the history and development of soft systems methodology. *Systematic Practice and Action Research* 13, 733-755.
- MORAN, C.A., 1997. Technological transfer groups. The Regents of the University of California and Gregorio Billikopf, University of California. [Online] <http://www.cnr.berkeley.edu>. [Date of access: 10/02/2004].
- MSP (MULTI STAKEHOLDER PROCESSES) RESOURCE PORTAL, 2004. Building your capacity to facilitate multi-stakeholder processes and social learning. [Online] <http://www.iac.wur.nl/msp/home.php>. [Date of access: 08/10/2004].
- MUOK, B., KIMONDO, J. & ATSUSHI, I., 2001. Farmer-to-farmer extension: experience in drylands Kenya. Proceedings of the Extension Working Party (S6.06-03) Symposium. [Online] www.regional.org.au/au/iufro/2001/muok.htm. [Date of access: 15/09/2003].
- NORMAN, D.W., WORMAN, F.D., SIEBERT, J.D. & MODIAKGOTLA, E., 1995. *The Farming Systems Approach to development and appropriate technology generation*. FAO, Rome. ISBN 92-5-103644-6.
- OFIR, Z.M., 2002. Monitoring and Evaluation: A reflection on Landcare in the ARC-ISCW. Report of a workshop held on 22-23 January 2002. ISCW Report No. GW/A/2002/26.
- OECD, 1997. *Environmental Indicators for Agriculture*. Organisation for Economic Co-operation and Development. OECD Publications, France.

- OJA, S.N. & SMULYAN, L., 1989. Collaborative Action Research: A Developmental Approach. London: The Falmer Press.
- OLIGA, J.C., 1988. Methodological foundations of systems methodologies. *Systems Practice* 1, 87-112.
- ORLIKOWSKI, W.J., 1993. CASE tools as organizational change: investigating incremental and radical changes in systems development. *Management Information Systems Quarterly* 17, 309-340.
- PASTEUR, K., 2001a. Thinking about Logical Frameworks and Sustainable Livelihoods: A short critique and a possible way forward.
- PASTEUR, K., 2001b. Tools for Sustainable Livelihoods: Livelihoods Monitoring and Evaluation. [Online] <http://www.livelihoods.org/info/tools/Pas-ME01.rtf> [Date of access: 20/09/2005].
- PATTON, M.Q., 1990, 2002. Qualitative Research and Evaluation Methods. Third Edition. Sage Publications, Thousand Oaks, California. ISBN No. 0-7619-1971-6.
- PATTON, M.Q., 1997. Utilization-Focused Evaluation: The New Century Text. Third Edition. Sage Publications, Thousand Oaks, California. ISBN No. 0-8039-5265-1.
- PETTIGREW, A., 1992. The character and significance of strategy process research. *Strategic Management Journal* 13, 5-16.
- PIERI, C., 1997. Planning sustainable land management: the hierarchy of user needs. In: Proceedings of the International Conference on Geo-information for Sustainable Land Management, 17 – 21 August, Enschede, The Netherlands. ITC Journal 1997 – 3/4.
- PONTIUS, J., DILTS, R. & BARTLETT, A., 2002. Ten years of IPM training in Asia - from farmer field school to community IPM. FAO, Rome. [Online] http://www.fao.org/documents/show_cdr.asp?ri_file=/docrep/005/ac834e/ac834e00.htm [Date of access: 09/06/2005].

- POUND, B., SNAPP, S., MCDUGALL, C. & BRAUN, A., 2003. Managing natural resources for sustainable livelihoods – using science and participation. Earthscan publications, London. ISBN 1-84407-026-3.
- PRETTY, J.N., 1996. Participatory learning for integrated farming. Original paper from the proceedings of the Workshop on Integrated Farming in Human Development. Tune Landboskole, Denmark. <http://ifs.plants.ox.ac.uk/tune/tune96/contents.html> [Date of access: 04/07/2002].
- PRETTY, J.N. & CHAMBERS, R., 1993. Towards a Learning Paradigm: New Professionalism and Institutions for Agriculture. Brighton, UK: IDS.
- PRETTY, J.N., GUIJT, I., SCOONES, I. & THOMPSON, J., 1995. Participatory Learning and Action - A Trainer's Guide. International Institute for Environment and Development. London. ISBN 1 899825002.
- PRETTY, J.N., MORISON, J.I.L. & HINE, R.E., 2003. Reducing food poverty by increasing agricultural sustainability in developing countries. *Agriculture, Ecosystems and Environment* 95, 217-234.
- QUIZON, J., FEDER, G. & MURGAI, R., 2000. A note on the sustainability of the Farmer Field School Approach to agricultural extension. Development Economics Group, The World Bank. [Online] <http://lnweb18.worldbank.org/ESSD/essdext.nsf/26ByDocName/AKISResearchExtension> [Date of access: 03/08/2003].
- RAINA, R.S., 2003. Disciplines, institutions and organisations: impact assessments in context. *Agricultural Systems* 78, 185-211.
- RHOADES, R.E. & BOOTH, R.H., 1982. Farmer-back-to-farmer: a model for generating acceptable agricultural technology. *Agricultural Administration* 11, 127-137.
- RIGBY, D., HOWLETT, D & WOODHOUSE, P., 2000. Sustainability indicators for natural resource management and policy. Working Paper 1: A review of indicators of agriculture and rural livelihood sustainability. UK NRPAD Research Programme. ISBN No: 1-9-02518616.

- ROBERTS, G.M.O., 1997. Action Researching My Practice as a Facilitator of Experiential Learning with Pastoralist Farmers in Central West Queensland. PhD Thesis. The School of Agriculture and Rural Development, University of Western Sydney. [Online] <http://www.scu.edu.au/schools/gcm/ar/art/t-groberts00.html> [Date of access: 22/09/2005].
- ROBERTSON, M., WHITBREAD, A., SHAMUDZARIRA, Z., KAMANGA, B., WALL, P., WADDINGTON, S. & SAKALA, W., 2002. Decision trees and rules of thumb for agricultural technologies tested in Risk Management Project (RMP). RMP II, CIMMYT & CSIRO Sustainable Ecosystems / APSRU.
- ROCHELEAU, D.E., 2003. Participation in context: what's past, what's present and what's next. In: Pound, B., Snapp, S., McDougall, C. & Braun, A. (Eds). *Managing Natural Resources For Sustainable Livelihoods – Using Science and Participation*. Earthscan publications, London. ISBN 1-84407-026-3.
- ROGERS, K.H. & BESTBIER, R., 1997. Development of a protocol for the definition of the desired state of riverine systems in South Africa. Department of Environmental Affairs and Tourism, Pretoria. ISBN: 0-621-27824-6.
- RÖLING, N., 1994. Platforms for decision-making about eco-systems. In: L.O. Fresco, L. Strooisnijder, J. Bouma and H. van Keoulen (eds.): *Future of the Land: Mobilising and Integrating Knowledge for Land Use Options*. Chichester: John Wiley and Sons, Ltd.
- RÖLING, N., 1995. Knowledge transfer and user groups. Department of Communication and Innovation Studies. Wageningen Agricultural University (WAU), Wageningen, The Netherlands.
- RÖLING, N., 1997. The soft side of land: socio-economic sustainability of land use systems. In: *Proceedings of the International Conference on Geo-information for Sustainable Land Management*, 17 – 21 August, Enschede, The Netherlands. ITC Journal 1997 – 3/4.
- RÖLING, N.G. & JIGGINS, J., 1998. The ecological knowledge system. In: N.G. Röling & M.A.E., Wagemakers (eds.): *Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty*. Cambridge University Press: Cambridge.

- RÖLING, N.G. & WAGEMAKERS, M.A.E., 1998. *Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty*. Cambridge University Press: Cambridge.
- RÖLING, N.G. & WOODHILL, J., 2001. *From paradigms to practice: foundations, principles and elements for dialogue on water, food and environment*. Background Document for National and Basin Dialogue Design Workshop, Bonn, December 1 and 2, 2001.
- ROSE, J., 2000. Soft systems methodology as a social science research tool. *Systems Research and Behavioural Science* 14, 249-258.
- RYAN, T. & BRAY, S., 1997. *Landcare networks*. Proceedings of the Landcare Changing Australia - National Conference, Adelaide, Australia. ISBN No. 0730802051.
- SAUNDERS, D. & KELLNER, K., 2003. *Landcare research strategy and action plan*. South Africa – Australia Institutional Strengthening of the Department of Agriculture Project (ISDA), Phase 2. Milestone Report 9. GRM International Pty. Ltd.
- SCARBOROUGH, V., KILLOUGH, S., JOHNSON, D. & FARRINGTON, J., 1997. *Farmer-led Extension: Concepts and Practices*. London: IT Publications.
- SCOONES, I., CHIBUDU, C., CHIKURA, S., JERANYAMA, P., MACHAKA, D., MACHANJA, W., MAVEDZENGE, B., MOMBESHORA, B., MUDHARA, M., MUDZIWO, C., MURIMBARIMBA, F. & ZIREREZA, B., 1996. *Hazards and Opportunities – Farming Livelihoods in Dryland Africa. Lessons from Zimbabwe*. International Institute for Environment and Development, London. ISBN 1-85649-353-9.
- SELENER, D., 1998. *Participatory Action Research and Social Change*. Global Action Publications, Quito, Ecuador. ISBN 9978-95-130-X.
- SENGE, P., 1990. *The Fifth Discipline: The Art and Practice of the Learning Organisation*. Century Business, London.
- SIMMONDS, N.W., 1985. *Farming systems research: a review*. World Bank Technical Paper No. 43. Washington D.C., World Bank.

- SIMPSON, B.M. & OWENS, M., 2002. Farmer field schools and the future of agricultural extension in Africa. SDimensions, FAO, Rome. [Online] http://www.fao.org/sd/2002/KN0702a_en.htm [Date of access: 08/07/2005].
- SMITH, H.J., 1997. South African and Australian Landcare Partnering Forum – Implications for research in South Africa. ISCW Report No. GW/A/97/80.
- SMITH, H.J., VAN ZYL, A.J. & BOUWMAN, H., 2000. An action plan for water quality research and technology transfer in the rivers flowing through the Kruger National Park. Water Research Commission Report No. 988/1/00.
- SMITH, H.J., AGRELLA, K. & MBATANI, N.B., 2001. Development and implementation of sustainable land management practices in the Bergville District of the KwaZulu-Natal Province. First Progress Report, Bergville/Emmaus Landcare project. ISCW Report No. GW/52/A/2001/56.
- SMITH, H.J., TRYTSMAN, G., AGRELLA, K. & LENTSOANE, P., 2003. Development and implementation of sustainable land management practices in the Bergville District of the KwaZulu-Natal Province. Second Progress Report, Bergville/Emmaus Landcare project. ISCW Report No. GW/52/A/2003/02.
- SMITH, H.J., TRYTSMAN, G., DLAMINI, T.C., BLOEM, J.F. & AGRELLA, K., 2004. Development and implementation of sustainable land management practices in the Bergville District of the KwaZulu-Natal Province. Third Progress Report, Bergville/Emmaus Landcare project. ISCW Report No. GW/52/A/2004/07.
- SMITH, H.J. & JANSEN VAN RENSBURG, H.G., 2004. Planning workshop for Mkobola Landcare project. Report of a Workshop held on 3-6 May 2004. ARC-ISCW Report number GW/A/2004/51.
- SMITH, H.J. TRYTSMAN, G., BLOEM, J.F. EVERSON, T. & MTHETHWA, S., 2005. Development and implementation of sustainable land management practices in the Bergville district of the KwaZulu-Natal Province. Fourth progress report, Bergville/Emmaus Landcare project. ARC-ISCW Report number GW/A/2005/04.

- SNAPP, S. & HEONG, K.L., 2003. Scaling up and out. In: Pound, B., Snapp, S., McDougall, C. & Braun, A. (Eds). *Managing Natural Resources for Sustainable Livelihoods – Using Science and Participation*. Earthscan publications, London. ISBN 1-84407-026-3.
- STONEHAM, G., EIGENRAAM, M., RIDLEY, B. & BARR, N., 2003. The application of sustainability concepts to Australian agriculture: an overview. *Australian Journal of Experimental Agriculture* 43, 195-203.
- STRAUSS, A.L. & CORBIN, J., 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Thousands Oaks, CA. Sage publications.
- STRAUSS, A.L. & CORBIN, J., 1994. Grounded theory methodology: an overview. In: N.K. Denzin and Y.S. Lincoln (Eds). *Handbook of Qualitative Research*. Thousands Oaks, CA. Sage publications.
- STROUD, A., 2003. Transforming institutions to achieve innovation in research and development. In: Pound, B., Snapp, S., McDougall, C. & Braun, A. (Eds). *Managing natural resources for sustainable livelihoods – using science and participation*. Earthscan publications, London. ISBN 1-84407-026-3.
- SPRINGER-HEINZE, A., HARTWICH, F., HENDERON, J.S., HORTON, D. & MINDE, I., 2003. Impact pathway analysis: an approach to strengthening the impact orientation of agricultural research. *Agricultural Systems* 78, 267-285.
- TAN, J.K., 1985. Some notes on participatory technology development. *IFDA Dossier* 45, 12-18.
- TRIPP, R., 1991. *Planned Change in Farming Systems: Progress in On-Farm Research*. Chichester: John Wiley.
- TRIPP, R. & WOOLLEY, J., 1989. The planning stage of on-farm research: identifying factors for experimentation. Mexico, D.F. and Cali, Colombia: CIMMYT and CIAT. ISBN 968-6127-02-X.
- TURNER, D.P., 2000. *Soils of KwaZulu-Natal and Mpumalanga: Recognition of Natural Soil Bodies*. PhD Thesis, University of Pretoria, South Africa.

- UNITED WAY OF AMERICA, 2001. Measuring program outcomes: a practical approach. [Online] <http://national.unitedway.org/outcomes/resources.html> [Date of access: 11/10/2002].
- UPHOFF, N.T., 1989. A field methodology for participatory self-evaluation of PPP group and inter-group association performance. FAO, Rome. [Online] <http://www.fao.org/sd/ppdirect/ppre0059.htm> [Date of access: 11/10/2002].
- UPHOFF, N.T., ESMAN, M.J. & KRISHNA, A., 1997. *Reasons for Hope: Instructive Experiences in Rural Development*. West Hartford, Conn: Kumarian Press.
- UPHOFF, N.T., ESMAN, M.J. & KRISHNA, A., 1998. *Reasons for Success: Learning from Instructive Experiences in Rural Development*. West Hartford, Conn: Kumarian press. ISBN 1-56549-077-0.
- VAN DE FLIERT, E., 2000. Recognising a climate for sustainability: extension beyond transfer of technology. Creating a climate for change: Extension in Australasia. Australasia-Pacific Extension Network. National Forum 26-27 October 2000, Melbourne Convention Centre.
- VAN DE FLIERT, E. & BRAUN, A.R., 2002. Conceptualising integrative, farmer participatory research for sustainable agriculture: from opportunities to impact. *Agriculture and Human Values* 19, 25-38.
- VENABLE, J., 2005. Coloured cognitive maps for modelling decision contexts. In: T. Bui & A Gachet (eds). Proceedings of 1st Workshop on context modelling and decision support. Paris, France, 5 July 2005. ISSN 1613-0073. [Online] www.CEUR-WS.org/Vol-144/03_venable.pdf [Date of access: 30/06/2006].
- VERNOOY, R. & McDOUGALL, C., 2003. Principles for good practice in participatory research: reflecting on lessons from the field. In: Pound, B., Snapp, S., McDougall, C. & Braun, A. (Eds). *Managing Natural Resources for Sustainable Livelihoods – Using Science and Participation*. Earthscan publications, London. ISBN 1-84407-026-3.
- VICKERS, G., 1961. Judgement. In: *The Vickers Papers (1984)*. Harper & Row, London.
- VICKERS, G., 1965. *The art of Judgement*. Chapman & Hall, London.

VICKERS, G., 1970. *Freedom in a Rocking Boat*. Allen Lane, London.

VICKERS, G., 1983. *Human Systems are Different*. Harper & Row, London.

VINCENT, L., 2003. Participatory research, natural resource management and rural transformation: more lessons from the field. *In*: Pound, B., Snapp, S., McDougall, C. & Braun, A. (Eds). *Managing Natural Resources for Sustainable Livelihoods – Using Science and Participation*. Earthscan publications, London. ISBN 1-84407-026-3.

WALSHAM, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of Information Systems* 4, 74-81.

WASTELL, D.G., 2001. Barriers to effective knowledge management: action research meets grounded theory. *Journal of Systems and Information Technology* 5, 21–35.

WCED (WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT), 1987. *Our Common Future*. Oxford University Press.

WEBSTER, R.M., 1990. *Bioclimates of Natal*. Co-ordinated Extension, Farm Planning. Department of Agriculture, Natal Region.

WILCOX, D., 2004. A short guide to partnerships. [Online] <http://www.partnerships.org.uk/AZP/part.html> [Date of access: 15/06/2005].

WILLIAMS, B., 2004. A reflection tool. [Online] <http://users.actrix.co.nz/bobwill/> [Date of access: 04/08/2004].

WOODHILL, J., 2004. *Multi-Stakeholder and Dialogue Processes for Integrated River Basin Management - A Framework for Facilitation*. Unpublished paper.

WOODHILL, J. & ROBINS, L., 1998. *Participatory evaluation for Landcare and Catchment groups: a guide for facilitation*. Greening Australia, Yarralumla ACT.

YOONG, P. & PAULEEN, D.J., 2004. Generating and analysing data for applied research on emerging technologies: a grounded action learning approach. *Information Research* 9 paper 195, [Online] <http://InformationR.net/ir/9-4/paper195.html> [Date of access: 22/06/2006].

ZUBER-SKERRITT, O., 2005. A model of values and actions for personal knowledge management. *Journal of Workplace Learning* 17, 49–64.