EMPOWERMENT OF WOMEN THROUGH WATER USE SECURITY, LAND USE SECURITY AND KNOWLEDGE GENERATION FOR IMPROVED HOUSEHOLD FOOD SECURITY AND SUSTAINABLE RURAL LIVELIHOOS IN SELECTED AREAS IN LIMPOPO

Report to the
WATER RESEARCH COMMISSION

by

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Executive summary

The project titled *Empowerment of Women Through Water Use Security, Land Use Security and Knowledge Generation for Improved Household Food Security and Sustainable Rural Livelihoods in Selected Areas in Limpopo* was a four-and-half-year project based on three selected district municipalities. The rationale of the project was based on the fact that although the South African Constitution enshrines gender equality, women in rural areas experience a limited of water use security and limited knowledge to achieve food security.

The rationale further indicates that lack of water and land use security refers to physical, legal and tenure insecurity while lack of food security implies insufficient physical, economic and social access by all people at all times to enough food for an active and healthy life. Empowerment of women through secure access to water and land, as well as by obtaining knowledge and developing skills must receive priority attention. This may provide the necessary incentives to take ownership of the process of productive use of water to achieve food security and improve rural livelihoods.

The rationale is further premised on the fact that findings from this research will contribute to bridging the divide between the abovementioned current reality and government policy intentions. It will deepen the understanding of social dynamics at the community and household level that impact on the empowerment of women and attainment of sustainable food production. It includes better understanding of institutional and organisational impediments affecting the decision-making powers of women. Better understanding of what impact land reform and rural development policies have on women is of specific importance. Furthermore, this research will improve the understanding of co-operative governance and inter-governmental relations at national, provincial and local level, regarding interaction with affected people in rural areas and the related household food security. In particular the socially embedded practices in traditional areas which are affecting the security of women with reference to household food production and improving livelihoods require attention. Empirical data collected and analysed in this study will lead to understanding of key domains of empowerment that are relevant for rural farming women.

The three irrigation schemes and their Districts were Steelpoortdrift (Sekhukhune District); Mashushu (Capricorn District) and Rambuda (Vhembe District). The main objectives of the

project were to get a comprehensive understanding of constraints, challenges, opportunities and interventions required for empowerment of women to promote household food security and rural livelihoods through increased water productivity and land access as they relate to crop cultivation. A mixed methods research approach was used for this project in order to attain a comprehensive understanding of the key objectives. Quantitative data was collected to determine biographical and broader statistical patterns related to the key objectives of the study. A participatory and reflective process was used to collect qualitative data. The qualitative approach engaged farmers and their communities in dialogue with each other and with the researchers in order to understand constraints and challenges they face in access to water and land use security, and opportunities that could help them in this regard. Questionnaires, key-informant (individual and focus-group) interviews, observations, and interactive workshops were used as the methods of data collection for the study. Purposive sampling was used to select the study participants. These included active farmers who were members of the irrigation schemes in the selected areas and were willing to participate. Informed by the sustainable livelihoods asset framework and the people-centred approach, the research was conducted collaboratively with various institutions (extension services, farmers, local traditional authorities, local government authorities and provincial and national government) in the selected areas. Thematic analysis was utilised to analyse qualitative data, while quantitative data were analysed using descriptive statistics in Statistical Package for Social Sciences (SPSS). Overall, this multi-prong approach to data collection and analysis helped illuminate processes that might enhance agency and empowerment of the farmers and the communities for improved water and land use security. The major findings of the study were:

- ***Naturalised volumetric water supply measurement showed that adequate water was available at two of the irrigation schemes (Steelpoort and Rambuda).*** The water supply in the third site (Mashushu) was found to be limited. The potential evaporation and monthly rainfall data for the study areas further indicate the need for irrigation. In all the three sites, seasonality, quality of the irrigation infrastructure and scheme water management schemes affected availability of the water. Findings also revealed strong competition for water between agriculture and the burgeoning mining industry in Limpopo especially in the vicinity of Steelpoort where there is proliferation of mines. It was also found that bulk of this water was being consumed by the surrounding mining industry, limiting supply to local

farmers for crop cultivation, particularly should the farmers wish to expand and adversely affecting their productivity and food security.

- ***The study identified a number of gaps in knowledge and skills of the farmers***. These included farmers' knowledge of water and land policies as well as agronomic and marketing knowledge and skills. The institutional processes relating to land-use and water-use security were poorly understood. It further emerged that poor English proficiency hindered the farmers' access to knowledge for improvement of skills. Further access to information, particular market related information was very poor. However, the farmers displayed farming knowledge derived from the long farming tradition in these communities. This was found to be loosely structured and based on oral ways of passing on amongst farmers. Even when farmers attended training or were trained on-site, there was poor mechanism of sharing and adoption. This study found that it may be that the overall approach to farmers development may not be structured to enhance agency and empower farmers. Discrepancies were found to exist between cultural practices and statutory laws in regard to accessing land and water use in the study areas. It was found that there were differences in the way statutory laws and customary laws were understood and practised. This led to gendered and geographically differentiated access to water and land.

- ***The socio-cultural context was found to play a critical role in influencing women's access to land and water resources.*** It was found that institutions and organisations house and determine codes of conduct that govern access to resources and livelihood improvement. Institutions such as marriage and traditional authorities often awarded land rights to the male householders and this limited some categories of women to access land. The connectivity which each community had with external institutions and organisations was also seen as an important element in improving livelihoods. Where there was stronger connectivity, as in the case of Rambuda, farmers displayed a higher level of agency in livelihood decisions they made. Generally, it appeared that institutions and organisations can either be an obstacle or an enabler for agency enhancement. Transformed institutions and organisations which are oriented towards people-centred and participatory approaches are what the study found to be most

instrumental in bringing about sustained change. We concluded that there was need for change in approach of farmer development and capability raising through i) enhancing development of women farmer agency, especially recognition of the distributed leadership, ii) improving market access of farmers, including market research to identify crops and get pricing information. Finally, a critical and possible central catalyst in empowering the farmers was reorientation of farmers in agency-enhancing farmer development.

- ***Limited land, undocumented land rights, limited skills set and lack of access to productive assets were identified as constraints that women farmers in this study experienced.*** The study found that women aspired to improve their resource base and had both short-term and long-terms aspirations. Among these hopes and aspirations were desire for their own working equipment (such as tractors), improved irrigation facilities and improved access to inputs, and wishing to acquire more land, access markets and be in an improved financial position. It was found to be nonetheless unclear to the women how these aspirations could be achieved. As stated above, the transformative role of organisations and institutions in empowerment and agency building is vital for improving livelihoods and food security but unless these organisations and institutions are themselves transformed and adopt a people-centred approach, their role in building farmer agency will remain limited.

- ***The analysis of women empowerment using the Women Empowerment in Agriculture Index (WEAI) shows that women in the study were poorly empowered in terms of time use, leadership and ownership of resources.*** An empowerment process for women in these areas could include a coherent strategy of partnering with organisations and institutions that have a role in improving livelihoods and people's welfare, particular in land user rights, water use security, leadership and time use. The sustainable livelihoods assets and people-centred research approaches adopted in this study indicate that human and social asset development should lead to sustained empowerment and agency enhancement driven by the women themselves. This could partially be realised by building on the creative responses that women are already adopting and by using structures and

organisations that women are already part of and capacitating these structures give them a voice at the policy-making table.

In conclusion, the study shows that the empowerment of rural farming women is complex and will take a multi-sectoral approach buttressed by committed integrated development planning and alongside integrated financial planning and spending. This has to be coupled with an approach to farmer development stepped in human and social asset building in order to prepare farmers for the use of natural, financial, physical and institutional assets to yield improved food security and livelihoods.

Key recommendations include a people-centred approach that focuses of internal and external institutions, organisations and stakeholders that affect improving capabilities of farmers and improving accessing and security of land and water use rights. People-centred policies, programmes and approaches are important through for knowledge and skills development in order for farmers to overcome constraints and realise improved food security and livelihoods through market access. This may lead to the empowerment of improved livelihoods and food security of women particularly if policies, programmes and approaches that foster women's input in productive decisions, access to credit and leadership (including public speaking in the context of agriculture).

This report consists of six chapters addressing the terms of reference. They include the introduction, review of literature, existing water use in crop cultivation, knowledge, constrains, aspirations and empowerment, institutional arrangements, organisational arrangements and empowerment. The conclusions and recommendation are made at the end of the report. This report is complemented with guidelines and a detailed capacity building report see Appendix B.

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5DE	:	Five Domains of Empowerment Index
CLaRA	:	Communal Land Rights Act 11 of 2004
CMA	:	Catchments Management Agencies
COGTA	:	Co-operative governance and Traditional Authority
DAFF	:	Department of Agriculture, Forestry and Fisheries
FBWP	:	Free Basic Water Policy
GDP	:	Gross Domestic Product
GTM	:	Greater Tubaste Municipality
HDI	:	Historically Disadvantaged Individuals
HIV/AIDS	:	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IDP	:	Integrated Development Plan
IFPRI	:	International Food Policy Research Institute
IFR	:	In-stream Flow Requirements
JFPM	:	Johannesburg Fresh Produce Market
LDA	:	Limpopo Department of Agriculture
LEISA	:	low external input sustainable agriculture
LRAD	:	Land Redistribution for Agricultural Development
MAR	:	Mean Annual Run-off
MDG	:	Millennium Development goals
NPC	:	National Planning Commission
NWA	:	The National Water Act (NWA) 36 of 1998
NWRS	:	National Water Resource Strategy
OPHI	:	Oxford Poverty and Human Development Initiative
PTO	:	Permission to Occupy
RDP	:	Reconstruction and Development Programme
RESIS	:	Rehabilitation of Small Irrigation Schemes
SH	:	Smallholder
SLA	:	Sustainable Livelihoods Approach
SLAG	:	Settlement Land Acquisition Grant
SPSS	:	Statistical Package for Social Sciences
TC	:	Tribal Councils
URDT	:	Uganda Rural Development and Training
WA	:	Water Act (WA) of 1956
WARS	:	Water Allocation Resource Strategy
WEAI	:	Women Empowerment in Agriculture Index
WFD	:	wetting front detectors
WSA	:	Water Service Act No. 108 of 1997
WSDP	:	Water Services Development Plan
WUA	:	Water User Association

1. REVIEW OF THE LITERATURE

1.1 Introduction

Rural populations constitute at least 70 % per cent of the world's very poor, a significant preponderance of these being women (IFAD, 2010). South Asia and sub-Saharan Africa have the highest incidence of rural poverty and are worst affected by food insecurity and malnutrition (Sally et al., 2003; Koch, 2011). In South Africa, a substantial and increasing proportion of rural households are headed by women, who thus also have significant responsibility for household food security. 35 per cent of the South African population is vulnerable to food insecurity with populations in rural areas being most affected (Dunne & Edkins, 2005). Ending hunger and achieving food security are highlighted as development priorities in Millennium Development Goal 1 (50% reduction in hunger and extreme poverty by 2015) and Sustainable Development Goal 2 (end to hunger and achievement of food security, improvement of nutrition and promotion of sustainable agriculture by 2030) (FAO 2015, FAO 2007). These goals can be achieved through public investments and policies that promote increased food production of smallholder farmers for rural households, and in this regard the importance of secure water use is undisputed (Bell, 2001; Abayawardana & Hussain, 2002).

Although gender equality is enshrined in Section 9 of the South African Constitution (RSA, 1996), women in rural areas continue to experience insecurity in access to water use coupled with lack of knowledge and experience needed to achieve food security. Among the many factors that give rise to this situation, one key issue which particularly disadvantages women in rural areas is land use security (Thamaga-Chitja et al., 2010). (Here, water and land use insecurity relates to issues of physical, legal and tenure, while food insecurity implies problems in access to sufficient food for sustaining an active and healthy life (FAO, 2003).

Empowerment of women in rural areas by securing their access to water, land and developing their knowledge and skills can improve food security and strengthen rural livelihoods, and this can be brought about if there is support from government policy, strategies and legislation underpinned by adherence to gender equity. In addition, women empowerment is enabled or impeded by cultural practices, the position of women in the broader society, awareness, understanding and interpretation of policies (The World Bank, 2012).

Smallholder agricultural development in South Africa has failed to bring about significant farmer empowerment because it has largely ignored the issue of improving farmer agency. The sector continues to perform poorly despite considerable fiscal expenditure in recent years on smallholder farmer support programmes, including irrigation schemes (Chitja and Mabaya, 2015). Legoupil (cited by Van Averbeke et al., 2011) noted three decades ago that smallholder irrigation, 'in spite of large-scale investment, is only marginally effective and failed to provide high yields attributed to problems related to technical, management, training, agricultural policy, financing, etc.'

Petit (1996) defines as an institution any arrangement that coordinates the behaviour of individuals. For Eisenstadt (1968) institutions are at core a set of norms and expectations regulating the interaction of social actors in human social life. According to (Vorley et al., 2012), institutions and organisation set the context and are 'vehicles' of agency for improving empowerment. In this study we reiterate that institutions and organisations and the policies they house must be transformed and reoriented towards enhancement of agency in giving empowerment support to farmers.

In theory, current national water policies create opportunities for smallholder farmers to access water but wrongly assume that these farmers are equipped to navigate the legal arena and interact with other stakeholders on an equal footing. In addition, water is mostly accessed by land owners in smallholder irrigation schemes, and in patriarchal communities this may well put women at a disadvantage. Thus institutions and organisations need to be transformed to take account of inequalities between smallholder farmers (women in particular) and commercial farmers, and empower smallholders to take advantage of the available opportunities. Similarly, for land use security, institutions and organisations need to be transformed to enhance agency. Continuing dichotomies in this regard in South African statutory laws and cultural laws and practices are documented by Thamaga-Chitja et al. (2010). In communal areas, land use security is articulated and administered by tribal councils (TCs) (Mathis, 2007), for whom the concepts of *ubuntu* and *ubukhosi* (role played by the chief in maintaining communal wellbeing) stand out as crucial factors in the endeavour to give every person in the community fair opportunity for a land-based livelihood.

Against this background, the next section of this report reviews the literature on empowerment of women in relation to water use and land use security and generation of knowledge for improving household security and livelihoods. The concept of sustained rural

livelihoods agency enhancement will be invoked to elicit insights on empowerment in relation to institutions, organisations, policies, practices and knowledge generation on water and land security.

1.2 Empowerment

Empowerment is a complex process that may be defined in various ways. The understanding of empowerment in this study was informed by the definitions given below:

> expanding people's ability to make strategic life choices, particularly in contexts in which this ability had been denied to them. (Kabeer, cited in Alkire et al. (2012),
>
> a group's or individual's capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes (Alsop, Bertelsen and Holland, cited in Alkire et al. (2012)
>
> the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives. (Narayan (2005), cited in Alkire et al. (2012).

In this study, women empowerment signifies affording women the necessary ability to undertake tasks individually or in groups in order to acquire access and control over societal resources (Allahdadi, 2011). The definitions listed here make it clear that empowerment is a complex issue, encompassing justice, agency, institutions and accountability (Alkire et al., 2012). In the first place they imply equipping an individual or community to rise above oppressive and unequal situations, especially pertinent for rural farmers in rural sub-Saharan Africa who live in mostly underdeveloped rural areas with poorly developed infrastructure and institutions (Dorward et al., 2005). More particularly, rural women, who mostly have limited, secondary rights to resources, are likely to be the least empowered segment of the population. But the definitions also point to an element of agency, implying possibilities for smallholder farmers to act in improving their situation in pursuit of self-determined goals.

1.2.1 Characteristics of empowerment

The listed definitions also point to possible characteristics of empowerment – firstly, insofar as empowerment is a process that an individual or group of people will undergo and in which they move from a condition of disempowerment to a condition of empowerment. Difficult to observe, and only clear when the results become apparent, the process involves three principal elements: resources, agency and achievements (Kabeer et al., 1999).

Resources, or ‘enabling factors’ as Malhotra and Schuler (2005) call them, are essential in the process of empowerment as they provide the conditions under which empowerment occurs. Agency is central to the way choices are made; it is what makes women take advantage of emerging opportunities and resources and then use them to achieve their own goals (Ibrahim and Alkire, 2007). Finally, achievements are the outcome of agency and choices – as in the case of economic empowerment and political emancipation (Malhotra and Schuler, 2005). In the empowerment discourse, achievements are an important indicator of agency because they show a woman’s ability to make effective choices.

Agency can be defined as the ability to act on behalf of what one values (Alkire et al., 2012). So integral is this concept of agency to empowerment that some writers see no possibility of empowerment unless the women as beneficiaries take an active part in the process of change, since empowerment is not something that can be endowed upon a person (Jeckoniah et al., 2012; Malhotra and Schuler, 2005). In addition, empowerment is context specific. Although most rural women reside in largely patriarchal communities, they experience disempowerment and empowerment differently (Kabeer, 2001). Some women in Muslim countries, for example, are not permitted to move out of the residential compound or speak to men who are not related to them (Mahmud et al., 2012) and studies found that for these women, free movement was considered empowerment in their context. In some African communities, women can move freely but are not allowed to speak at traditional courts and meetings; empowerment for them would be gaining the ability to speak for themselves.

1.3 The Context of Smallholder Irrigation Agriculture in South Africa

1.3.1 Institutions as creating an enabling environment

According to North (1999), constituents of an institution include formal rules, informal constraints (norms of behaviour, conventions, and self-imposed codes of conduct), and the enforcement characteristics of both. For Petit (1996), an institution is any arrangement that coordinates the behaviour of individuals. Eisenstadt (1968) emphasises that an institution is at core a set of norms and expectations regulating the interaction of social actors in human social life. This study chiefly follows the definitions by Petit (1996) and Eisenstadt (1968) in view of the complexity of juxtaposing formal government water policy with rural settings where numerous rules and norms are likely to be recognised, and important, without being written or formalised.

Similarly, an organisation may be defined as a structure of social relationships and social actors arranged in positions and roles, usually, but not always, deliberately arranged and designed to achieve an identified end (Bouma, 1999). Thus, if institutions are the rules of the game then organisations are the players. Organisations are groups of individuals engaged in purposive activity. Constraints imposed by the institutional framework or institutional norms may be coded but often they are not. Summarising the definitions, it could be said that institutions are sets of norms and expectations which shape how collectives such as organisations operate. The sustainable livelihood framework views institutions as mediating access to the five capitals (Scoones, 1998). Institutions and organisation set the context and are 'vehicles' of agency for improving empowerment (Vorley et al., 2012). Their crucial function is that they create an environment which can enable or hinder empowerment (Hennink et al., 2012) by regulating access to resources and services (Kabeer, 1999).

When there is a disjuncture between institutional expectations and people's actual experiences, people tend to form organisations as a strategy of survival. In many cases these organisations are forced to operate outside or diverging from the institutional rules when these rules have been ineffective in supporting the livelihoods of the local people (Vorley et al., 2012). However the failure of institutions could discourage organisations from adhering to the rules of the game (the rules and norms of the institutions) policies must be in place to make sure that institutional norms and expectations are strictly adhered to and genuinely serve the fundamental survival needs of the local people. Where institutions and organisations are not in harmony, the institutions may all too easily lose control and influence over what happens at the local level. This has been seen in rural sub-Saharan Africa where formal institutions have limited reach and traditional and patriarchal tribal institutions remain dominant (Lastarria-Cornhiel, 2006; Rose, 2003; Yngstrom, 2002). The problem in many cases is that governments lack capacity or will to extend the reach of statutory law and other institutions (Sjaastad & Cousins, 2009; Joireman, 2008; Toulmin, 2008; Boone, 2007). Weak regulation puts the mainly female smallholder farmers at a disadvantage in trying to plan for sustainable livelihoods.

1.3.2 Culture and gender roles

In both Africa and Asia, rural populations are frequently governed by customary law, based on longstanding local traditions and values, which directs all spheres of a resident's life, including marriage, divorce and inheritance (Lastarria-Cornhiel, 2006; Yngstrom, 2002;

Jacobs, 2004; Toulmin, 2008). A significant additional factor for rural women in these populations is that the customary governance institutions are in most cases patriarchal and paternal in nature (Joireman, 2008; Agarwal, 2003). Patriarchal communities are characterised by patrilineal inheritance with male household heads having primary access to resources (Deininger & Castagnini, 2004). Women in these systems have secondary rights and access to most productive resources that derive from and are dependent on the primary access assigned to their male relatives (Joireman, 2008). In patriarchal communities, women of all ages were traditionally regarded as legal minors who require a male relative to represent them in transactions (Joireman, 2008). However, customary law is not static and has evolved significantly since the pre-colonial era in response to changes in social relations and at the national level (Toulmin, 2008; Yngstrom, 2002).

Prevailing unemployment among rural women, and their dependence on agriculture for livelihoods, subjects them to the power of their male relatives (Lastarria-Cornhiel, 2006). Often it is male relatives who control production activities and decide how to spend the money while women remain unpaid implementers and labourers (Ambunda and de Klerk, 2008, Ebere, 2011). In South Africa, constitutional provisions for gender equality are imperfectly implemented and these gender-based inequalities persist (Murugani, 2013).

The secondary position of women is not confined to land access, and extends to most aspects of their civic status in patriarchal communities (Joireman, 2008). Bride price, which signifies the transfer of a woman from one family to another, implies also that women belong first to their natal male relatives and later to their male husbands (Ambunda and de Klerk, 2008, Tripp, 2004). In this context, women cannot own property as they themselves are seen as property (Tripp, 2004). When important family decisions are made, rural women are seldom consulted by their husbands, and in the rare cases where they are involved their input can still be overruled (Ambunda and de Klerk, 2008). In many parts of rural South Africa, if a woman needs to appear in the traditional court she cannot do so without a male relative speaking for her because women have no right of address in these meetings (Dawson et al., 2009). In the absence of other male relatives, a woman could be represented by her son (Nadasen, 2012). It should be no surprise that rural women raised in this context often have an inferiority complex in the presence of men and would rather not take positions of authority, even when they outnumber men in organisations (Ambunda and de Klerk, 2008).

Morrell (2001) notes likewise that in African societies, sons, and in particular boy heirs, are socialised and groomed to inherit their family's property, including land. But Morojele (2011) argues on the other hand that the demands of capitalism in a contemporary society put both men and women equally under pressure to provide subsistence, signalling that the inequitable privileging of sons and other males in access to and ownership of land is incompatible with the present-day need for women to access and own land, and with the critical roles that women are poised to play through use and ownership of land.

Women mostly have less access to education and fewer opportunities to earn a skill than their male counterparts (Lastarria-Cornhiel, 2006, Thamaga-Chitja, 2012). This skills deficit extends to agriculture, with no exposure to formal agricultural training for most rural women and with most extension officers failing to address women as beneficiaries of extension services (Cahn and Liu, 2008). Illiteracy and innumeracy mean that women farmers are unable to benefit from recommendations in extension literature and poor schooling leaves them mostly monolingual (Lastarria-Cornhiel, 2006). Women are also likely foregoing the benefit of an identity document when it costs money to get one (Lastarria-Cornhiel, 2006). Overall, in a patriarchal community women have less power than their male counterparts, who may take decisions that do not favour women as farmers in their own right (Nadasen, 2012, Chikozho, 2005).

Culture tends to assign particular jobs in the household and on the farm to men and women of particular ages, marital status, literacy and economic status (Ambunda and de Klerk, 2008). Women are generally responsible for housework, childcare and agricultural production, while men are expected to work and earn money (Rugadya et al., 2004). For example, the strength of Venda culture is its resilience in the face of modernisation and development observed in the community. Mudimeli (2011) notes that in the Venda culture, women are largely seen subordinate and that marriage plays an important role in according their identity in the community. The Sepedi culture was similar. These views are both handed down by tradition and deeply embedded in culture, presenting significant obstacles to empowerment of women (Mudimeli, 2011, Oduyoye, 2007). However, it is important to acknowledge that culture were changing and certain practices are socially embedded and variations between practices exist. Illustrations of problematic cultural discourse in Venda culture and religion included respondent statements such as 'women cannot lead' and 'women are inferior to men' (Mudimeli, 2011).

In some cases these patriarchal ideas are also reinforced by religions, limiting women to subservient roles both at home and in the church (Mpedi, 2008). This has been observed in indigenous churches which give women secondary rights matching their status in the culture, even though women account for a significant proportion of the congregants (Mpedi, 2008, Mudimeli, 2011). Church rules and certain biblical texts that support the culture are invoked to exclude women from leadership roles other than in women's organisations (Mudimeli, 2011). Mudimele (2011) notes in addition that some women actively oppose the notion of women in leadership and pastoral positions. Oduyoye (2007) points out that it is difficult and near impossible to separate culture and religion in Africa.

Traditional gender roles often involve women in a range of income generation activities such as beer brewing and selling of vegetables in addition to growing food crops (Ambunda and de Klerk, 2008). These are activities which generate less income than male activities such as building and growing of cash crops (Ambunda and de Klerk, 2008), increasing the likelihood that the woman's income may go towards household expenses rather than being invested in agriculture (Agarwal, 2003). Gendered division of labour also means that women have multiple demands on their time (Ambunda and de Klerk, 2008). In addition to their other income generating activities, women's reproductive duties continue, and this may negatively affect their participation in other more lucrative but time-consuming activities (Ambunda and de Klerk, 2008).

1.3.3 Aspirations

Context affects goals and aspirations. The question is to what extent these aspirations are in line with the currently accepted ways to empower women (Field et al., 2010), particularly when women's gender roles may restrict them to time-consuming reproductive duties (Niehof, 2004). We question strategies that limit women's aspirations to what they currently aspire to because the context can also set a glass ceiling for what people can dream about (Field et al., 2010, Mudimeli, 2011). Neoliberal thinking assumes that what people aspire for is what they must be assisted to get (Ferguson, 2007). But too often, where the local context limits opportunities and imaginations, people may set very low aspirations for themselves. Our contention, invoking the concept of universal human rights, is that it is appropriate to challenge or shift people's thinking in the direction of a justifiable human standard of living, and this is what our project hopes to initiate (Lastarria-Cornhiel, 2006).

Initiatives to empower rural women are often criticised for being out of touch with the realities of their living conditions (Cornwall, 2003). This happens when the voices of the women whom the programmes are expected to empower are not heard and their aspirations, goals and needs are not considered when designing such programs (Cornwall, 2003). It can also happen when the cultural setting such that women are dominated by men, and especially so for disadvantaged single women with no male relatives to access important resources (Tripp, 2004, Agarwal, 2003).

1.4 Prerequisites for Women Empowerment in Agriculture

The role played by rural farming women in agricultural production and processing makes women's empowerment, in particular the empowerment through agriculture of female smallholder farmers, a highly pertinent concern in agricultural development – especially in view of the growth potential of the agriculture sector in Africa and the high number of smallholder farmers involved (Jeckoniah et al., 2012; Alkire et al., 2013). Research has shown that there is a positive relationship between women's empowerment in agriculture and the nutritional status of families (Sraboni, Malapit, Quisimbig, & Ahmed, 2014; Malapit & Quisimibig, 2014). In her discussion on empowerment, Kabeer (1999) emphasises the importance of access to resources in achieving women's empowerment. She adds that these resources (material, human and social) enhance the capacity of individual to make choices (Kabeer, 1999). Although research has shown that giving women the same resources as men would significantly improve their yields (Quisumbing and Pandolfelli, 2009), inequalities persist because of long-established institutional practices such as gendered resource allocation in patriarchal communities.

1.5 Assets: water use security

1.5.1 Water use in South Africa: policy and practices

Prior to 1994, access to water was governed by the Water Act (WA) of 1956 which replaced all previous water laws (RSA, 1998). The WA applied water management principles from water-rich Europe which linked water resources to individual land (riparian rights), affording the landowner sole ownership over both the land and the water resources, with little account taken of the scarcity of water in South Africa (van Koppen and Schreiner 2014, de Coning and Sherwill 2004, Perret 2002). Under the apartheid regime, larger farmers were given privileged access to natural resources and other institutions while smallholder farmers were

discriminated against (Perret, 2002). Black households were largely landless and confined to about 13% of the country, leading Perret (2002) to characterise water scarcity as a 'socially constructed concept'.

The WA made provision for water use in the case of agricultural production for household food consumption but not in the case of agricultural production for economic gain, and can thus be cited as a causal factor for rural poverty (Perret 2002). Where smallholder households had access to irrigation water, it was recommended that the state provide them with between 1.3 and 1.7 hectares of land for their livelihoods (Tapela, 2008). In a 2006 study, only 100 000 hectares out of the 1.3 million hectares of irrigated land in South Africa were in smallholder irrigation schemes (Backeberg, 2006). In addition, there is a gendered and racial dimension in access to irrigated water use: most commercial farmers are white and male, while most smallholder irrigation farmers are black and female (Backeberg, 2006).

1.5.2 Reforms in water policy: legislation and strategies 1994-2015

Reforms instituted in the water sector were similar to reforms in the land sector, with a largely redistributive agenda shaped by objectives of the Reconstruction and Development Programme (RDP) that included meeting basic human rights and combating poverty, and gave especial priority to provision of water and sanitation (Schreiner & Naidoo, 2000; DWAF, 2009). The water reform process was set in motion with approval of the new constitution in 1996 in which section 27(1)b gave everyone the right to water (de Coning and Sherwill, 2004). Next came the Water Law Principles of 1996, compiled first for public comment prior to approval by Cabinet in November of 1996 (de Coning and Sherwill, 2004). This was followed in 1997 by a White Paper on National Water Policy for South Africa, leading on to promulgation of the National Water Act in 1998 which replaced the old Water Act of 1956 (de Coning and Sherwill, 2004).

While this was taking place, the Water Services Act of 1997 addressed issues of water access and sanitation for previously disadvantaged households, among which were smallholder irrigation farmers (RSA, 1997a). This culminated in the allocation, from 2001 onwards, of 6000 litres of free basic water per household in terms of the Free Basic Water Policy in which it was designated as an issue of respect for human dignity (DWAF, 2007). Informed by the NWA, the National Water Resource Strategy was announced in 2004 to implement of the policy changes (Backeberg, 2006). The Water Allocation Reform Strategy (WARS)

announced in 2006 provided detailed strategy and approach to fulfil the mandate of the NWP and NWA (DWAF, 2006). A revised second edition of the National Water Resource Strategy, NWRS2, was published in 2013.

1.5.3 National Water Policy

The White Paper on National Water Policy (1997) was developed after the consultative Water Law Principles of 1996 (de Coning and Sherwill, 2004). The broader objectives of the policy were to achieve, sustainable, equitable access to water and efficient water availability for South Africa (DWAF, 1997). Important for agriculture and smallholder irrigation was the recognition of the role equitable water access could play in rural economic development, to be achieved by expanding the options for previously disadvantaged black people and restricting those of white farmers (Backeberg, 2006).

1.5.4 The National Water Act

The National Water Act (NWA) 36 of 1998 dismantled previous water acts and put new emphasis on equity to redress past injustices in the water sector (Perret 2002; van Koppen and Schreiner 2014). Under the rights-based NWA, riparian rights no longer apply and water is regarded as a common asset (van Koppen and Schreiner 2014; Perret 2002). The Act aims to ‘control the use of all water resources, to protect them from being abused and polluted, and ensure that every person has equitable access to water resources’ (de Coning and Sherwill, 2004). To redress past injustices, Section 27 (2) of the Act lists the following criteria for water allocation and reallocation between users: 1) to provide for the reserve, 2) to address over allocation from a water resource or 3) to address disproportionate use (van Koppen and Schreiner, 2014). To support the development of resources and infrastructure and the management of water services the NWA included policy measures which would finance the proposed reforms (Yokwe, 2009). In addition, section 56 of the NWA provided for the marketing of water (Backeberg 2006, Yokwe 2009). The NWA also requires farmers to form water users associations and pay for water, water use and water services (DWAF, 1998).

1.6 Strategies

1.6.1 National Water Resource Strategy 1

The National Water Resource Strategy (NWRS) initiated in 2004 set out legislation and policy frameworks for equitable allocation in accordance with the requirements of the

Constitution, the National Water Policy (1997) and the National Water Act (Act No. 36 of 1998) (DWAF, 2004). Based on the IWRM, and conceived as the vehicle through which policy changes would be implemented, the NWRS framework for water management focused on auditing water availability to ensure sufficiency of supply for improved quality of life for the general population (DWAF, 2004).

In relation to use, conservation, management and control of water the NWRS covered water use, conservation in agricultural water use, charges for water use and establishment of organisations for water management (Backeberg, 2006). A system of licensing replaced the old riparian system, with licences valid for the applicant for the specified use, and for up to 40 years, subject to review every 5 years (DWAF, 2004). The authority was also responsible for identifying users from previously disadvantaged communities who may have had an interest in obtaining a compulsory licence (DWAF, 2004). Conservation would be promoted by improving efficiency in the sector through reduced wastage, in which a key strategy would be modernisation and maintenance of conveyance infrastructure equipment (DWAF, 2004). End users would be charged for water use and irrigators would be required to fund water management and water resource development and pay for water used (Backeberg, 2006). Charges would be levied for water resources development and for use of water works from government- or NGO-funded schemes to recover the cost of the schemes, with operations and management costs for water subsidised by government on a reducing scale over 5 years (Backeberg, 2006). Finally, establishment of organisations for water management would see a gradual decentralization of responsibility for water management to catchment management agencies (CMAs) and local water users associations (WUAs) (Backeberg, 2006). All existing irrigation boards would be transformed into WUAs (which would fall under the CMAs) following stakeholder consultation and approval by the Department of Water and Sanitation (DWS). In supporting establishment of the WUAs, the DWS would build capacity for subsistence and emerging farmers which would enable them to navigate the water sector and its changes (Backeberg, 2006).

1.6.2 Water Allocation Reform Strategy

The Water Allocation Resource Strategy (WARS) initiated in 2005 set out to execute and realise the policy intents of the NWA taking account of the prevalent inequality on gender and racial lines in water access and resource use (DWAF, 2006). The WARS, guided by the NWRS, sought in addition to balance efficient use of water by users for better production

yields with increased entrepreneurial opportunities. The WARS provided a framework for equity in regard to inclusion and active participation of small-scale producers, including farmers (DWAF, 2006). Due to the complex and contentious nature of water reform, DWAF recognised the need 1) to establish a balance between the necessities of socio-economic growth and equitable and beneficial water use by both previously disadvantaged individuals and existing water users, and 2) to carry out a well-implemented process in a timely manner to prevent socio-political unrest (DWAF, 2006). The WARS states that 60% of allocated water should be in black hands by 2020, half of whom would be women (van Koppen and Schreiner, 2014).

1.6.3 National Water Resource Strategy 2

The initial 2005 strategy made provisions for improvement and was followed by a second National Water Resource Strategy (NWRS2) published in 2013. The new strategy adopted a developmental water management perspective that reflects and builds on the principles of equity, environmental sustainability and efficiency underpinning both the National Water Policy and the NWA (van Koppen and Schreiner, 2014). The NWRS2 also makes provision for subsidised infrastructure to support poverty eradication and clarifies the order of priorities regarding water rights (van Koppen and Schreiner, 2014).

1.7 Implementation of the Water Policy, Legislation and strategies

Between 1994 and 2004 the South African government spent R14.8 billion on infrastructure to connect previously disadvantaged South Africans to existing and new bulk supplies and also to build new ‘small-scale infrastructure’ (van Koppen and Schreiner, 2014). There was abundant infrastructure development for those who could afford to pay, whereas developments were limited for small-scale productive water users such as smallholder farmers (van Koppen and Schreiner, 2014). A national fund for resource-poor famers was accordingly established in 2004 but the budget was chiefly used to promote rainwater harvesting at the homestead (van Koppen and Schreiner, 2014). While this addresses water access for domestic chores, it could restrict household production insofar as water for agricultural use would compete with water for domestic chores.

A national coordinating committee for small-scale irrigation support, led by the then Department of Water Affairs and Forestry (DWAF) with DAFF and IWRM, was established in 2001 but ceased to function when the focus of DWAF was switched to licensing and

registration. Small-scale irrigation development was further disadvantaged by poor support from DAFF, and there were suggestions at DWAF that it would be better to abandon smallholder irrigation and use the water for more economically profitable activities (van Koppen and Schreiner, 2014 quoting Van Rooyen & Versfeld, 2010, p. 13). However, this line of thinking went against the policy goals outlined in the National Development Plan 2030 and the New Growth Path which saw irrigated agriculture as a means for establishing greater equality (van Koppen and Schreiner, 2014).

1.8 Impact of Water Policies, Legislation and Strategies on Smallholder Irrigators

The new water policies were expected to improve water access for household and livelihood activities among previously disadvantaged households. Research on how the new policies affect smallholder irrigators has focused chiefly on the effect of water charges (Yokwe 2009, Backeberg 2006) and the efficiency of using irrigation water (Speelman et al., 2008). DWAF documents show that progress is slow, and for a number of different of reasons (DWAF 2013, DWAF 2006). Perret (2002) makes the point that although a number of rights are proposed in the NWA it is not clear which rights are applicable to the smallholder farmer, adding that because the Act only allows WUAs to apply for licenses for rights under special conditions it urges smallholder irrigation farmers to form WUAs so that they can be licenced and registered and charged (Perret, 2002). Without the benefit of a WUA, smallholder farmers' would confine their individual water rights to general use or to weaker rights as Schedule-1 users (Perret, 2002; van Koppen and Schreiner, 2014). The NWA and subsequent strategy documents fail, however, to take into account that smallholder farmers may not have the capacity to form a WUA or participate in an already existing one. In addition, allocation reform has been difficult to implement and has also made it difficult for poor and often illiterate smallholder farmers to access licensing. A report by DWAF officials noted that in Tosca, Mhlatuze and Jan Dissel catchment areas most licences had been awarded to applicants other than historically disadvantaged persons (DWAF, 2013). The effect is to confine smallholder farmers largely to the category of Schedule 1 users (van Koppen and Schreiner, 2014). Given the prevailing water scarcity in South Africa, it seems that smallholder farmers without licences will continue to be relegated to the periphery of economic productivity.

1.8.1 Gender and water use security

Policy developments in South Africa after 1994 took place against a background of international developments such as the Convention on the Elimination of All Forms of Discrimination Against Women (1979), the Convention on the Rights of the Child (1989), the African Charter on the Rights and Welfare of the Child (1990), and General Comment Number 15 adopted by the United Nations General Assembly in 2003, which all refer to right-based water access (Lastarria-Cornhiel, 2006). The South African constitution and the water policies sought to bring equity to water access in a context where such access had previously been denied and been largely unregistered. Since land rights in smallholder irrigation schemes are governed by customary law (van Averbeke and Mohammed, 2008), it is likely that the water rights in smallholder irrigation schemes were likewise governed by traditional and customary laws. Water security in this context may be defined as 'the reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of water-related risks' (Grey & Sadoff, 2007), while water rights may be defined as rights to use water from water sources such as rivers, ponds, streams or source of groundwater (UDWR, 2009).

Rural South Africa is largely patriarchal and governed by tribal councils; in consequence, productive resources such as water and land in are largely controlled by men (Cousins, 2007). With land allocation in irrigation schemes, both land rights and water rights were mostly assigned to families (Tapela, 2008) and in the case of patriarchal communities this generally meant in practice that the rights were allocated to men; women would mostly have user rights to water, although they could negotiate for other rights. In a smallholder irrigation schemes, land rights determine water rights; thus, if women cannot access land they cannot access water in their individual capacity. According to van Koppen (1998), the limitation for women of rights to water is linked to rights to land being held by men. The majority of rural women struggle to secure the right to water since they continue to be dominated by those who have access to land and economic power (Gabru, 2005). Access to and control of resources is a reflection of status, and secondary access to productive resources signals that women have a secondary status in their communities (Zwarteveen and Meinzen-Dick, 2001).

Often rural women use land to provide for their families without legal rights to water and land (Brewster et al., 2006). Where male migration is common but women's rights to water as individuals remain secondary this may compromise the women's capacity to perform their

duties. Women use water for irrigation, but where the only source of water available locally is irrigation water women have been shown to use it also for other household uses, as in a study of rural women in Nepal where it was socially acceptable for them to use the irrigation water passing through the village for household chores (Zwarteveen and Meinzen-Dick, 2001). Given the prevailing water scarcity it is possible that this could also be the case in communities with smallholder irrigation schemes in South Africa.

Literature shows that although rural women can access water from the commons and from irrigation schemes to perform their household duties as women, they are seldom given recognised rights in this regard (Zwarteveen and Meinzen-Dick, 2001). Instead they are considered to be either household members of the farm owner or irrigators, and this can have negative consequences when it comes to registration of rights to water. It has also been shown that although women access for water for their livelihood activities, they are often not involved in the management of the water (Zwarteveen and Meinzen-Dick, 2001). Gendered access may thus have negative implications for production by women and their household food security, particularly when they have to 'compete' for water resources with male-oriented activities such as livestock production. In relation to women's agency in accessing water and defending their rights findings vary where the focus has been on women's duties as providers of food for the household (Zwarteveen and Meinzen-Dick, 2001).

1.9 Assets: Land Use Security

1.9.1 Review of land reform policies in South Africa

The South African land reform programme was formulated to address the plight of landless South Africans who had been previously denied land under apartheid (DLA, 1997). Given the overcrowding, the poor physical state of the land and the general landlessness in the former homelands, coupled with high unemployment, the government at the time saw agriculture as one of the ways that could be used to reduce poverty. Almost 20 years on, agriculture is a key poverty reduction strategy in the national development plan. The programme to redress issues of access to land had three aspects: land restitution, land redistribution and land reform (DLA, 1997).

In land restitution, designed to bring restitution to those who had been removed from their land after 1913 (DLA, 1997), the focus was mostly on groups, which could be compensated

by being given either land or money. Women in land restitution mostly benefited as members of households.

Land redistribution is the arm of land reform which was used to give land to landless black people. It was run under the Settlement Land Acquisition Grant programme (SLAG) from 1995 to 1999 (DLA, 1997). The beneficiary unit was a South African married or cohabiting couple or anyone with recognised dependents (DLA, 1997) to whom the government would give a grant of R15 000 (later increased to R16 000) to buy land (DLA, 1997). At the time, the grant could buy some hectares of land, but for beneficiaries to buy a farm they had to form a Communal Property Association where many of them would come together to buy the farm. Land redistribution under SLAG was halted when a new minister took over in 1999 (Hall, 2004).

The land redistribution programme was then changed to Land Redistribution for Agricultural Development (LRAD), which focused on an emerging class of black farmers (NDA, 2001). The target beneficiary in LRAD was the individual, who was expected to have some knowledge of agriculture and have a business plan (NDA, 2001). The beneficiary would also be asked to contribute at least R5 000 in cash and would receive R20 000 from the department on a sliding scale (NDA, 2001). For the poor who could not afford to pay the R5 000, the policy was changed so that beneficiaries could contribute labour or a combination of labour and cash. In recognition of differing individual needs, the programme included four different components: food security, equity scheme (farm owners and workers), production for markets (experienced farmers) and communal agriculture (for farmers with land but no capital) (NDA, 2001). One provision included in LRAD was that about a third of all benefits would be transferred to women. It also encouraged women as individuals to apply for their own land if they met the prerequisites but failed to take into account the fact that most women, particularly rural women, cannot raise the expected amount, being in most cases the poorest of the poor.

1.9.2 Land reform in rural South Africa

Most black South Africans living in the rural areas were moved there as a result of forced removals during apartheid (DLA, 1997). The former homelands, where most of these people were forced to move, made up about 13% of the land in South Africa, and were characterised by overcrowding and limited arable and grazing land. The rural populations were and still are

governed by a chief (mostly male), now called a traditional authority (TA), who holds the land in trust on behalf of his community. On being awarded user rights, some rural households were given permission-to-occupy letters (PTOs), but the land has always been vested in the tribal authority as chief administrator of the user rights. In this respect, rural land tenure is inconsistent with land tenure in urban South Africa, where land owners have full rights to their land. The opportunity to get the same rights would have been provided under Communal Land Rights Act 11 of 2004 (CLaRA), but the act was contested and currently does not apply. Nevertheless, rural dwellers required security of user rights while the law was being drafted and the Interim Protection of Informal Land Rights Act 31 of 1996 (renewed annually) was therefore enacted to protect their rights. The land reform arm also focused on tenure reform in the former homelands, which has mostly fallen into suspension while the future of CLaRA remains unresolved (Cousins, 2007). Although CLaRA included provisions for joint ownership of land by married couples which would give women equal tenure with men and uphold the rights of spouses of land owners (Africa, 2004), these provisions could be changed if they were out of accord with rules and customs of a community. The interpretation by the custodians of these customs and practices as to what constitutes right to access may thus impede access to land for rural women, with negative consequences for livelihoods and food security.

CLaRA (2004) was declared invalid by the Constitutional Court on grounds of unconstitutionality and lack of consultation, being deemed by grassroots organisations and others to give too much power to the traditional authorities while reducing rural dwellers to the status of subjects, and women to a secondary position (Cousins, 2007). Also rejected was a close and problematic ‘relative’ in the form of the Traditional Courts Bill, which would have given increased power to chiefs in resolution of civil disputes, which was thrown out because it threatened to entrench differential rights for rural and urban citizens. Overall, the impasse in resolution of land rights affects up to 16 million South Africans who are the poorest and most food-insecure (Stats SA, 2011). It must be concluded that the now defunct CLaRA (2004) and the Traditional Courts Bill were not progressive in general and disadvantageous to women in particular.

Current land laws in South Africa have negative implications for rural people, the poorest especially, in regard to individual title to land, gendered access to land and security of tenure. CLaRA had been seen as the most important instance of legislative reform and the lacuna caused by its scrapping leaves rural communities, particularly women, vulnerable to

discriminatory practices in land allocation and land use. There is therefore a need for policy to protect and restore the land rights of these rural dwellers who have long been excluded from secure individual tenure. CLaRA proposed to assign land ownership to the traditional authority rather than the individual rural dweller, which would still limit the extent to which a rural household could use their land commercially. One school of thought argues that most rural dwellers are not familiar with individual land title, and that there is a risk that sophisticated 'investors' could take advantage of uneducated rural people who would end up losing their land. However this may be the case, there is nonetheless a need for a legal framework that clarifies land issues in rural South Africa while protecting the previously disenfranchised communities in these areas.

1.9.3 Impact of land reform programme on ownership rates

In 2005, the Land Reform Programme had at that stage given 3.4% of agricultural land to black South Africans, mostly through land redistribution (Walker, 2005). The figure remained below 7% in 2010 (Lahiff, 2010). Although this falls significantly short of the 30% target by 2015, many previously landless South Africans have benefited. For women, the benefits related to receiving land as beneficiaries and securing rights. They now have access to land, water and other natural resources with which they make a living, giving many women a feeling of belonging and an affirmation of their identity as South Africans. There have been concerns however, over the quality of land that beneficiaries received during the programme.

Hall (2004) speaks of low-value land in semi-arid regions. It has been difficult for many South Africans to 'take up' the land they have been given. In some cases the new land is far from the beneficiaries' current residence and it is expensive for them to relocate (Valente, 2009). Others are also reluctant to move from developed areas into areas without any infrastructure. In addition, there has been very little post-resettlement support. The beneficiaries in most instances did not receive extension services, training, infrastructure development or access to credit and markets (Lahiff, 2008, Walker, 2005), which has limited their capacity for productive land use. Although the term 'post-settlement' is in use, the land reform process in South Africa failed to incorporate any consideration of 'pre-settlement' issues, which could help to explain to widespread failure experienced by resettled people. As noted earlier, agricultural production inherently requires skills, markets and pre- and post-settlement institutional empowerment and support, and it can be strongly argued that pre-

settlement support is especially important for empowerment and agency enhancement that could improve chances of success. But for rural dwellers in communal areas, there has been no change whatsoever in relation to individual ownership. Nevertheless, it is important to understand that individual title may not always benefit the individuals in the intended way (it may in fact burden them and the economy), especially when the new owner has low skills, poor financial, market and institutional support. The key issue in this complex land reform area, replete with statutory and cultural contradictions, is to identify instruments for rural dwellers in South Africa (over 14 million people who wish to benefit from land in a way that can attract financial investment) that safeguard the rights of those made vulnerable because they are less educated or sophisticated.

1.9.4 Effectiveness of land reform measures for women and people-centred water use

For change or development to occur, laws are enacted and policies are formulated to give effect to the laws through strategies and programmes which may include interpretation and sense-making by different stakeholders tasked with implementation. Shortcomings even in well-conceived policies and strategies may become evident during the implementation. This may be due either to lack of capacity in the course of delivery or to inadequate consultation during the policy-making process. The relevance and impact of identified land and water laws, policies, strategies and programmes on women in terms of the sustainable livelihoods approach and its central tenets of participation, empowerment and people-centredness is important. The applicable statutes for this report are the Spatial Planning and Land Use Act of 2013, the Communal Land Rights Act 11 of 2004, CLaRA, the Restitution of Land Act 48 of 2003, and the Interim Protection of Informal Land Rights Act 31 of 1996.

The Spatial Planning and Land Use Act of 2013 sets out provisions for inclusive, developmental and equitable spatial planning and for addressing past spatial and regulatory imbalances. Issues of inclusivity, equitability and development have crucial bearing on livelihoods in rural areas, especially for women, whose access to resources is restricted by a legal and cultural framework that makes them dependents of men, thus leaving single women the most vulnerable of all. The Spatial Planning and Land Use Act seems to have had little effect in communal rural areas, where the now defunct Communal Land Rights Act (1994) was more relevant even though it failed to promote equitability, especially for women. It is also true that, spatial planning and zoning in rural areas is historically weak, which adversely affects optimal land use.

The purpose of the Communal Land Rights Act 11 of 2004 (CLaRA) was to create legal security of tenure by transferring communal land. Communal usage rights for rural residents are administered by a chief, who in most cases is a man. Strongly patriarchal attitudes still prevail in rural areas, and lead to potential exclusion of deserving people, particularly women. The rights cannot be 'sold' or used for collateral and thus create no incentives for investment in developmental activity in rural areas. CLaRA has now been discarded, creating further uncertainty for rural dwellers that could benefit from rights that would open up economic possibilities for them. And now that South Africa has wall-to-wall municipalities (that can provide individual title), it is relevant to ask why communal rural dwellers cannot access individual title. This raises the further question of the role of traditional authorities (TAs) in regard to land rights administration and title for individual dwellers. It is an established fact that women in the poorest provinces, including Limpopo, are heavily burdened with providing food for their poor households (STATS SA, 2012), which means that they are even more heavily borne down by lack of access to land for food production. In the absence of CLaRA, the Interim Protection of Informal Land Rights Act 31 of 1996 has an important role in providing legal security of tenure through transfer of communal land, giving some protection rural dwellers while legislation specific to their land rights is being debated. The reality for women however is that continuation of existing cultural rights regimes which vest access and user rights in a male household head keeps women at a disadvantage as secondary citizens.

The other Act discussed in this report is the Restitution of Land Act 48 of 2003, in terms of which transfer of land required claims that had been lodged during the application period to be researched, validated, gazetted, negotiated and settled. However, restitution did not cover all rural dwellers, and to protect the land of rural dwellers from appropriation and possible displacement under the Interim Protection of Informal Land Rights Act 31 of 1996 these and other kinds of proof (e.g. receipts) were therefore given to the household head, and a record of all land rights was maintained in the relevant traditional authority (Murugani, 2013). Women benefited as members of their households (the focus was the household), not as individuals, and this may have limited the extent to which women in general (e.g. unmarried women) benefited. Furthermore, cases have been cited of women who were awarded restitution to commercial farms near rural communities becoming easy targets of crime, and also of criticism from some rural communities that it was not the place of women to 'own and operate land in their own right (Thamaga-Chitja et al., 2010). Such experiences may

discourage women from seeking to benefit from other land reform programmes that support individual ownership of commercial land by previously disadvantaged women. The slow pace of land transfers (Walker, 2005; Myburgh, 2013), coupled with communal land frameworks that forego individual title, delay still further the hope of land ownership for poor rural women in South Africa and the strengthening of livelihoods that could make possible for them.

South Africa, like most sub-Saharan African countries, has a dual land property rights system (Toulmin, 2008; Goebel, 2007; Deininger & Castagnini, 2004; Grey & Kevane, 1999). In customary land tenure in South Africa there is no individual ownership of the land either by ordinary individuals or by the traditional authority (the chief); the state remains the owner, represented by the minister of Land Reform and Rural Development (Mathis, 2007). Manona (2012) comments that absence of security of tenure, due to inadequacy and lacunae in legislation, conflicts with the constitutionally entrenched protection of property rights. Although the institutional weakness here in relation to land rights is gender-blind, affecting both men and women in rural South Africa, women's access to land is compromised still further by customary practices that are often remain deeply patriarchal (Thamaga-Chitja et al., 2010).

1.9.5 Statutory law and women's land rights

According to the South African constitution, men and women regardless of race or creed can own land as individuals in their own right or as part of a group according to the rules of the group (RSA, 1996). In most countries, including South Africa, ownership of land is attested by a nationally recognised title deed (De Soto, 2000) which is transferable through sale or inheritance. Ability to sell the land with a transfer of title deeds creates a land market (De Soto, 2000). Although the title deed can be used to borrow money for investment in the piece of land, it has been argued that poor farmers would not take loans against their land (Lastarria-Cornhiel, 2006). Alternatively, land can be rented out if the proprietor does not wish to use the land (De Soto, 2000).

Although statutory land law is presented as the ideal tenure system, it has several disadvantages. First, privatization of land concentrates land in the hands of the elite and well-connected individuals, particularly if one must pay to obtain title (Toulmin, 2008; Lastarria-Cornhiel, 2006). Second, although women theoretically have an equal opportunity to own

land, most lack the resources to participate in the market (Jacobs, 2004). Third, although statutory law should cover the whole country as an administrative region, it only applies to major urban areas constituting about 10% of sub-Saharan Africa (Lastarria-Cornhiel, 2006; Rose, 2003; Yngstrom, 2002). This is because most governments do not have the capacity or will to widen the reach of statutory law and related institutions, with the result that other laws prevail which are discriminatory towards weaker groups (Lastarria-Cornhiel, 2006). Fourth, although the statutory law is premised on gender equity, various laws may contradict this in practice (Lastarria-Cornhiel, 2006). Some laws may unintentionally put women in a subservient position, such as inheritance laws which favour sons over daughters or laws which give men and women different grounds for divorce (Lastarria-Cornhiel, 2006). Finally, introducing statutory laws which are not supported by local institutions weakens and hinders women's land access both during titling projects and after their completion (Lastarria-Cornhiel, 2006). For example, women in Vietnam were supposed to benefit from a land titling project but uncooperative implementers and communities caused them to remain as secondary beneficiaries (Lastarria-Cornhiel, 2006). In a Zimbabwe resettlement project, single women got land as individuals in their own right but on their death a male relative inherited the land because customary laws were applied (Mudege, 2008).

1.9.6 Customary law and women's land rights

Land in most rural areas under customary law is seen as a symbol of power and belonging. The land is vested in the chief who allocates it to his citizens and adopted citizens on the basis of need and other social customs (Cousins & Hornby, 2009; Toulmin, 2008). Under customary law, the chief and his council are the most powerful people in the village (Bogale & Korf, 2005). Land allocations are normally made to a male household head on behalf of his family, consequently the household is the most basic arena of land ownership (Cousins & Hornby, 2009; Yngstrom, 2002). The land passes from father to son to keep it in the family (Yngstrom, 2002). Women access the land from their male relatives and this gives men power and authority (Cousins & Hornby 2009; Rose 2003; Yngstrom 2002). In the colonial period, allocation of land followed the 'unitary household' model which assumed that resources allocated to the household head on behalf of his family would be distributed equitably (Agarwal, 1998). However, research has shown that household members have differential access to resources according to gender, age and position (Kerr, 2005). The rights of the male household head take precedence over those of his male and female beneficiaries

(Yngstrom, 2002). So although families and other social networks are very important for women's access to land, women's position in the family and therefore society is that of a weak dependent (Lastarria-Cornhiel 2006; Yngstrom 2002).

Although customary laws differ according to tribe and country, a common feature of patrilineal customary law is that women are secondary beneficiaries of resources as they are considered minors (Cousins & Hornby, 2009; Toulmin, 2008; Lastarria-Cornhiel, 2006; Jacobs, 2004; Rose, 2003; Yngstrom, 2002). Men access resources through grants from individuals or the chief, or through inheritance or other arrangements, but women's rights are linked to those of their husbands (Rose, 2003). Under customary law, land is accessed through a combination of individual and collective rights and land is allocated only to citizens of a particular area (Jacobs, 2004). The rights differ depending on the sex of the recipient, which determines the extent to which they can be exercised (Rose, 2003; Gray & Kevane, 1999). In most customary law systems, there is no documentation of the rights one possesses or how they may be used (Toulmin, 2008). Generally, property rights for men comprise control, access and influence, while women have access rights and sometimes influence; women consequently have a smaller resource portfolio than men (Torkelsson & Tassew, 2008; Yngstrom, 2002). The land is held by the chief for his people and once he has allocated it to a male household head, the recipient controls its daily use and exploits its produce for his benefit (Yngstrom, 2002). The household head allocates some pieces of the land to the members of his household according to seniority if he has several wives and he may retain some for himself (Yngstrom, 2002).

Marriage is a major access point for both men and women (Lastarria-Cornhiel, 2006; Cousins & Hornby, 2009; Jacobs, 2004; Yngstrom, 2002). In Msinga, South Africa, married men receive land so that they can provide food for their families (Cousins & Hornby, 2009). In this instance, land is treated as essential to a household's land-based livelihood activities. Apart from grants, men can rent out or inherit land from other individuals. For women, marriage represents a critical access point for land and other productive resources (Cousins & Hornby, 2009; Goebel, 2007; Yngstrom, 2002). A husband will allocate land to his wife to produce crops for household consumption (Cousins & Hornby, 2009; Yngstrom, 2002). A man is expected to give residential and arable land to his wife in exchange for her labour (Yngstrom, 2002). In some parts of Ghana, if after years of marriage a man does not allocate land to his wife it is seen as justifiable grounds for divorce (Yngstrom, 2002). The land a woman accesses from her husband is seen as safe as long as she stays married to him

(Cousins & Hornby, 2009; Yngstrom 2002). Swaziland women complained that their land rights were weak because they depend on their husband or in-laws' benevolence (Rose, 2003). Case studies on Msinga, South Africa and Murang'a, Kenya show also that in some cases a married woman inherited her mother-in-law's land after having worked on it with her for years (Cousins & Hornby, 2009; Yngstrom, 2002). This land was seen as secure because once the mother-in-law allocated it, it was recognised as the woman's land and she could one day allocate it to her daughter-in-law (Cousins & Hornby, 2009). A woman can use her land to cultivate her crops and she controls the work done on the field and the produce (Yngstrom, 2002). However, Swaziland women use the land according to the instructions of their male relatives and cannot rent it out without permission to do so, as land is regarded as a male domain which women cannot handle (Rose, 2003).

The fate of widows depends on the customs of the area and her relations with her husband's family. According to customary law women cannot inherit land or the matrimonial home (Toulmin, 2008; Gray & Kevane, 1999). In Tanzania, a widow would manage the land as a trustee for her sons until they came of age and could represent themselves, except that access to resources relied on the family and if relations broke down the widow would return to her natal village (Yngstrom, 2002). From a South African case study Jacobs (2004) noted that widows could lose their rights to land to the deceased husband's relatives. In the rare case that she inherited there was always some pressure to hand over the property to her husband's relatives (Jacobs, 2004). In Zombodze, Swaziland, a widow could stay on her husband's land provided the family of the deceased allowed her to (Rose, 2003). The widows of Msinga, South Africa, had various options: a widow could be inherited by one of her brothers-in-law; she could continue residing at the house without her brother-in-law's protection and risk losing her property gradually to the family; she could ask for land in her own right which she would hold for her son until he came of age; or, finally, she could return to her natal home (Cousins & Hornby, 2009). The plight of widows in the context of high HIV/AIDS prevalence is particularly disheartening. A study conducted in KwaThanya, Shayizandla and Mpumuza, South Africa, showed, on the other hand, that older women retained access to their deceased husbands' land and that this was a significant access point to land use security for them.; although the land was said to belong to them until the older son claimed it, the women were in control of the land and made decisions about what to plant and how to use the produce (Thamaga-Chitja et al., 2010).

Single women in a customary environment experience a range of problems in seeking to access land, even if they have dependents (Cousins & Hornby, 2009). Decisions on land access for women who have never married or are widowed or divorced are considered case by case (Cousins & Hornby, 2009; Rose, 2003). Most of these women rely on their natal families to represent them at local courts (Cousins & Hornby, 2009; Rose 2003). The circumstances surrounding the woman's single status are likely to determine whether or not she will get land, as rural areas are conservative and the chief's court is the custodian of local customs (Cousins & Hornby, 2009; Rose, 2003).

Women who have never married but have children are in a precarious position, since they are seen as having contravened local customs. Their families may present their request for a land grant at the chief's court and show that there is need for them to receive land (Cousins & Hornby, 2009). Some single women who had been allocated land had it registered in a male relative or son's name (Rose, 2003). Although and use security for single women may increase with the number of years she has cultivated a field (Gray & Kevane, 1999), the single women in a Swaziland case study faced land confiscations, threats of eviction and threats of violence or sorcery if they resisted eviction (Rose, 2003). In some cases, single women are allocated land on the family plot and on the family residential land (Cousins & Hornby, 2009). Continued use of the land depends on the maintenance of good relations between a single woman and her family, particularly her male relatives, which further weakens her position in the family and community because she cannot afford to disagree with the family in case she needs their help in the future (Lastarria-Cornhiel, 2006). Women whose relationships with their natal family had broken down stand to lose their land (Cousins & Hornby, 2009). If the family head dies, the woman's continued stay is not guaranteed; some women were evicted by their father's relatives (Cousins & Hornby, 2009). Divorced women return to their natal homes because marriage is patriarchal and a woman cannot continue to stay at her former home because it belongs to her former husband and his clan (Cousins & Hornby, 2009; Rose, 2003). Alternatively the woman can be allocated a plot of land in the same village (Cousins & Hornby, 2009).

1.9.7 Land rights discrepancies

The dual land administration system in most developing countries creates discrepancies between statutory land entitlement based on equal rights and protection of rights before the law and customary law determinations based on social welfare and safety nets (Toulmin,

2008). This diversity in land rights is accompanied by contradictions in rights and their hierarchic importance that compromise their security (Toulmin, 2008).

These contradictions are particularly apparent where statutory laws have been applied in customary law areas without engaging the local populace (Gray & Kevane, 1999). It is not clear how the different regimes relate to each other, which decision-making body has precedence or how individuals can secure their rights in both arenas (Toulmin, 2008). Conflict may arise if there are overlapping rights to a plot of land as has been noted in Uganda (Gray & Kevane, 1999). Under customary law the rights to a piece of land may differ according to season and livelihood activity whereas statutory law excludes secondary rights holders (Toulmin, 2008). Toulmin (2008) questions the validity of a judgment by either authority in the eyes of the rights holders. Individuals with resources and knowledge could exploit differences between the two sets of rights to appeal to those aspects of either which favour them (Namara et al., 2010; Toulmin, 2008).

Another difficulty is that although statutory law gives equal rights to both men and women and people of marginalised groups it does not apply outside of urban centres (Lastarria-Cornhiel 2006; Deininger & Castagnini 2004). Communal tenure is consequently more prevalent because chiefs are easily accessible, although a significant disadvantage of traditional land administration systems that function without reference to rights of the individual is that they are open to corruption and patronage – lack of accountability being a legacy, in this regard, of colonial-era disruption of communal land practices (Toulmin, 2008).

1.9.8 Strategies women employ to tackle land insecurity

Women's insecurity is embedded in the nature of social relations (Lastarria-Cornhiel, 2006). Patrilineal customary law determines the means of accessing and relating to land (Yngstrom, 2002), and for women these means are tied to their relationship to the men in their natal and marital homes (Cousins & Hornby, 2009; Lastarria-Cornhiel, 2006; Jacobs, 2004). Continued accessing of land through a man depends on the maintenance of a mutually beneficial and cordial relationship (Lastarria-Cornhiel, 2006; Yngstrom, 2002). Although the case can been made that individual titling is best suited for improving the status of women and their production efficiency, married women in some studies opted instead for joint ownership as being less provocative in running of the family establishment and less threatening to their continued access to land (Agarwal, 2003; Jacobs, 2004). Single women, however, would

benefit from individual titles to secure their land holdings against land greedy and jealous neighbours (Cousins & Hornby 2009; Rose 2003).

Strategies that women resort to when their land is threatened can range between manipulation, challenge and respect for authority (Rose, 2003). Using examples from Swaziland and Malawi, Rose (2003) showed that women using customary law to secure their land were successful in many cases when they knew local land laws, knew how to lodge an appeal in the local courts and, even though proposing a solution outside customary law, still maintained respect for the chief and local court. More generally it has been found that women recognise opportunities and loopholes in the customary framework and use them to secure their rights to land in their communities. Women use social relations and customary institutions to secure land (Cousins & Hornby, 2009; Lastarria-Cornhiel, 2006; Yngstrom, 2002). A woman's family can petition the chief and his council for land for her on the basis of her lineage and having dependents to fend for (Cousins & Hornby, 2009). Alternatively, a woman can have the land registered in the name of her minor son and she can pledge to honour his obligations until he comes of age (Rose, 2003). Women may also appeal to powerful and influential women who can represent them to the chief or his council (Rose, 2003). This is evidence that women can navigate the customary law framework and gain and retain access to land, although in conservative communities where women's groups have successfully asked for land to use for community gardening or for individual gardening for food security purposes, documentation of a land allocation would nonetheless improve their position (Rangan & Gilmartin, 2002; Gray & Kevane, 1999). Women could also pursue share cropping, tenancy and lease agreement arrangements with other land owners following procedures recognised by their customs (Toulmin, 2008).

1.10 Knowledge generation

Knowledge is generally classified into two types: procedural knowledge and propositional knowledge. Procedural knowledge, also referred to as practical knowledge, is understood as focusing on learning what to do; it is knowledge that is not easily codified, and tends to be more context bound (Wilson and Demetriou, 2007; Eraut, 2002; Bernstein, 1999). Propositional knowledge on the other hand is the term applied to declarative, abstract knowledge that includes concrete facts, principles, and knowledge of ideas. This type of knowledge is codified and is mostly, but not exclusively, academic in nature. The ways in which these two kinds of knowledge are acquired differ, with propositional knowledge

acquired through formal learning and procedural knowledge acquired mostly through informal learning. Research on how and where learning takes place tends to show a dichotomy between the cognitive and the social view of how people learn (Lieberman and Mace, 2008; Fraser, Kennedy, Reid, and McKinney, 2007; Kelly, 2006; Knight, 2002). The cognitive view of learning is based on the assumption that learning is an individual activity, that individuals acquire knowledge in one context or setting, and that they are able to use this knowledge in other settings (Kelly, 1999). An alternative view is that learning is a social activity, taking place within communities of practice (Wenger, 1998). This situated view of learning emphasises collaboration, collegiality, a sense of belonging and recognition by the community as crucial in learning (Wenger, 1998). It sees learning as happening mostly on site, in this case in the farming plots, and as shaped by contextual factors, and therefore difficult to codify. However, there has been a shift in the way learning is regarded, and increasing recognition that the two views are complimentary rather than dichotomous deepens our understanding of how people learn. It is this complementary view of learning that we adopt in thinking about how best to improve the smallholder farmers' knowledge and skills in this study, and this requires closer attention to what exactly makes up procedural and propositional knowledge for smallholder farmers.

Established ways through which farmers acquire knowledge and skills the world over include farm schools, farmer days, government and private extension, farmer-to-farmer knowledge exchanges, and formal training (Aliber et al., 2010, Friis-Hansen and Duveskog, 2012). Many of these ways of acquiring agricultural/farming knowledge would be considered as examples of cognitive learning, which assumes that farmers would simply 'take' the codified knowledge given to them during training and apply it in their contexts, in this case their plots, in exactly the way they were taught. This is a limited view of how farmers learn which fails to take account of the farmers' contexts. It is therefore not surprising that there has been mixed success on each of these modalities of improving knowledge and skills levels, yielding mixed results when it comes to linking farmer empowerment to decision making in agricultural production, use and access of resources, income, leadership and time use (Aliber et al., 2010, Friis-Hansen and Duveskog, 2012). It can thus be strongly argued that knowledge and skills are crucial for empowerment (Friis-Hansen and Duveskog, 2012).

In the key role that they have played in agriculture over the ages, women have accumulated a rich legacy of indigenous knowledge in the form of technical agricultural know-how. The FAO (2004) defines local knowledge as 'a collection of facts [relating] to the entire system of

concepts, beliefs, and perceptions that people hold about the world around them.' This knowledge often relates to indigenous practices in one form or another. Traditionally women around the globe have lived in balance with nature in their management of water for domestic and agricultural purposes. Women's local knowledge should therefore be taken into account when implementing rural projects and doing research on appropriate technology for food production and processing, rural water supplies and renewable energy sources. Greater participation by women and more recognition of their potential contribution in the design and development of water technologies could significantly benefit national economies and household food security (UNIFEM, 2001), although it is a concern that the accumulated generational knowledge seems to reside in older women, raising questions about the passing on of the local agricultural knowledge to younger generations. The notable decline in the level of participation in agriculture by younger people, with evidence that they are less and less interested in farming (Altman et al., 2009) could have serious consequences for sustainability and knowledge transfer.

Crop production is highly technical and demands high levels of both propositional and procedural knowledge; good yields depending on correct choice of crop and variety, appropriate land preparation and conservation, planting at the right time, correct and timely use of fertiliser and other agrochemicals, effective crop protection and rotation, a crop-specific watering regime, timely harvesting, and processing, packaging and safe storage of produce (Aliber et al., 2010, Arias et al., 2014, Baudron et al., 2012, Friis-Hansen and Duveskog, 2012, Marenya and Barrett, 2009, Misiko et al., 2011). When smallholder farmers lack this knowledge, productivity and gain from crop farming are reduced. Indigenous knowledge may be robust (Koocheki, 2004), but gaps remain which can only be filled through appropriate training that recognises and taps into the existing local knowledge. Establishing what works in a particular village calls for socially focused knowledge, co-constructed by both the farmers and their 'teachers'. In addition, researchers are constantly finding more efficient varieties and ways of growing crops which could assist the smallholder farmer to increase production (Denning et al., 2009), signalling the need to keep up with the continuously changing face of technologies in agriculture. Investment is needed in agricultural training of both the farmer and extension officer to build and expand smallholder farmer skills so that they can adapt to changing social and economic circumstances where they would otherwise lag behind their commercial counterparts (Poulton et al., 2010),.

Effective ways to improve the training are through field demonstration plots and use of visual aids such as extension posters on the management of various crops.

Farmer training must include knowledge of concrete facts, principles and ideas in agriculture, as well as practical knowledge of what to do (skills). In a 'community of practice' such as a village or a group of irrigation scheme farmers, knowledge is possessed by both individuals and the community as a whole and learning takes place at both individual and community levels.

Most smallholder farmers (SH) in the developing world have had no formal training and rely on advice from their extension officer and knowledge handed down from their forebears (Aliber et al., 2010, Koocheki, 2004). Extension officers are expected to both assist farmers with concrete facts about farming/agriculture and impart practical knowledge, but South African SH farmers in the former homelands have mostly had little exposure to modern and developed agriculture, unless they have previously lived or worked on a farm (Aliber et al., 2010). Aliber et al. (2010) point out that agriculture is no longer taught as a subject in South African schools, and the quality of agriculture education at secondary school level is questionable with poorly trained teachers. Smallholder farmers who have at best received minimal agricultural education may be almost wholly reliant on their extension officer for knowledge, but too often extension officers who come from the same system are poorly equipped to deal with the farmers' problems since most of their professional training is based on commercial agriculture (Aliber et al., 2010).

However, the concept of 'knowledge gaps' should be approached with caution as it too easily assumes some form of emptiness and void in the farmers' knowledge base which may not necessarily be the case. It may also reflect a history of failure to recognise stature and value in local knowledge. There needs to be attentively negotiated investigation of knowledge to support the farmers in improving food security. The danger with the conventional understanding of knowledge gaps, which assumes emptiness, is that it might encourage what Schecter and Lynch (2011) refer to as gap filling or banking approaches to addressing these issues. This would be problematic in view of the issues that need to be navigated in farmers' knowledge base when devising strategies for women empowerment through improved food security and land use. In this study our conception of knowledge gaps relates to areas in farmers' agricultural knowledge base that require some revision or improvement. Current

extension services for SHs based on conventional farming methods tend to assume that knowledge can simply be 'deposited' in people's minds.

1.10.1 Land use empowerment, food security and sustainable livelihoods

Secure access to land is essential for rural livelihoods (Li et al., 2008; Toulmin, 2008; Deininger & Castagnini, 2004). Agriculture is among the top three rural livelihood activities and contributes significantly to household food security (Aliber et al., 2006). Literature shows that farmers with secure access to land and water are more productive than those without (Quisumbing & Pandolfelli, 2009). In addition, it has been shown that land conflicts and speculation disrupt farming (Toulmin, 2008; Deininger & Castagnini, 2004). This can be attributed to the displacement of farmers and the loss of man hours and money on litigation which could have been spent on agriculture (Toulmin, 2008; Bogale et al., 2006). Access to land has also been shown to improve one's access to water (Namara et al., 2010; Pellizoli, 2010). Rural women are actively engaged in agriculture as a livelihood activity and produce a significant amount of food in the world (Kent & MacRae, 2010). However, they farm on their male relatives land and this has implications for the quality of resources they can access (Agarwal, 1998).

Women play a significant role in rural agriculture but they do not own the land they cultivate (Kent & MacRae, 2010). The land belongs to the husbands and other male relatives, and access to the land depends on their generosity (Yngstrom, 2002). Literature has also shown that land use insecurity is gendered and that it discourages women from investing in land (Agarwal, 1998). Conflict has been shown to reduce production because it displaces farmers and wastes time and money which could have been invested in agriculture (Toulmin, 2008; Deininger & Castagnini, 2004). Agarwal (1998) shows that women's productivity on land they do not own is much lower than on land they own. This has been found to be true for land owned by their male relatives and particularly so if the woman will not control the produce (Agarwal, 1998). In the absence of their male relatives women frequently become *de facto* household heads (Kent & MacRae 2010; Agarwal 2003). Land use security and control of produce could have a significant impact on women's agricultural production and their household food security (Kent & MacRae, 2010).

Women's agriculture is negatively affected by poor access to resources such as seed, fertiliser and machinery (Kent & MacRae, 2010). Women cultivate food crops for consumption and

see agriculture as a means for establishing household food security (Kent & MacRae, 2010). Gardens, for which water may well be a limiting factor, contribute significantly to household food security, and with support, can expand from producing for household consumption, to producing excess for sale to neighbours, and ultimately to producing for profit (Backeberg & Sanewe 2010; Kerr 2005).

1.10.2 Water use, empowerment, food security and sustainable livelihoods

Water is essential for agricultural production, but most poor people do not have physical and economic access to adequate water for consumption, let alone for productive purposes (Namara et al., 2010). Access to water is linked to access to land, and in most irrigation schemes the size of the land one owns determines the amount of water one can access (Namara et al., 2010; Pellizoli, 2010). This disadvantages women who do not own land and who cannot access valuable land with on-site water resources (Namara et al., 2010). Farmers with secure access to water have higher agricultural productivity than those without the difference being attributable to increased area under cultivation, greater crop intensity and fewer crops lost (Namara et al., 2010). Participation in irrigation schemes or secure access to agricultural water led to increased food security and dietary diversity in Kenya, Nepal and India for participating households and other households in the area (Namara et al., 2010).

The empowerment of women in underdeveloped areas should be an urgent developmental goal in underdeveloped nations, including South Africa. While it is common knowledge that women play a major role in agricultural and non-agricultural activities relating to their household food security and livelihoods, worldwide they still experience insecure access to both land and water they need for a productive and sustainable livelihood. In South Africa too, direct access to land for women is often hindered by the disjunction between statutory and customary land rights systems that may disempower them (Thamaga-Chitja et al., 2010). Furthermore, level of education, which is often lower for women than for men, limits women's access to information that could significantly empower them in working to improve food security and livelihoods. People-centred and gendered government policies, strategies and legislation that affect women's water use security, and land use security are crucially important for the empowerment of rural women farmers.

Empowerment requires process and support at policy, institutional and programme levels. Since empowerment often includes interaction with external voices and forces, empowerment

processes need to take account of both external stakeholders (policy directors & implementers, extension services, etc.) and internal stakeholders (e.g. the farmers, tribal councils, cultural leaders and norms, etc.). 'It is vitally important that all structures of government, including the President should understand fully that freedom cannot be achieved unless women have been emancipated from all forms of oppression' (President Nelson Mandela, opening South Africa's first democratically elected parliament, 1994).

Women have the potential to evolve a new economic order, accelerate social and political development and consequently transform society into a better one. There is considerable evidence for the claim that access to education can bring about changes in cognitive ability, which is essential to women's capacity to question, reflect on, and act on the conditions of their lives and to gain access to knowledge, information, and new ideas.

1.10.3 Knowledge generation, empowerment, food security and sustainable livelihoods

In most developing countries rural women are a disadvantaged group in acquisition of knowledge of agricultural and water technologies and services (Prakash, 2003). South Africa is no different, and more than half of rural households are headed by women who are the primary users of water in subsistence agriculture (Bob, 2002; Abayawardana & Hussain, 2002). Women's opportunities for water-based income generation through gardening and farming, livestock, aquaculture, forestry, and other water-based enterprises are still limited (van Koppen, 2001). Schreiner et al. (2004) argues that women's economic empowerment is essential to escape poverty as subsistence for the families depends upon women.

Investing in human capital is the most effective resource for poverty reduction, economic empowerment and stimulation of sustainable development. It is a widely recognised that educating women produces better economic and social returns than educating men (Prakash, 2003). However, in many developing countries women still receive less education and are mostly technologically illiterate, regardless of the key role they play in agricultural development as producers, and water and land users (UNIFEM, 1994; FAO, 2001). Societal norms, gender bias, and traditional laws and policies undermine women's potential, depriving them of economic opportunities for improved livelihood (Prakash, 2003). Education alone may therefore not be transformative in the absence of other normative shifts and changed power relations. Studies show that education and empowerment of women are more effective

in delivering effective transformation in such settings, as it takes more than education to reach thresholds of change.

Educated and empowered women become better equipped to extract benefits from existing services and opportunities, and to generate alternative opportunities, roles, and support structures for improved wellbeing (Malhotra and Schuler, 2005). Further manifestations of education and empowerment are apparent in increased income-earning potential, ability to bargain for resources within the household and decision-making autonomy. Education and empowerment of women is therefore seen as fundamental for progression and sustainability in water development.

Because women in rural areas remain less developed, gender equity in relation to technology is also likely to suffer. Women in developing countries are often not recognised as the principal stakeholders in agricultural and local water activities despite their role as primary food producers, and for this reason they are often overlooked in issue related to development and choice of water technology and training on its use (Prakash, 2003; IFAD, 2007). Technological illiteracy remains a major impediment to the development and wellbeing of women and they often lack the necessary skills to operate and maintain the developed technologies. This is because women are typically less involved and less empowered to make their voices heard in technology planning and decision making (RCSA, 2003; IFAD, 2007). As a result, there are few technologies that are tailor-made to suit women's multi-domestic roles and skills for effective plant and livestock production.

2. METHODOLOGY AND APPROACH

2.1 Introduction

The purpose of this study was to investigate the empowerment of women through water use security, land use security and knowledge generation for improved household food security and sustainable rural livelihoods in selected areas in Limpopo.

The research design was a mixed methods approach where data collection and analysis employed both qualitative and quantitative approaches (Ivankova et al., 2007) to gain 'situated knowledge' relevant to the interests and objectives of the study (Llewelyn 2007). The mixed mode approach was best suited to investigating existing water use in crop cultivation, as well as the institutional arrangements, organisations, structures and processes that affect water use in the three sites. The study used a combination of data-collection methods including field observations, questionnaires and interviews which involved key-informant and group discussions together with site visits to answer the research questions. The strength of the mixed mode approach is that it allows researchers to answer the 'what' and 'how' and 'why' questions (Cohen, Manion & Morrison, 2011). The integration of both numerical and qualitative data in this kind of research allows for triangulation, and reflects an integrated way of thinking and of viewing life. In this study, researchers generated quantitative data through the use of questionnaires and other measurement tools and spent time living among the participants, observing their farming practices and taking field notes leading to 'thick descriptions' of the farming life. This was an attempt at capturing lives of participants in the hope of capturing the meanings members in each community assigned to their farming activities (Henning, van Rensburg & Smit, 2004). Local leaders and district government officials were interviewed, and an interpreter was useful in mediating where there were language barriers.

A case study approach was employed to analyse the role and impact of institutions, organisations and processes on water use by respondents and their communities in their agriculturally based food security and livelihoods efforts. Merrian (1988) describes a case study as being concerned with the cultural context, and as providing a holistic description of a social unit. One of the main characteristics of a case study method is its bounded nature, where very clear boundary lines exist between what is considered 'a case' and what is not.

However, Yin (2013) cautions against adopting a very tight definition of a ‘case’ as ‘bounded’, and argues for a ‘blurred’ boundary line between a ‘case’ and its context. It is this view of a ‘case’ that we adopt in this study, where each of the three sites is viewed as a ‘case’, but where each case is studied within its context, and where the boundaries between the ‘cases’ studied and their contexts are blurred or porous.

A concurrent triangulation strategy was employed (Creswell, 2003) to collect the qualitative and quantitative data simultaneously so that comparison could be made between the findings of the different methods that would lead to well-founded conclusions (Ivankova et al., 2007; Creswell, 2003). In keeping with the in-depth focus of the study, the researchers gave priority to the qualitative results and used the quantitative results to describe and quantify variables associated with the trends and relationships explored (Creswell, 2003).

2.2 Site Selection and Sampling

Purposive sampling was used to select research sites and participants who would best provide data to explore the empowerment of women through water use security, land use security and knowledge generation for improved household food security and sustainable rural livelihoods. Purposive sampling is a form of non-probability sampling where the researcher decides who will participate in the study based on specific criteria (Oliver, 2006). Purposive sampling is further described as choosing to study a subject that fits the objectives of a set study (de Vos, 1998), and the research team used different methods to arrive at the target sample. The following broad criteria were used to select three research sites for this study, as outlined in the terms of reference.

- Sites had to be rural in nature and located in three different district municipalities of Limpopo
- Only sites with active irrigation schemes were eligible to participate
- Women and their agricultural activities had to be the main focus of the research.

Once the sites that met these broad criteria were identified, specific criteria were applied in narrowing down the selection to identify the three best suitable sites. In addition to the criteria for the irrigation scheme selection, geographical location of the scheme was selected to include Sekhukhune, Capricorn and Vhembe Districts to add variability in geography and cultural context. The following two specific criteria were used:

- Older irrigation schemes built in the mid-1970s were selected. This decision was informed by past Water Research Commission research that had demonstrated the functionality of such irrigation schemes both institutionally and technically.
- Irrigation schemes were chosen that were constituted by well-organised groups with a demonstrated track record of functionality and a low level of community and investor friction.

The process of site identification and selection was extensive and involved the following:

- Visits to the sites in the first year of the project by members of the research team, who were located in the Limpopo and KwaZulu-Natal provinces respectively. According to de Vos (1998), the importance of site selection in action-oriented research can be an important decider in the success or failure of a community-based research project.
- Project team consultation and interviews with key informants including extension officials and a researcher from the University of Limpopo.
- Analysis and review of key documents and reports on the topic.

The University of Limpopo proved to be a great strength of the team in that researchers from this institution provided relevant key informants in government extension and used its existing networks with communities to provide information that assisted with the selection of research sites. According to Chambers & Conway (1992), established trust is critical in community development oriented research. This process culminated in the choice of three projects in irrigation schemes which fitted the set criteria. These are described in detail below.

2.2.1 Research area description

The study was conducted in rural Limpopo, which is in the north of South Africa, bordering Zimbabwe to the north, Mozambique to the east and Botswana to the west (Limpopo Provincial Government, 2009). The study sites are depicted in Figure 2.1. In area the province comprises 10.2% of South Africa and it has a population of 5.2 million people according to the 2001 census (Limpopo Provincial Government, 2009).

The province is made up of five districts: Capricorn, Waterberg, Vhembe, Mopani and Sekhukhune (Limpopo Provincial Government, 2009). The province has mineral reserves, fertile agricultural land and diverse fauna and flora (Limpopo Provincial Government, 2009).

Most (60%) of the land is privately owned and 25% of the land is under traditional governance (Limpopo Provincial Government, 2009). In spite of the province's competitive advantage in agriculture, mining and tourism, there is significant outward migration by skilled rural dwellers to Gauteng and Western Cape Provinces (Limpopo Provincial Government, 2009). Outward migration, changes in family structures and other social changes have led to weakened social cohesion (Limpopo Provincial Government, 2009).

Limpopo is one of the poorest provinces in South Africa along with KwaZulu-Natal and Eastern Cape (STATS SA 2012; STATS SA 2014). It is also the least urbanised province and has 96% African population, the highest in South Africa (Ramathoka et al., 2009; Statistics SA, 2012). Roughly 1% of the population is engaged in agriculture as a livelihood activity and of these; Africans constitute 98.36% of the households (Ramathoka et al., 2009), for whom small-scale agriculture is a significant source of food (STATS SA (2012). Limpopo contributes a large percentage of migrant workers in provinces such as Gauteng and Mpumalanga and thus presents a number of issues relating to de facto female-headed households (STATS SA, 2012). The predominantly rural nature of the province implies the prevalence of customary tenure and provides an opportunity to study the land property rights of rural Limpopo women in the context of Venda and Pedi customs (STATS SA, 2014).

Agricultural land was therefore limited to the hectares allocated when the farms were demarcated. One study community per district was purposively selected, each having had furrow irrigation set up before South Africa's democracy in 1994. These were GaMalekane (Steelpoort Drift Irrigation Scheme) in Sekhukhune, GaMampa (Mashushu Irrigation Scheme) in Capricorn, and Rambuda (Rambuda Irrigation Scheme) in Vhembe.

2.2.2 Description of the study sites

GaMalekane is located in the Sekhukhune District Municipality, under Chief Malekane (GTM LEDS, 2007). The community is part of the Tubatse Steelpoort Rural Land Council and is a Pedi-speaking community (Stimie, 2001; GTM LEDS, 2007). Greater Sekhukhune's rural economy is dependent on small-scale agriculture but water scarcity is a limiting factor. The residents of GaMalekane moved to the site in 1970, after their traditional chief had applied for and was allocated agricultural land by the government (Stimie, 2001). The government then built the Dr Eiselen Dam and the Steelpoort vegetable irrigation scheme (Stimie, 2001). The scheme is 69 ha in extent and has 69 registered farmers (Monare-Motseo,

2011). However, continuous sub-division on the plots between family members is a common practice. Social grants are the main sources of income in rural Limpopo (STATS SA 2012). Other livelihood activities include employment in mines, farm work and migrant labour.

GaMampa community is in a valley enclosed by mountains about 200 km south-east of Polokwane (UL, undated). It is in Capricorn district and is a Pedi-speaking community (UL, undated). The valley is surrounded by nature reserves and there are limited livelihood opportunities. In 1959, the former homeland government built three irrigation schemes in the valley – Mashushu, Fertilis and Valis – which were fed by a local river (Masiyandima et al., 2003). These irrigation schemes increased local food production but the infrastructure suffered considerable damage in the floods of 1995 and 2000 which has adversely affected small-scale family farming – a significant livelihood source (Adekola et al., 2008; Masiyandima et al., 2003). However, agricultural activities have continued, with farmers using mainly earth-constructed canals to improve the infrastructure. Similarly, social grants remain the key income earner for many households (Statistics SA 2012) as there are limited livelihood activities.

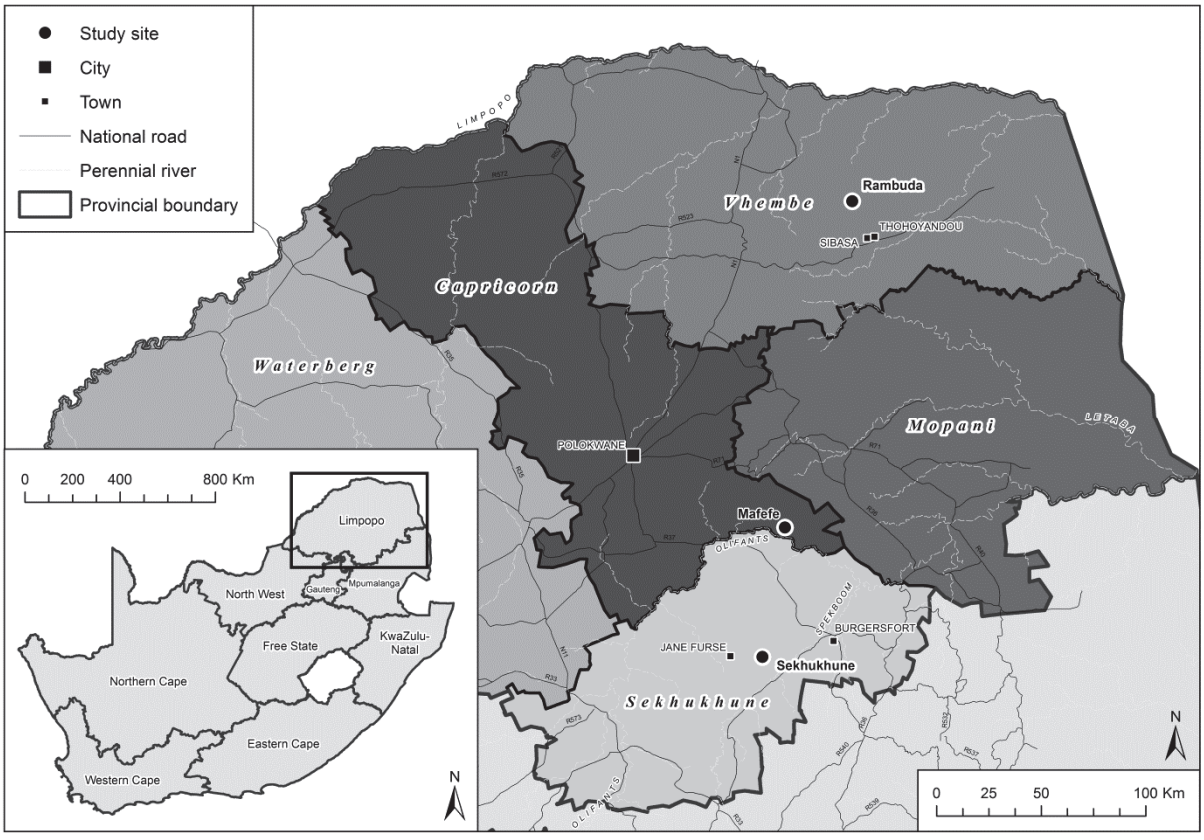

Figure 2-1 Map of Limpopo indicating study areas

Rambuda is a Venda-speaking community located in Mutale Local Municipality in Vhembe district north of Thohoyandou and the scheme was established in 1952 (Lahiff, 2008; Nethononda & Odhiambo, 2011). The scheme is 170 ha in extent and has 1.2 ha plots. There are 104 active farming members who pay an annual renting fee of R18. The main source of the water is from the Tshala river, depositing water into the main concrete canal which delivers water to four balancing dams of the irrigation scheme. The distribution of the water into the scheme is through secondary canals, while irrigation of the plants is through short earth furrows managed through an irrigation programme setting irrigation times. General livelihoods in Rambuda include active migration and remittances are thus a key income source for many households. Other more skilled individuals are employed in the municipality complex. Surface irrigation method is used in this scheme.

2.3 Sampling of Participants

Across schemes, purposive samples varying from 27 to 222 farmers were selected over the four years depending on willingness and the nature of the objective at different points in the study. Two criteria were used to select farmers who participated in the research:

- Firstly, participants were chosen on the basis of being active farmers who were members of the irrigation schemes, and had been farming for more than 10 years in the selected areas.
- Secondly, participants had to be willing to participate in the research each time the researchers requested.

Due to the fact that this was a four-year study, researchers had very little control over who participated each time the research team visited. For this reason the number of participants fluctuated depending on who was available at the time of data collection from year to year.

2.4 Data Collection

Data collection took place over the four years, and the study used a combination of data-collection methods including field observations, questionnaires with face-to face interviews, individual and focus-group interviews, transact walks, administration of the Women Empowerment in Agriculture Index (WEAI) Questionnaire, and volumetric measurement of the water flow in the three irrigation schemes.

2.4.1 Survey questionnaires

Biographical data was collected using a structured questionnaire that was administered in face-to face interviews with individual farmers. Data collected included age, gender, level of education, number of years in the irrigation scheme, and other quantitative and contextual information on access to water and land, policies, and empowerment relating to the participants' involvement in the irrigation schemes.

Cohen et al. (2011) describe interviews as involving 'the gathering of data through direct verbal interaction between individuals' (2000:269). The strength of the interview is that it allows for greater depth that is otherwise difficult to attain using other methods, because the researcher can probe deeper, and also detect 'unspoken messages' through body language (Cohen & Manion, 2008). Maree and Pietersen (2007) maintain that this also allows the researcher to identify new emerging lines of inquiry that are related to the phenomenon being studied.

Focus-group interviews were used as a main data-collection instrument to probe issues relating to women's participation in the irrigation scheme. Among of, according to DiCicco-Bloom and Crabtree (2006), focus-group interviews have the following advantages: they allow a range of topics and issues related to the study to be raised by different individuals in the group, thus giving the researcher more insight into the phenomenon under study; they allow the participants to express a variety of views about issues; and they can generate a large amount of data within a short space of time. Focus-group interviews were particularly relevant for this study in that they do not discriminate against people who cannot read or write, and people are encouraged to talk and participate when they see their peers contributing.

2.5 Observations

Observation is one of the most widely used data-collection methods for ethnographers because it enables them to collect 'live' data from live situations (Cohen, et al., 2011). Observation allows researchers to collect data on a variety of settings: physical, human, interactional and programme-related (Morrison, 1993). These settings allow the researcher to get a more complete picture of the 'case' under study, allowing for a fuller understanding of the phenomenon under study. Observation in qualitative research is categorised either as participant or non-participant, depending on the level of participation of the researcher in

activities that his/her participants engage in. Participant observation entails the researcher participating fully in the activities he/she plans to observe. A non-participant observer, on the other hand, is detached from the participants and does not participate at all in their activities (Cohen, Manion & Morrison, 2011). It can be argued that researchers are rarely confined to one role and oscillate in a continuum from full participation to non-participation. This was true for researchers in this study, who found themselves sometimes participating to a lesser degree in what the women farmers were doing, and sometimes not participating at all.

Observation in qualitative research can be structured, semi-structured or unstructured (Cohen et al., 2011). In structured observation the researcher develops categories of observation in advance and very specific data is collected in a highly systematic way. A semi-structured observation is where the researcher has identified key issues around which his/her observation will focus, but the process is less structured and less systematic. Unstructured observation entails getting into a research situation without a clear focus of what will be observed. While the research team had identified key issues around which observation would focus, researchers in this study were not tightly bound to them. Observations oscillated between being semi-structured and being unstructured. This allowed the researchers to record as much information as they could, collecting 'thick descriptions' of the different situations under observation in an attempt to get a deeper understanding of each 'case'.

Observations were carried-out during transact walks where resources available to the community were recorded, for example, the size of the irrigation scheme, the terrain, the location of water resources, the road network, and canals. Observations were also used to get a sense of farming practices; for example, farmers were observed doing land preparation, applying fertiliser, sowing seeds, watering, weeding and harvesting. The marketing practices were also observed, such as selling at roadsides and on pension days, and informal traders coming to buy from the farmers. Researchers also observed how irrigation scheme members interacted with one another in meetings and group discussions. There were several occasions where researchers were allowed to sit in the irrigation scheme meetings.

2.6 Women Empowerment in Agriculture Index

The Women Empowerment in Agriculture Index (WEAI) measures women's empowerment across five domains: (i) decisions about production; (ii) access to decision-making power about productive resources; (iii) control of use of income; (iv) leadership in the community

and (v) time allocation (Alkire et al., 2012).). IFPRI and OPHI recently developed the WEAI index to enable development practitioners to measure women's empowerment in the five domains.

The WEAI is informed by the following three conceptions of empowerment:

- empowerment as 'expanding people's ability to make strategic life choices, particularly in contexts in which this ability had been denied to them' (Kabeer, as cited in Alkire et al., 2012)
- empowerment as 'a group's or individual's capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes' (Alsop, Bertelesen and Holland, 2006) and;
- empowerment as 'the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives' (Narayan, as cited in Alkire et al., 2012).

An adapted WEAI index was used in this study to give a baseline of the extent to which women were empowered in the three study areas.

(a) Modifications of the WEAI Questionnaire design

A single questionnaire was designed by combining individual and household modules into one questionnaire to allow for the simultaneous collection of both household and individual data. Some modules which focused on health and gender based violence were omitted as they did not fit with the general focus of the study. Some questions were also modified for ease of translation and the time use data was largely estimated as it was found that the farmers did not refer to time during the course of their day.

2.6.1 Volumetric measurement

Data collection also involved volumetrically quantifying the amount of water flowing into each of the three small-farmer irrigation schemes using the Cipoletti weirs to measure the flow. A Cipoletti weir is one of the oldest, cheapest, most straightforward and reliable structures for the determination of flow in channels where sufficient water depth is available. It has a trapezoidal shape and can be constructed from wood, metal or concrete, perpendicular

to the flow in a channel. The structure has a sharp-edged opening or notch of specific shape and dimension through which the water can flow. The flow rate is determined by measuring the flow depth (or head) above the crest of the weir and using the value to calculate the flow rate.

2.6.2 Participatory workshops and process of data collection

Participatory workshops were held in each of three irrigation schemes at the end of the project. This is in line with the participatory nature of this project that puts participants at the centre of the research process. The main purpose of the workshop was to validate the findings of the project team and to correct any misrepresentation of participants' ideas and the meanings associated with them. The workshop was also to clarify some issues that emerged in the findings. This process forms part of information sharing and knowledge sharing as outlined in the WRC knowledge tree. This was a four-year project, and data collection took place at certain intervals during the four years. The table below outlines when data collection took place and the kind of data that was collected at each phase.

Table 2-1 Data-collection process during the study

Aim	Methodology & Total Sample Size	Period
Identifying, shortlisting motivating and selection three villages and crop production areas in rural villages in Limpopo	Visits to Limpopo Consultation with the provincial Department of Agriculture Consultation with the chiefs and other community stakeholders Consultation with academics from the University of Limpopo, Department of Agriculture	2011
Review relevant literature on government policy, strategies and legislation and synthesis with particular attention to gender equity	Review of national literature on land and water reform policy, legislation and strategies, using a gender lens Review local and international literature on the empowerment of women in Agriculture Identifying frameworks available and suitable to assess / measure women empowerment in agriculture	2011
Describe and analyse social relations, demographics, gender dynamics, roles and responsibilities of women in three selected rural villages	Survey questionnaires Focus-group discussions with farmers Individual semi-structured interviews with key informants (**Total Sample Size: 98)**	2012
Describe and analyse existing water use in crop cultivation activities undertaken by women at homestead food garden and/or cropland scale in three selected rural villages	Focus-group discussions with farmers Individual semi-structured interviews with key informants Survey questionnaires (**Total Sample Size: 90)** Volumetric measurements of water supply, crop and livestock requirements by an expert water consultant	2012-2013

Aim	Methodology & Total Sample Size	Period
Describe and analyse the influence of institutional arrangements regarding access for land and water use, organisational structures and processes on incentives and/or disincentives for use of land and water by women	Focus-group discussions with farmers Individual semi-structured interviews with key informants	2012
Empirically investigate and specify existing levels of knowledge, identify knowledge and skills gap as well as requirements for skills development of women	Focus-group discussion with farmers Semi-structured interviews with key informants	2012-2013
Empirically investigate the constraints, needs, aspirations and goals within the context of local culture	Focus-group discussion with farmers Semi-structured interviews with key informants	2012-2013
Evaluate the impact of land and water allocation policies, strategies and legislation on women in rural households	Focus-group discussion with farmers Semi-structured interviews with key informants Document analysis – Land and water policies, legislation and strategies	2014
Participatory Workshop	Identification of key stakeholders in each location Securing commitments for attendance from all stakeholders, including the farmers, and arranging all logistics Posters, power point slides, oral presentations	2015

2.7 Conceptual framework

The underlying premise of development approaches that put people at the centre and build on their strengths and assets is that development should focus on improving people's living conditions and making it more possible for the poor to access to basic human necessities (Hershberg & Thornton, 2005). With regard to agricultural development approaches, the issue of agency has recently entered discussion as a new concept in the discourse of agriculture (Vorley et al., 2012). This concept is rooted in the social sciences and refers to the enhancement of intangible livelihood assets to improve people's capabilities. It has particular relevance to this project as an element in the overarching theoretical framework proposed by Scoones (1998), which explains that livelihoods are built and derived from five livelihood assets. The FAO (2000) describes Scoones' Sustainable Livelihood Analysis (SLA) approach as promoting development that is sustainable, people-centred, participatory, responsive, multi-level and conducted in partnership.

Most agricultural policies in the past focused on improving tangible assets, whereas the central tenet of SLA is that fostering empowerment and agency speaks to intangible assets hitherto given less attention. This project focused on these intangible assets, the social and the human, in an attempt to understand their nature, levels, and interactions with water and land use security for farmers seeking to improve livelihoods and food security. According to

Bentley and Pugalis (2014), people-centred approaches are those which target people as primary beneficiaries of policy, best achieved when the context, needs of the people and possible solutions are taken into account.

The study was informed by the SLA approach, in which Scoones (1998) defines a sustainable livelihood as comprising capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintains or enhances its capabilities and assets while not undermining the natural resource base.

This approach recognises the crucial role played by livelihood assets in shaping the strategies used by individuals and households in achieving livelihood outcomes (Scoones, 1998, Niehof, 2004). Figure 2.2 shows the framework of analysis. The strength of this approach lies also in its recognition of the dialectic nature of the relationship between livelihood outcomes and livelihood assets (Scoones, 1998). This study is an attempt to gain deeper insight into what rural women aspire to and what capabilities and assets they perceive as important for sustainable livelihoods.

In addition, the SLA framework has relevance for the study in that it problematizes livelihood outcomes deriving from linkage of access to resources such as land and water with knowledge generation as a factor in the empowerment of the selected rural farming women and their communities. The study also engaged with the joint impact on rural farming women's livelihood outcomes of internal factors such as own productive resources, goals and aspirations and external factors such as the current farming system, cultures, external institutions and interventions.

The SLA framework recognises the relationship between livelihood outcomes and livelihood assets, among which human capital is central. In the SLA framework, human capital refers to skills, knowledge and the ability of an individual or household to work (Scoones, 1998). Knowledge helps a household to access resources and institutions so that it can successfully pursue a livelihood strategy. We argue that empowerment needs to address, among other things, human capital that will enhance farmers' livelihoods through, in this case, water and land use access. It is important also to recognise that rural residents are a heterogeneous group with differing access to the five assets that sustain livelihoods (Scoones, 1998). Residents with more secure access to the assets have stronger livelihood strategies and outcomes. In addition, institutions have a significant bearing on the way different individuals

access resources and on their success in pursuing livelihood activities (Berry, 1989). It may well be that some local institutions restrict access to key resources on grounds of gender, age and ethnicity.

Previously interventions have tended to focus on addressing input shortage, but there is also a need for training to raise local farmers' knowledge to levels which help them to succeed (Scoones, 1998).

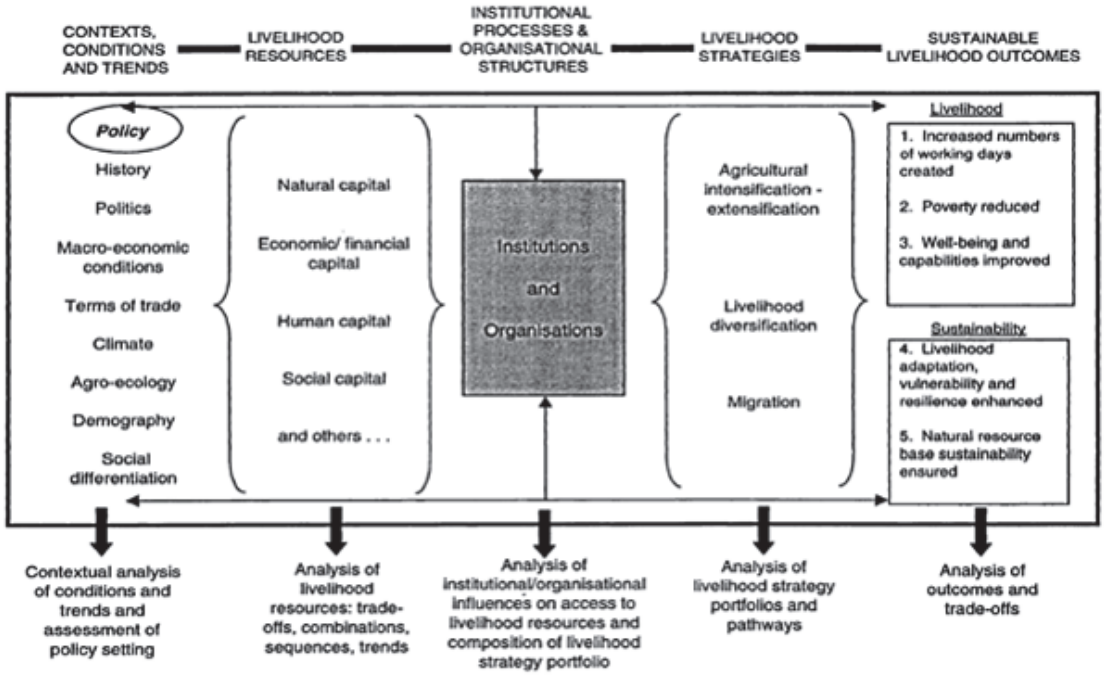

Figure 2-2 The Sustainable Livelihoods Framework

2.8 Data analysis

Qualitative data was analysed using thematic, content and comparative analysis. This technique was chosen to compare and contrast findings across the three irrigation schemes. Descriptive statistics and cross-tabulations were used to analyse survey data, using Statistical Package for Social Sciences (SPSS, 2005).

To generate the WEAI, the Foster-Alkire methodology was used as detailed in the WEAI manual (Alkire et al., 2012). However the following modifications were made to the methodology.

The index was constructed using the manual and the processing was adapted for SPSS. For the construction of the Gender Parity Index, the following methodology was used. First the

researcher determined which respondents were adequately empowered (achieved 80%) based on their 5DE scores. Second, the 5DE score for men in each community was averaged (mean) to provide an empowerment score to compare with the individual 5DE score of female farmers in the respective community. Third, SPSS was used to compute the difference between individual female farmers and the average male farmer in their community. The differences were compared and those farmers who had the same 5DE score as the average male farmer or higher were considered at par with their male counterparts. The percentage of these women was determined to be 51.2%. In addition, for women who were not at par with their male colleagues, the differences between their score and the mean score of the average male farmer in their communities and a 'gender gap' was computed for all three communities. These three figures were recorded and then their mean was computed to allow for the average gender gap in the study area to be determined. This mean was used to calculate the gender parity index for the three study sites, while the three community specific gender gaps were used to calculate the GPI for the respective communities.

These formulae were used to generate the 5DE index, Gender Parity Index and the WEAI.

5DE = % of empowered women + (% of disempowered women **x** % of adequacy of disempowered women)

i.e. 5DE = (1-H) + [H x (1-A)] ……. (1)

GPI = 1- (% of women without gender parity **x** % average empowerment gap)

i.e. GPI = 1- (H_{GPI} x I_{GPI}) …… (2)

WEAI = (0.9 x 5DE) + (0.1 x GPI) …….. (3)

3. EXISTING WATER USE IN CROP CULTIVATION

3.1 Introduction

This chapter presents findings on the existing water use in the three study areas. As described in the methodology chapter (Chapter 2), a mixed methods approach was used for data collection and analysis in this study, including face-to-face interviews, group discussions, key-informant interviews and field observations. Volumetric water usage measurement was also conducted to determine existing water in the three sites under investigation. Findings indicate that the water supply was adequate at two of the irrigation schemes (Steelpoort and Rambuda) but was limited in Mashushu. Seasonality, quality of the irrigation infrastructure and scheme water management schemes affected availability of the water in all the irrigation schemes. Findings also revealed strong competition for water between agriculture and the burgeoning mining industry in Limpopo especially in the vicinity of Steelpoort.

The chapter concludes by highlighting key findings on existing water use, institutional arrangements, organisations, structures and processes in the three study sites. In the study's underpinning theoretical framework of sustainable livelihoods assets and people-centred approaches, human and social capitals are pivotal for empowerment and agency enhancement and institutions and organisations are crucial vehicles of empowerment and agency enhancement. It is therefore important for any empowerment approaches to be informed by a careful analysis of the people concerned, since it is likely that age, gender and stage of life would influence uptake and/or adoption of interventions. We argue that improvement of relevant human and social skills requires transformation of institutions and organisations in an effort to empower the farmers and enhance their agency for sustaining of livelihoods.

3.2 Water Availability Overview for Three Study Areas

Limpopo is generally characterised as water scarce (Schultze, 2010). Rainfall in the province is variable, ranging from as low as 200 mm to 1200 mm (ARC, 2010). Monthly rainfall data and potential evaporation rates are provided in tables 3.1 and 3.2. The notable deficit between

monthly rainfall data and the monthly potential evaporation data is indeed an indication of the low rainfall in the study areas and thus the key need for irrigation in the study areas.

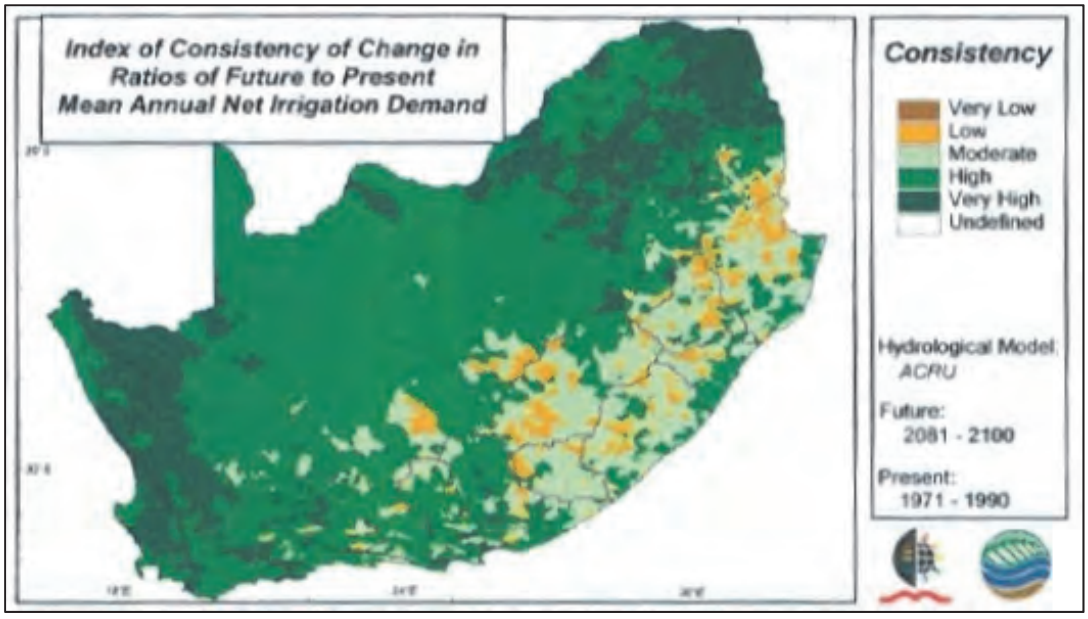

Figure 3-1 Index of consistency of change in ratios of intermediate future to present as well as of more distant future to present, mean annual net irrigation demands computed with the ACRU model from output of multiple GCMs (source: Schultze, 2010)

As seen in Figure 3.1, Limpopo is poised to suffer from lower water supply due to future climate change, with very high consequent demand for irrigation water. The potential evaporation data and the rainfall data further support this (Table 3.1 and 3.2). This prospect makes it likely that development needs in other sectors such as the fast growing mining industry in the eastern part of the province would need to be balanced with the need in agricultural development so that these other developments do not take place at the expense of agricultural development that is so fundamental to the survival of the majority of people in these rural communities.

Water competition was also apparent between emerging farmers and established users (mines, municipalities and 2915 commercial farmers). Those who historically have had limited or no access to water are likely to face problems as smallholder farmers who wish to expand production. The three schemes in this study area are fed by two main catchment systems: the Livubu Catchment System feeding the Rambuda scheme in Vhembe district, and the Tubatse Catchment, which is a sub-catchment of the main Olifants system, feeding the Mashushu and the Steelpoort schemes.

A further key concern for water availability in the present and in the future is the impact of climate change in agricultural water availability (Schultze, 2010). The escalating cost of water and increasing competition for water is especially troubling for those who historically had no access to water for agricultural purposes, the majority of whom are women living in poverty. This poses a threat to initiatives to establish equity and sustainability in water use and access. Future mean irrigation demand values for South Africa shown in Figure 3.1 indicate that Limpopo faces a very high mean irrigation demand (Schultze, 2010).

Table 3-1 Median monthly rainfall in study sites (mm)

	Month	**Steelpoort Scheme Weir**	**Mashushu Scheme Weir**	**Rambuda Scheme Weir**
Median Rainfall (mm)	January	96	95	173
	February	75	91	170
	March	62	72	107
	April	31	28	42
	May	9	8	14
	June	0	1	3
	July	0	2	4
	August	0	1	5
	September	10	8	13
	October	45	40	40
	November	93	86	88
	December	95	98	153

Table 3-2 Monthly potential evaporation in study sites (mm)

	Month	Steelpoort Scheme	Mashushu Scheme	Rambuda Scheme
Monthly Potential Evaporation (mm)	January	223	215	227
	February	184	179	186
	March	181	179	188
	April	145	145	150
	May	129	129	133
	June	108	107	113
	July	120	119	124
	August	155	154	160
	September	188	185	192
	October	212	213	220
	November	219	208	233
	December	220	214	223

3.3 Existing and Potential Water Supply

In Limpopo, the Olifants River Basin is the principal sub-catchment of the Limpopo River basin, in which the Steelpoort River (also known as Tubatse) is a major tributary. According to McCartney et al. (2004), significant mining, industrial and agricultural activities that involve intensive irrigation schemes, are found in higher concentrations within the Olifants River Basin. Nevertheless, aside from the Steelpoort study site, the two other study areas are essentially rural with less intense human development. Naturalised river flow data for the study sites, obtained from the Water Resources (2005) Database, was therefore deemed suitable for assessment of water availability. Naturalised water flow data is an important factor in water resource assessment for establishing flow conditions unaffected by human-induced development that may have affected land cover and water use changes (McCartney et al., 2004), and this is illustrated in Table 3.3.

Table 3-3 Naturalised water flow of the study sites

Site (river)	Annual water flow (million cubic metres)
Rambuda (Mutale River)	126.99
Mashushu (Motlapitse River)	42.14
Steelpoort	Data not available

Source: Derived from data in WSAMs database (Schultz and Watson, 2002)

The data in Table 3.3 shows that the river flow per annum is comparatively abundant for the Rambuda scheme while it was very low for the Mashushu scheme. The Steelpoort scheme may be facing a water management problem since it extracts its water from a smaller stream that appears to originate inland and eventually links to the Steelpoort River. Although the Steelpoort River had a much higher flow, the smaller stream from which the scheme extracts has a much lower flow captured into a small dam. Availability of water for this scheme was mostly linked to dam water management and scheduling of opening up the weir managing water flow into the canal system for flood irrigation. The combination of competition over the water resources and the high deficit between rainfall and potential evaporation raises significant concern in relation to future water availability. Policy and implementation will have to be responsive in seeking to balance the livelihoods need of those who have not had access to water for agri-based livelihood against the needs of commercial users.

3.4 Volumetric Measurements of Water Supplies at Mashushu, Rambuda and Steelpoort

3.4.1 Steelpoort Drift Irrigation Scheme

Water at Steelpoort is supplied from a reservoir in the Dwars River approximately 4.5 km from the irrigated area (see Figure 3.3). The reservoir is filled by run-off water, and water for the scheme is released into the river below the wall through a controlled outlet. The valve is reportedly seldom adjusted. The water then flows down the river for approximately 3 km to a small weir, from where it is diverted into a stilling basin with a sand trap and a Cipoletti measuring weir. The water then flows for about 1.1 km under gravity in a pipeline (red line in Figure 3.4) to a concrete canal (blue line) that enters the village via an inverted syphon (orange line) that crosses a storm water furrow. After approximately 300 m, the canal (blue line) flows into a balancing dam at the top of the scheme. Water is supplied to the scheme through a canal (green line) that is fed from an outlet at the bottom of the dam, where another Cipoletti measuring weir is installed. The canal that flows into the dam also continues past the top of the dam to join up with the main canal supplying water from the balancing dam to the fields.

3.4.1.1 Volume of water available for agriculture at Steelpoort

The flow of water was measured at the second Cipoletti at the outlet of the balancing dam. Using the Francis equation to determine flow, the typical flow rate to the scheme from the balancing dam was calculated as 0.034 m^3/s (or 122.8 m^3/h). If the typical operating hours can be obtained, this can be multiplied with the typical flow rate to provide an estimate of the daily volume of water supplied to the scheme. For example, if water is released from the balancing dam from 7:00 to 15:00, it is supplied for 8 hours. Multiplied with the flow rate of 122.8 m^3/h, a volume of 982 m^3 is supplied per day. The scheme area according to the department's report should be 69 ha, but when measured from aerial imagery, it is closer to 30 ha. The 982 m^3 supplied to 30 ha, works out to 3.2 mm per day being supplied. This is quite low, and a supply of 6 mm per day will be required during the peak demand period in summer if optimal crop production is to be reached. However, for the type of risk-aversive farming typically practised by small-scale farmers, the supply may be enough. It must be noted that the scheme is not always fully cropped, especially in the dry season, thus suggesting that the water supplied per day is likely to be more than 3.2 mm per day. Both supply and demand will vary during the year due to climate, planting programs and markets.

The supply to the scheme is limited by the gravity pipeline from the weir to the canal and the capacity of the canal itself.

3.4.2 Mashushu irrigation scheme

The scheme consists of approximately 40 ha area with 30 farmers who have plots in this area, but only about 30% of the area is cultivated. Furrow irrigation is used throughout at Mashushu. It forms part of the Mashushu cluster of irrigation schemes as shown in Figure 3.7, which includes the Fertilis, Vallis, Canyon and Gemini irrigation schemes. Figure 3.8 shows an aerial view of the layout of the Mashushu scheme only.

3.4.2.1 Water supply infrastructure

Currently, one gabion weir and one informal weir divert water from the Mohlapitse River to the lands at Mashushu via two primary earth canals, an upper and a lower canal that respectively direct the water to the upper and lower lands. Informal outlets branch off the main canals to secondary earth canals. There are no balancing dams. The upper weir is an informal diversion structure made of rocks and sand bags, while the lower weir is a gabion structure with rock masonry. Significant leakages occur. The primary upper canal is an earth canal of 320 metres. Width varies from 1 m to 1.5 m and seepage is evident over certain sections due to sandy soils. There are no storm water crossings over the canal. The first 50 m which runs parallel with the river is vulnerable to flood damage and a number of sections are badly overgrown.

The primary lower canal is an earth canal of 430 m. Width varies from 1 m to 1.5 m and seepage is evident over most sections due to sandy soils. There are no storm water crossings over the canal; the first 60 m runs parallel with the river and is vulnerable to flood damage. There are no water flow control structures in place and a number of sections are badly overgrown. Storm water damage is evident due to absence of storm water crossings.

The scheme layout was planned but subsequently adapted by farmers because sections of the upper canal were non-functional, together with some informal extensions of the scheme. It seemed that only the primary upper canal was in use during the field visit.

3.4.2.2 Water available for irrigation at Mashushu

No water measuring structures are installed on any of the supply infrastructure and it would be difficult to quantify flow in any of the canals as they have no fixed profile with known flow width and depth. The only information that could be found was a reference in a report from the Department of Agriculture that 21 million m^3 of water is available annually from the Mohlapitse River for the cluster of schemes, which have a combined demand of 1.2 million m^3.

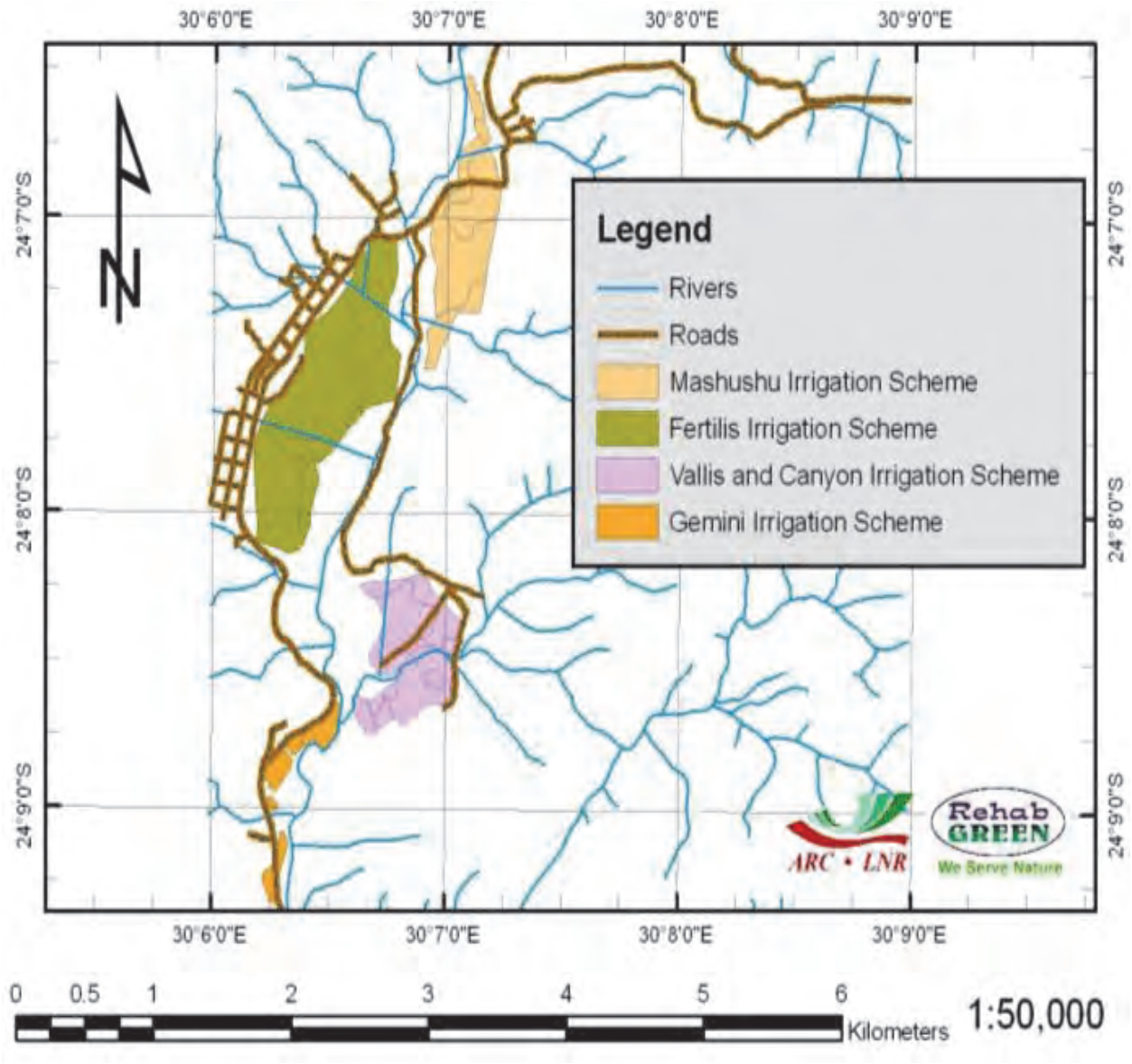

Figure 3-2 Location of Mashushu irrigation scheme relative to the Mashushu cluster of schemes

Figure 3-3 Aerial view of the Mashushu irrigation scheme

Figure 3.4 shows the Mean Annual Run-off (MAR) as well as the In-stream Flow Requirements (IFR) for the catchment per month. In Table 3.10, it can be seen that the sum of the difference between these values per year is equal to 21.072 million m^3; this is the amount of water available. Table 3.10 also shows an estimated crop water requirement for a typical mix of crops and typical planting patterns, totalling 1.187 million m^3 per annum for all four of the schemes in the cluster when short furrow irrigation is used. The data was compiled on behalf of the Limpopo Department of Agriculture during a scoping study for the revitalization of small-scale irrigation schemes in 2006. The plan was to provide pressurized types of irrigation systems (such as sprinklers) for the schemes but implementation was limited by available funds and priority areas.

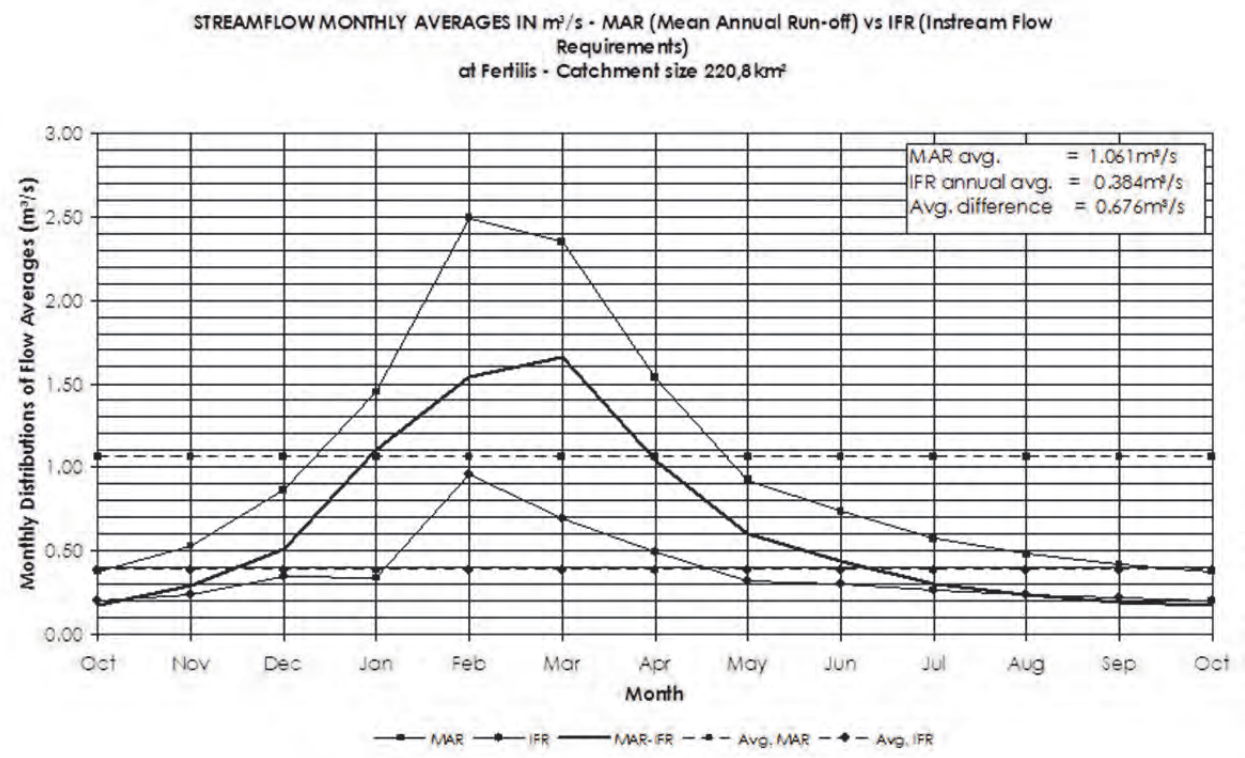

Figure 3-4 Water availability at Mashushu cluster of irrigation schemes

(Limpopo Dept of Agriculture, 2006)

3.4.3 Rambuda Irrigation Scheme

The water source at Rambuda Irrigation Scheme is the Tshala River, from which water is diverted by a small concrete weir (Figure 3.11) to a semi-circular concrete canal approximately 6 km long. This canal runs through the village to the irrigation scheme, where water is distributed to the fields with smaller concrete canals. Water can be stored on the scheme in night storage (balancing) dams. Originally the scheme had four dams but only three are still visible and they are all very poorly maintained.

Figure 3-5 Weir in the Tshala River supplying water to the Rambuda irrigation scheme

Figure 3-6 View of one of the night storage dams at Rambuda irrigation scheme

The dams are still being used but they are totally overgrown with reeds and grass (Figure 3.6), cause high unnecessary losses. Water is let into the dams during the night or other times when it is not required for irrigation and then released into the secondary canals when required. The control gates and structures are generally in a poor condition. The general layout of the scheme is shown in Figure 3.7.

3.4.3.1 Water available for irrigation at Rambuda

There is no measuring structure at the weir but approximately 200 m further along the canal; there is a rectangular measuring weir. The flow rate over a rectangular weir with two end contractions can be calculated with the Francis equation: the flow rate in the main canal was calculated as 90.5 m^3/h.

A hydrological study that was undertaken for the revitalization report in 2006, showed that the water available from the river to the scheme was 0.7 million m^3/year at 100% assurance

of supply or 1 million m^3 at 80% assurance of supply. The water usage for the flood irrigation system currently used, was calculated as 820 000 m^3 per annum for typical crop selections and planting patterns. The water supply system (excluding the balancing dams) is in a fair condition except for some minor concrete edge breaks and debris in the canal, and losses should not be more than what the supply of water can provide. The infrastructure for water reticulation and storage at the three sites is generally in a poor state of disrepair such that it impinges on water availability and promotes water losses.

Figure 3-7 Aerial view of the Rambuda irrigation scheme

Figure 3-8 Rectangular measuring weir 200 m downstream from the Rambuda canal inlet

3.5 Crop and Livestock Water Requirements

Table 3.4 shows the crops that are planted in the three areas and their respective water requirements. Major crops in Steelpoort are vegetable crops as compared with Mashushu and Vhembe which focused on maize and root crops.

Table 3-4 Minimum water requirements (mm)

Crop List (E)	Absl. Min Rainfall/ annum
Cabbage	300
Beetroot	500
Carrot	400
Potatoes	400
Sweet potato	350
Onions	300
Maize	400
Groundnuts	450
Spinach	300
Beetroot	300
Peas	800
Pumpkin	450
Green beans	500
Chillies	400

The flow rates at Steelpoort and Mashushu suggest that water availability may compromise the yields and quality of most horticultural crops. Hardier crops such as maize and groundnuts may not be affected that much. The solution to these low flow rates is the adoption of the 'Block method' of irrigation, where the scheme is divided into blocks in which one crop is grown at a time and farmers are allocated a few lines in each block. The sum total a farmer crops does not change but the farmers will be growing the same range of crops. They have to agree on the crops on the basis of marketability and rotation considerations. The advantage of this system is that water scheduling will consider the sensitivity of individual crops to moisture stress and also the growth stage. It enables better management of crops through sound rotation for enhanced control of pests and diseases, as well as nutrient cycling. This method also enhances the volumes of each crop that the scheme can produce, thereby making it attractive to bigger markets.

3.6 Water Use by Livestock in the Study Areas

In all three study areas, most participants of the irrigation schemes and their households did not keep large livestock. Some households only kept poultry. Observations also verified this with some of the researchers living in the study areas for brief periods during data collection and walking through the villages and to the water sources away from the village. At alternative water sources, such as the 'spring' and the river at Rambuda, larger livestock such as cattle and donkeys were often seen but did not belong to the scheme members. The respondents reported that sometimes larger livestock, such as cattle, drink from the canals but they spent more time along the river near the outskirts of the villages.

The majority of the respondents from the study sites did not keep livestock; observation concerning the villagers' livestock was made with regards to fencing. In Rambuda, alternative water sources were based away from the village and yet used by villagers and study participants during water shortages were not fenced off. It appeared that fencing sections of the water source could provide better access and cleaner water for human consumption while still affording livestock access to the much needed water. A small number of cattle which presumably belonged to other community members in the study sites was observed drinking from the canal in both Steelpoort and Mashushu. This observation raised questions about the competition of water between humans and livestock, as well as the quality of water consumed in the home, in the study sites. Due to the fact that irrigation scheme members did not keep livestock, water use by livestock was limited to the

observations reported above where livestock was one of the multiple users of irrigation scheme water including humans.

4. KNOWLEDGE, CONSTRAINTS, NEEDS AND ASPIRATIONS

4.1 Introduction

Relevant knowledge and skills are essential if smallholder (SH) farmers are to achieve their aspirations within their current situation and its constraints. Smallholder agriculture is a key livelihood activity for most of the world's rural population with an estimated 500 million small farms (Hazell et al., 2010). There is potential for this class of farmers to increase production and therefore household food supply and income; farmers, however, face problems related to income, location, education, gender, and size of their land, among other factors (Hazell et al., 2010). Despite these constraints some SH farmers have expressed an interest in upgrading from subsistence status to commercial status.

This study has used the sustainable livelihoods assets framework as a vehicle for understanding farmers' assets and their role in empowerment. In most farmer-development approaches, tangible assets have received more attention than intangible ones. This study suggests, however, that there should be more focus on intangible assets, such as improving human and social capital. Its central argument is that the development of intangible assets within the SLA framework enhances agency and empowerment, thereby promoting better utilisation of the tangible assets. But the approach to, and modality of, improving these human and social assets are crucially important. For that to happen, institutions responsible for farmer education, land and water access and policies which address the general lack of public goods need to be sensitive and, indeed, transformed for a more people-centred approach. The emphasis should be on the farmers and their needs (intangible assets) rather than on the farms (tangible assets).

This chapter presents findings on existing knowledge levels and skills gaps and constraints, and on the needs and aspirations of the farmers in the irrigation schemes. The results are discussed within the context of the culture that the farmers and their communities find themselves in. Although the study also intended to investigate crop production at homesteads and in the irrigation schemes, early investigation showed that home gardens were rarely kept due to scarcity of water and, in one location, rocky terrain. These constraints were noted by farmers within the schemes and verified by researchers who through transit walk confirmed the rarity of food gardens in the study areas. This suggests that water access, water harvesting

and recycling of household water may be important interventions for improving home-garden programmes.

4.2 Results and Discussion

Data were collected three times over a twelve month period to determine the crop production, marketing and financial knowledge skills that farmers possessed. Further knowledge areas that need to be strengthened were identified. The chapter also presents findings on women farmers' aspirations, needs, goals and on how their various roles impact on their livelihoods.

4.2.1 Crop production: knowledge, practices & gaps

Participants identified fifteen types of crops that they planted in the irrigation schemes. The most common of these were maize, sweet potatoes, ground nuts, spinach and beetroot. Other crops planted included pumpkin, beans, green beans, potatoes, chillies, green pepper, carrots, mutshaina, mustard rape (mostly *Brassica juncea* but also *Brassica rapa*), tomatoes and muxe, nightshade (*Solanum retroflexum),* a traditional leafy vegetable. The cultural practices associated with the cultivation of these crops are briefly mentioned below. Table 4.1 describes crop cultural practices related to the identified crops in the three schemes. An aggregated table is presented because of commonalities of practice. Where differences occurred, this is highlighted in the discussion.

Although the small-scale farmers participating in the study had little formal training in agriculture, Table 4.1 shows that they had some knowledge of planting, but were not sufficiently conversant with the correct spacing and depth requirements and the calibration of agrochemical usage. The observed farming practices were compared with the Department of Agriculture, Forestry and Fisheries (DAFF) guidelines. From this we can conclude that small-scale farmers in the study areas know how to produce crops commonly grown in their area; nonetheless, technical knowledge gaps were identified. Therefore bettering their technical knowledge and reducing the skills gaps relating to calibration and measurement could well improve productivity. Accordingly, the approach and extension should focus on how adults, specifically non-formally-trained farmers, can be led to improve their technical expertise.

Of interest, however, are the Rambuda farmers who planted what they called 'winter maize', which seemed to thrive. Further questioning revealed the maize was a winter maize variety. This suggests that there is a need to explore how knowledge is extended to farmers,

especially knowledge about new varieties and technologies that may improve productivity and thus livelihoods. Although the small-scale farmers have some knowledge, they have identified a number of areas they felt they need training in: new crops and methods, fertiliser application and produce marketing. They largely preferred on-the-field training because most had low levels of literacy.

Table 4-1 Technical agricultural knowledge per crop type

Stage	Crop cultural practices	Soil nutrition understanding
Ploughing	Mixing soil and fertiliser. Removing weeds	Appropriate soil preparation per crop type
Making ridges and furrows	Flat "bed" construction	
Fertiliser application	Fertiliser application	Gaps in calibration and measurement skills of fertilisers identified

Table 4-2 Spinach and beetroot production knowledge and gaps

Stage	Crop cultural practices	Crop production manual standards
Spinach*		
Planting	Make a nursery and transplant seeds at 10 cm. Plant in March	Plant seeds directly at 2 cm depth or broadcast. Plant from August to April.
Growing	Water a once a week	Water regularly, soil must not dry DAFF (2010).
Harvesting	Regularly full grown leaves	
Beetroot*		
Planting	Plant seeds in permanent place. Plant in March (others say anytime)	Plant from August to March. Lift mechanically when roots are about 5 cm in diameter. DAFF (undated)
Growing	Water weekly Separate any clusters	Water regularly, soil must not dry. Crops must be 5-7 cm apart.
Harvesting	Matures in 2 to 2.5 months	

* Cultivation for five common crops: respondents' methods compared with DAFF manual

Table 4-3 Maize, sweet potatoes and groundnuts production knowledge and gaps

Stage	Crop cultural practices	Crop Production manual standards
Maize*		
Planting	Sow seeds in a shallow hole and leave 0.5 m between plants. Apply fertiliser on planting. Plant between Sept and Oct (summer crop), and in July (winter).	Warm weather crop. Plant about 5-10 cm depth
Growing	Water every other week and weed throughout	Needs a lot of water (250L consumed per plant till maturity)
Fertiliser application	Apply additional fertiliser when plants are at knee and shoulder level. Apply LAN or chicken manure.	Apply fertiliser near seed
Harvesting	Harvest after 120 days or When birds begin to eat seeds, or When the "hair" changes from yellow to brown and dries.	Harvest after 120-140 days (Du Plessis (2003)
Sweet Potatoes*		
Planting	Cut vines from old crops and plant in soil with fertiliser (3:2:4) Planting time conflicts (anytime, summer or winter)	April and May (DAFF 2011)
Growing	Water regularly until new shoots grow and every 2-4 weeks	About 20 mm of water in early season, 40-45 mm in mid-season and 20 mm end of season
Fertiliser	No fertiliser application during growth to prevent potato grow big and tasteless	Apply nitrate, phosphate, potassium, calcium and magnesium at 0-10 weeks, 10-15 weeks and 15-20 weeks
Harvesting	Harvest after 3 or 6 months depending on variety. See cracks in soil	
Groundnuts*		
Planting	Plant continuously on soil with sprinkled with fertiliser. Plant in Sept- November	Plant on flat beds using minimal tillage. Plant from mid-Oct to mid-November in well drained soils. Plant in warm, moist soils.
Growing	Water once a week Keep all roots covered.	Water needed during flowering and pod filling
Fertiliser application	Apply super-fertiliser once more at just before flowering	Apply P, K and Ca in proportion.
Harvesting	Harvest after about 5 months, or When leaves turn yellowish.	Harvest after 160 days (5 months) DAFF (2010).

* Cultivation for five common crops: respondents' methods compared with DAFF manual

4.2.1.1 *Land preparation*

When participants were asked to describe how they prepared land to plant, they indicated that irrespective of the crop they planted, the first activity they did was to remove weeds and 'old plants'. Land preparation also involved loosening the soil, or ploughing, which they believed improved production, as is evident from the following comment:

> *I have seen that crops grow well when the soil is loose and soft, the roots go deeper.*

Another reason they mentioned for 'ploughing' was to **'***mix soil and fertiliser'* and to *'bring the nutrients to the top soil which is less fertile'***.** In addition to removing weeds and loosening the soil, participants mentioned that for all crops except groundnuts (which required flat beds), they dug or 'made' lines or rows, stressing the importance of this process for the growth of crops:

> *Ploughing and making lines comes before planting to loosen soil because plants grow better on well prepared soil*

Participants mentioned that they used hoes or tractors to remove weeds and to dig lines. It appeared that when working in their home gardens they generally used hoes, but in the irrigation schemes they relied more on tractors. Many of the participants said they experienced frustration during the preparation of land because the tractors were not easily available, thus causing delays in planting which ultimately reduces yields. In addition, others complained that they found hiring a tractor very expensive, since many of them were old people who relied on pension grants to finance their farming activities. Some also mentioned using donkeys and/or hoes to plough, leading to a smaller area being planted due to the inefficiency of donkey traction and/or hoes.

4.2.1.2 Maize

(a)The planting process

Maize was one of the crops grown by the participants. Their main method of planting was hand sowing by '*dropping seeds in a hole'*. Most mentioned that they included fertiliser during planting, however there were variations in the inclusion of fertiliser at the planting stage. While the majority of the participants reported including the fertiliser when planting maize seeds, some reported putting in fertiliser after three weeks. Many of the farmers did not make a differentiation between basal (compound) and top-dressing (N) fertilisers and mentioned that fertiliser usage is an area of concern to them. They indicated that they did not know how to measure and apply commercial fertiliser. Their fertiliser application methods are likely to cause fertiliser burn to the seedlings and hence could lead to reduced crop stand. Not all the participants gave detailed descriptions of how far apart they planted the seeds or of the depth of the 'holes' or the distance between the rows they dug to plant the maize seeds. A few mentioned, however, that they planted the seeds 0.5 m apart.

(b) Planting time

When asked about the time of the year when they planted maize, participants gave different responses. The majority of them (26 respondents) indicated that they planted maize in September or between September and November. The main reason given for planting at this time was that this was the rainy season, and that if they planted maize in winter it would not grow because of a lack of water. This appears to suggest that participants understood maize to require a lot of water, which, according to them, was only available during the summer season. However, a sizable number of participants from Rambuda reported that they planted maize anytime, and that as long as one used fertiliser, the maize would grow. Statements such as these were all given by farmers in Rambuda:

I plant anytime I want. You should weed and put manure to get a good a crop

You can plant anytime and use fertiliser and spray to get a good crop

Plant anytime and use chicken compost

The above responses, suggest that the agroecology of the area is less prone to frost, thus allowing for the so-called "winter maize" to be planted by farmers. Further, participants believed that the application of fertiliser or manure improved yields. However, normally maize is only planted at the end of September or early in October because maize germination requires temperatures above 10°C.

Some participants (13 from Rambuda) mentioned that they planted maize in July, while a few (7 farmers in Rambuda) mentioned that there are '*different varieties for winter and summer'*, and that it was important that farmers used the '*appropriate*' seeds. The winter maize is likely to get good prices on the market as only a few places countrywide can grow maize during winter. This may be an area that may need strengthening to ensure better incomes for farmers. Nevertheless, it was observed that only small areas in the irrigation schemes were dedicated to maize in Rambuda as in Steelpoort but more so in Mashushu.

(c) Use of fertilisers

All participants mentioned the importance of using fertilisers to get good crops. They varied on how often they applied fertilisers, with some saying they applied them twice during the growing season, and others that they applied them three times. However, they were not able to be specific about application rates and mentioned that they were not fully trained in fertiliser usage. One farmer was quoted as saying *apply additional fertiliser when plants are*

at knee and shoulder level. While not all of them mentioned the types of fertilisers they used, a few mentioned using KAN (Limestone Ammonium Nitrate), a good nitrogen and calcium source that raises soil pH, which is good for most crops.

While kraal manure and composting would contribute to soil fertility, our findings indicate that the three communities did not own much livestock and composting practices were not common. More insight into these issues could give a better idea of the viability of agro-ecological approaches such as organic farming. Our observations brought to light nitrogen and phosphorus deficiency symptoms in many farmers' crops, implying inadequate fertilisation of maize.

(d) Watering

Participants mentioned that frequent watering of the growing maize plants was critical, but they gave varying responses when asked about the frequency with which they watered their maize plants. Observations and focus-group discussions revealed that water scheduling is a major problem on all smallholder irrigation schemes and is often fraught with disagreements among members, such that water application often compromised crop yields. In some cases, watering was scheduled at fixed intervals regardless of crop growth stages.

Some farmers reported that they watered the crops every week while others reported watering them every other week. Yet others explained that maize needed to be watered more frequently during the early stages of growth and less frequently at later stages. All participants mentioned that maize needed to be weeded throughout but were not specific about when or whether they needed extra labour for doing the weeding.

(e) Harvesting

When asked about harvesting, some participants reported that they harvested after 120 days and looked for locally embedded signs of crop readiness, including *when birds begin to eat seeds* or *when the tassel changes from yellow to brown and dries.* In all three locations farmers stated that they aimed to produce for both sale and household consumption. One farming household in Rambuda was observed to have a small mill at home and produced their own mealie meal. Farmers were cognisant of the need not to consume all the maize when it was green but to save some as mealie meal later.

4.2.1.3 Sweet potatoes

Sweet potato was also grown by the participants at all three sites. Orange-fleshed sweet potato varieties, an important source of vitamin A, were grown. In South Africa, 64% of 1-9 year olds and 27% of women at reproductive age have low vitamin A status (Laurie, 2012). The Agricultural Research Council's Vegetable and Ornamental Plants Institute (ARC-VOPI) was reportedly involved in introducing the orange-fleshed sweet potatoes to these study sites.

(a) The planting process

The participants were asked to explain the process they followed when planting sweet potatoes. A common method was to use cut vines from old crops. Although farmers acknowledged that using cut vines from old stock can transfer diseases they did not elaborate on ways to avoid this – which implies the likelihood of the spread and build-up of diseases and pests.

(b) Timing

There was again no consensus on what the best time to plant sweet potatoes was. The majority of the participants (47) reported planting sweet potatoes anytime of the year, while some (12) reported planting between September and November. This suggests that there were no recommended crop rotations that the farmers collectively adhered to. The poor collective planning and marketing at all three irrigation schemes was apparent and was confirmed during focus-group discussions. This deficiency ultimately affects market access negatively.

(c) Use of fertilisers

Some of the respondents reported applying fertiliser during the growing period, with some of them warning against this, and arguing that fertiliser during the growth period would make the '*sweet potatoes grow big and tasteless'*. Participants emphasised that sweet potatoes needed fertilisers rich in potassium and low in N, as well as weeding to get a good crop. While some noted that they used foliar sprays, others mentioned using compost, and some used NPK 2:3:4 (30) compound fertiliser. The disparities in the knowledge of sweet potato among the participants were noted with concern because under a collective marketing regime quality difference and poor price fetching are known to be a cause of friction.

(d) Irrigation

Participants reported different frequencies in the irrigation of their sweet potato plants. They were aware, as they were not in the case of maize, that there were different varieties of sweet potato, and that watering needs varied according to the variety planted. This quotation by one farmer sums up this finding. *"I water once a month … depending on the variety I have grown"*.

Although the differences in varieties and corresponding differences in watering requirements were appreciated by the farmers, there were still notable variations in practice when it came to the irrigation frequency of the respective varieties. There appeared to be no common understanding of how much water each of the varieties needed, or of how frequently each should be watered: some of the participants irrigated twice a week, others once every other week even when water was available. This variation in practice was noted at all three sites.

Harvesting

The average time reported for harvesting was between 3 and 6 months, depending on the variety. Participants mentioned that when sweet potatoes were ready for harvesting or were mature, cracks appeared in the soil. Marketing activities followed. These consisted mainly of farm-gate sales; in some cases merchants arrived to buy larger consignments at the farm gate at all three sites.

4.2.1.4 Groundnuts

The planting process

Groundnuts were grown mainly in Rambuda. Unlike other crops, groundnuts were the only crops planted on rectangular flat beds. A number of participants in Rambuda described the process of planting groundnuts as involving placing seeds in the mouth and *spitting them into the ground which already has fertiliser*. Even those who did not mention the spitting mentioned that the seeds should be planted in soil sprinkled with fertiliser. The "spitting" method was deemed appropriate by the farmers as it allowed them to "hold the seed in the mouth" and to spit it into the hole while they used both hands to hold the hoe. They also explained that spitting allowed for the seeds to be planted close to each other as according to them groundnuts require close spacing in the planting. This local method of planting indicates

that farmers possessed knowledge and, in the absence of a mechanical planter, demonstrated adaptability and innovativeness.

Timing

Although the participants did not all say they planted groundnuts in the same month, they all noted that groundnuts do not do well in winter. They reported planting groundnuts between September and November. The main reason given for planting during this time was that it was sunny and warm.

Use of fertilisers

After applying fertiliser during the planting period, almost all participants reported applying fertiliser once during the growth period, just before flowering. They reported using super-fertiliser which is gypsum to avoid the 'empty pod syndrome'. Gypsum supplies the plants with calcium which is critical for kernel development.

Irrigation

Almost all participants reported irrigating groundnuts once every week. Some mentioned that it was important to keep the roots covered with water.

Harvesting

The participants reported harvesting the groundnuts after 4-5 months. Almost all of them reported that the main signs they used for concluding that the nuts were 'mature' were the leaves changing from green to yellow and then drying and falling.

4.2.1.5 *Other crops grown*

Several other crops were grown in smaller quantities. These included spinach, beetroot, pumpkin leaves, green beans, potatoes, chillies, green pepper, dry beans, mutshaina, tomatoes and muxe. These crops are briefly discussed hereafter.

4.2.1.6 *Spinach*

Participants reported planting what they call spinach which was observed (especially at Steelpoort) to be in fact Swiss Chard (big leaves versus spinach which has smaller leaves). They made no differentiation between the two crops owing to their close similarity. Seedlings

were bought at a nursery, and transplanted at 10 cm height. They planted the ‘spinach’ in winter because *it likes cold.* They reported that the ‘spinach’ seeds *like water*, and said they watered them once a week. As the ‘spinach’ leaves were reported to be vulnerable to attack by aphids and ants, they were drizzled with ‘bulldeath’ (a multi-insect powder made of permethrin (a pyrethroid) and carbaryl (a carbamate)) which the participants said they used to kill ants. They harvested the spinach when their leaves were “big”.

4.2.1.7 *Beetroot*

The participants reported planting seeds in a ‘permanent place’, in soil mixed with compost. Such direct seeding often requires thinning. Some reported that it was the first time they had planted beetroot and therefore did not know much about it. They said they knew that beetroot *likes the cold*. While some reported watering beetroot weekly, others reported watering it three times a week. They mentioned that they believed beetroot could be planted *anytime*. A few said that it should be planted in March. They reported using a mixture of fertiliser and ‘kraal manure’, and reported that it ‘matures’ in 2-2.5 months.

4.2.1.8 *Pumpkin leaves*

In planting the pumpkin for its leaf, participants reported planting seeds in the ground with fertiliser, and leaving about a metre between the plants. Participants explained that the space was to allow enough room for the plants to grow. They reported planting pumpkin as a leafy vegetable in October and November, as there is enough rain then. They reported harvesting in March, or when flowers develop and small pumpkins grow. They watered the pumpkin fields once a week. In other places the fresh leaves of the pumpkin were sold as ‘morogo’, i.e. leafy vegetable, but the farmers who participated in this study did not differentiate between the two produce forms. The sale of traditional leafy vegetables was however observed in urban centres such as Thohoyandou, which is not too far from Rambuda. The communities of the irrigation schemes consume pumpkin leaves as a relish eaten with pap (thick maize porridge).

4.2.1.9 *Green beans*

Participants reported planting seeds in a shallow hole in the ground in a line close to each other. They reported adding manure or fertiliser during the planting process. There was no consensus regarding the timing of planting green beans: some farmers reported planting them in March, others in October, while yet others said they planted the crop anytime as long as

there was water. Again, there was no uniformity regarding watering frequency, with some watering the plants once a week, others watering them every other week, and still others watering them *twice a week until established, then once a week.* They reported buying the seeds they used for planting green beans from shops. Participants emphasised the need for a good fertiliser, with some reporting that they used KAN (LAN -28%N) at planting and 101 when plants were about to flower. Others reported using chicken litter. They all reported harvesting the crop after 2-3 months. Some reported using ashes and/or chemical sprays to protect the plants from ants.

4.2.1.10 *Potatoes*

In planting 'Irish' potatoes, participants reported using sprouted tuber, a sprouting potato, which they *cut in half and then rub the open flesh with ashes and plant.* It is done to suberize the cut surface, thereby reducing the entry of pathogens that could rot the planted half tuber. They reported planting this crop in September, and noted that it was the first time they had planted potatoes. They reported watering the plants twice a week, and using fertiliser and spray. They said they knew the potatoes were ready for harvesting when the leaves got dry.

4.2.1.11 *Chillies*

Some participants (25) planted chillies by first nursing seedlings in small rectangular boxes and transplanting when the seedlings were about 10 cm tall. They applied fertiliser during planting and watered the growing plants once a week. They noted that they planted chillies at any time of the year, and applied fertiliser and pesticide sprays to ensure a good crop. They harvested the chillies when the fruits turned red. Chillies are a high-value crop that can be considered for contract growing if the farmers are well organised.

4.2.1.12 *Green pepper*

A few participants (5) reported planting green pepper. They said they had sown seeds in a nursery first and then transplanted seedlings at 15 cm height. They applied compost manure and fertiliser (KAN -28%N) during planting, which they said they did at any time of the year. They harvested the green peppers when they *lose their shiny appearance and become dull.*

4.2.1.13 *Carrots*

Five participants reported planting carrots, and said they planted them in winter. They sowed seeds in soil enriched with compost manure and watered every week. They said they did not use inorganic fertiliser because if carrots got too big they cracked; hence they felt compost manure was the best fertiliser for them.

4.2.1.14 *Beans*

Ten participants reported planting dry beans in February, with fertiliser. They reported planting seeds *in the ground* or *in holes using manure*. They noted that beans need a lot of water so they watered them regularly, some saying they watered them once a week. They mentioned the need to weed and add manure to ensure a good crop, and said they harvested when the leaves became yellow. Harvest maturity in dry beans occurs when pods turn yellowish to brown and the seeds shake loose.

4.2.1.15 *Tomatoes*

Six participants planted tomatoes in winter. They planted seeds and applied manure to the soil before planting. They said they watered the plants three times a week and harvested when the tomatoes turned red.

4.2.1.16 *Muxe & Mutshaina*

These two traditional vegetables were found only in Rambuda. This points to the harnessing of local knowledge with respect to the cultivation of these leafy vegetables. Other than some amaranthus species no other local vegetables as such were observed at the Mashushu and Steelpoort sites.

Six participants in Rambuda said they planted *mutshaina* in early winter (end April early May) by nursing and transplanting them into a bed. They watered them regularly and harvested when the leaves were big. Seven participants said they planted *muxe* (the leafy vegetable *Solanum retroflexum*, also called black nightshade). They nursed seeds and transplanted seedlings at 10 cm height, applying fertiliser after transplanting. They watered the plant twice or three times a week. They said they applied Malasol (Malathion 50 EC) to kill insects and harvested when the leaves became big.

4.2.2 Crop production knowledge gaps

The farmers said they were interested in learning how to grow new crops, as shown in Table 4.1. While it was a common theme in all three areas, it was emphasised in Mashushu with 81.8% of the participants indicating they needed training in the growing of new crops. The Mashushu participants have poor market access. Some felt that growing new crops with a high market demand would be beneficial for them. Perhaps these farmers also need information and appropriate training in marketing and contract farming.

As indicated in Table 4-4, 89.9% of the farmers identified crop protection and pesticide use as areas in which they needed further training. In addition, they reported that they needed to have protective clothing before using the chemicals. It was even said that the extension officer would not dispense pesticides to a farmer who did not have sufficient protective clothing and appropriate equipment. *"When the pesticides are available, the extension officer can give them to you but he wants to see the protective clothing, and I cannot afford it."*

The purpose of the protective clothing requirement is to prevent the numerous instances of acute poisoning reported in the literature as a result of the incorrect use of pesticides in the absence of protective clothing (Arias et al., 2014, Feola & Binder, 2010, Kouser & Qaim, 2011). The poor understanding and skills of the farmers with regard to pesticide handling needs urgent attention. As most of the farmers are monolingual, they are not able to read the pesticide containers' instructions and warnings, which are in English. It was established that while the extension officers did give the farmers information on pesticides, the use of these agrochemicals remained limited, such that farmers' understanding of the different toxicity levels of pesticides was poor; this lack of knowledge, if not addressed, may well have adverse effects on farmers' health.

Table 4-4 Identified crop production knowledge gaps

	General (%)	Mashushu (%)	Rambuda (%)	Steelpoort (%)
Crop protection	89.9	81.8	88.6	95.7
Crop management training	46.4	81.8	22.9	65.2
Crop rotation	39.1	9.1	51.4	34.8
Other	14.0	18.2	17.4	8.7

Given these farmers' poor pesticides-handling skills, agro-ecological practices may be beneficial to them. Such practices are, however, knowledge intensive and it cannot be expected that the farmers' dearth of knowledge in this regard will be soon or easily overcome. This study theorizes that the dearth of knowledge in these communities with regard to agro-ecological practices is due to long-term heavy reliance on conventional farming methods, to lack of awareness, to the low value placed on such knowledge and to inadequately and/or inappropriately trained extension officers.

Crop rotation was identified by 39.1% of the farmers as something they would like to learn more about. They were aware that this would improve their farming in some way. Most farmers, furthermore, displayed a lack of technical know-how regarding ways of measuring and applying fertilisers. As farming plays a vital role in sustaining livelihoods in these communities, it is crucial to bridge this knowledge gap given the risk of possible drops in yields resulting from reduced or inappropriate fertiliser use (among the few farmers able to afford fertiliser in the first place).

It is noteworthy that there exists a draft agro-ecological strategy for South Africa. Culture and knowledge are dynamic systems that change with time. So while on the one hand it is important to bridge the knowledge gap by importing know-how from the outside, that is, from Western farming models, it is as important to recover traditional ways of farming that used to be effective, and to (re)train the local people in farming techniques that form part of their cultural heritage. In this context, one should have regard to the training needs of women farmers, ensuring, however, that agendas are not imposed but are worked out in consultation with all the parties involved.

> *Fertiliser is expensive and we must use different kinds: Urea/KAN for nuts and maize and 321 for sweet potatoes, making it unaffordable*

Previous studies have shown that most farmers in Africa use very little fertiliser compared to their counterparts in Latin America and Asia (Marenya & Barrett, 2009), a disparity largely attributable to the relatively high price of fertiliser. Given the high cost of fertiliser relative to SH farmers' incomes combined with the variability of soil fertility over regions (Misiko et al., 2011), teaching these farmers about the chemical compounds missing in their soils and about the types and application levels of the required fertilisers would surely help them to save money and to make efficient use of the fertiliser they can afford to procure. Soil testing facilities should also be made available and affordable and strong support from extension officers is critical to a successful outcome.

Table 4-5 Previous training received by farmers

Course	Subjects	Organisations which facilitated
Crop production	Sweet potato	Department of Agriculture officials
	General	Other
	Crop rotation	
Fertiliser use	Uses of lime	Department of Agriculture officials
		Other
Pesticide use	Spraying	Department of Agriculture officials
		Other
Business management	Financial management	Other
	Marketing and planning	
Other	Water Harvesting	Other

Table 4.5 shows that some SH farmers had received some training on subjects ranging from agricultural production in general, planting the orange-fleshed sweet potato to financial management. Most (56.8%) of the farmers in this study received their training from NGOs and church organisations, 26.3% were trained by extension officers and 10.8% had received training at agricultural colleges. There is a clear gap between the kind of training the farmers got and the traditional forms of agriculture practised by local communities in the past. It would seem that the depletion of local knowledge regarding traditional agro-ecological practices plays no small role when it comes to the kind of training now being requested by SH farmers.

The farmers who had received training outside the community at agricultural colleges were perceived by other farmers as not using their knowledge effectively and as failing to pass on to them what they had learnt. This may be due to a weakness in the "train the trainer" model in use at those colleges, and it leads to one to question the relevance of the training received and the suitability of the training methods used. It also leads one to question the criteria used for selecting farmers to attend courses outside the community and raises questions about their ability to grasp new knowledge, especially in the context of complaints about the selection process. It seems that extension officers were responsible for selecting farmers to attend outside courses and some farmers expressed the opinion that some extension officers may have used selection for outside courses as a reward for those who respected them or were their friends. The scheme committees did not play a role in choosing candidates for outside training. When asked what criteria they used for selecting farmers for out-of-community training, an extension officer said:

There are 2-3 trainings each year. And a farmer's qualification is important for theory-based courses; for those we select people who can study at that level, but everyone attends practical training.

4.2.3 Agricultural production constraints

Being a SH farmer in a rural area brings with it constraints upon one's agricultural production and marketing activities. By definition, the SH farmers are resource-limited, have small pieces of land and may not have secure access to inputs and irrigation water (Dorward et al., 2004, Barrett, 2008, Namara et al., 2010). While the participants in this study had access to irrigation water, the remainder of the description holds. Table 4.6 below offers a breakdown of the constraints facing farmers in the study area.

Table 4-6 Constraints identified by farmers in three communities in Limpopo

Farmers' Constraints	Percentage (%)	Mashushu (%)	Rambuda (%)	Steelpoort (%)
Tractor availability and expense	38.5	9.1	45.5	34.8
Insufficient water	35.3	63.6	32.4	26.1
Seeds and fertiliser (availability and expense)	32.4	36.4	44.1	13.0
Animal invasion	42.6	81.8	35.3	34.8
Market access	17.9	45.5	6.1	21.7
Money for farming	15.3	9.1	20.0	13.0
Limited land	7.4	9.1	11.8	–
Road problem	6.7	37.5	–	–

The dominant farming system observed in these communities was mainly conventional and agro-chemically based, although more agro-ecologically based farming principles were said to have been used in the past. Conventional farming methods were also favoured by non-scheme members. The array of constraints presented in Table 4-6 is symptomatic of a struggling farming system whose difficulties arise mainly from inappropriate and/or misapplied farming methods coupled with extension officers who are conventionally trained.

In the distant past, SH farmers, trusting to the principles of agro-ecological production (Koocheki, 2004), relied more on the natural environment to improve their productivity and resource base. Indeed, most of the constraints reported in Table 4-6 such as lack of seeds and

fertiliser, the high cost of agrochemicals and the insufficiency of water, could be mitigated by adopting an agro-ecological approach to farming that would lessen the current heavy reliance on external inputs (Koocheki, 2004). The struggling SH farmers of today unfortunately are experiencing the effects of an over-reliance on conventional farming models and have lost most of the benefits associated with a more agro-ecologically based farming system.

A lack of farming implements was a reported constraint. Most respondents felt that tractors were too expensive to rent, some paying an unaffordable R1200 for land preparation. The largely prohibitive costs of tractor hire resulted in farmers using hoes. Also, with the approach of the planting season, there was a high demand for tractors and some farmers had to wait until after the recommended planting dates. Government tractors were sometimes available in Rambuda, but their reassignment before work was completed was a frequent occurrence. Farmers aspired to owning tractors in the Rambuda and Steelpoort irrigation schemes.

The high cost and, at times, the unavailability of seed and fertiliser were reported as constraints. Using old and out-of-favour varieties of seed together with a shortage of the appropriate fertiliser negatively affected a farmer's yield, its quality and marketability. In the three schemes under discussion the Limpopo Department of Agriculture had given the farmers seeds and fertiliser for some crops for the 2013-2014 season. While the farmers generally welcomed these inputs, a number were somewhat put out because they had by then moved onto other varieties of the crops which they perceived to be better; they felt that in future government should ask the farmers which crop variety they preferred. Also, government had supplied some of the farmers in one of the schemes with pesticides, but because of their toxicity the extension officer could not dispense them if the farmers lacked the required protective clothing. As this was unaffordable, the farmers were largely unable to take advantage of the pesticides supplied.

The unavailability of water due to seasonality and poor infrastructure was reported by plot holders, particularly in the peripheral sections of the Rambuda, Mashushu and Steelpoort schemes. Insufficient irrigation water was highlighted by most respondents, particularly those residing in Mashushu. The canals in Mashushu were not cemented, and the infrastructure was considerably damaged by past floods. Many respondents told of scheme members who stole water by diverting it and how, if one wanted to prevent this from happening on one's watering day, one needed to send someone to guard the furrow. This problem was specific to

those whose plots were at the periphery of the scheme, further away from the water source. Those in the community without power or without someone to stand guard for them would be victims of water theft. Other users outside the scheme included those attempting to grow food gardens and those salvaging water from household use in canals. A respondent in Rambuda said:

> *I do not have a plot in the scheme so I have a garden, but it is hard to plant on a large piece of land when I have to carry the water from the canal to my house.*

The above comment indicates that the community views the canal water as community water rather than as water exclusively for those in the scheme. Despite the water shortages, no water conservation practices such as mulching were observed in the scheme, indicating a lack of knowledge about them and their value.

Other constraints which were not identified by the SH farmers but were observed by the researchers emerged from the demographic data. The women were old and so may not have been able to perform all the work required. Planting, weeding and harvesting are strenuous tasks which even the young find difficult to perform. Waking up early to harvest before the arrival of the informal traders is hard for the elderly women who have to combine that with household chores, especially when there are young family members who have to be got ready for school in the morning. This statement by an older farmer confirmed the demographic data.

> *"You cannot plant one hectare alone. It is impossible. You need four of five people to work with you, but the labourers are expensive and these children do not want to come to the farm".*

A further constraint observed from the demographic data was the low level of education of most of the farmers. This very likely would limit their ability to read the English instructions and/or warnings on seed, fertiliser and agrochemical labels. The farmers' low educational level clearly has implications for their training and for the training modalities that would be appropriate.

4.2.4 Crop production needs

The sustainable livelihoods assets (SLA) framework was used in this study to understand farmer assets and empowerment. In most farmer-development approaches, tangible assets have received greater attention than intangible ones. This study suggests, however, that intangible assets, such as the improvement of farmers' human and social capital, should be

given priority. This shift of emphasis, resulting from the farmers' declared desire for skills upgrading, underpins the present study's central argument that the enhancement of SH farmers' intangible assets is their passport to agency and empowerment, such that the tangible agricultural assets at their disposal will come to be better utilised. Yet the approach to, and modalities of, training received by SH farmers up to now seem not to have led to the desired empowerment and success. In this section, training needs as identified by the farmers themselves will be analysed.

Table 4-7 Production training needs identified by respondents in the three communities

Training needs	Percentage (%)	Mashushu (%)	Rambuda (%)	Steelpoort (%)
Crop protection	89.1	81.1	88.6	95.7
Supermarket quality produce	56.9	9.1	14.3	22.7
Crop Management	46.4	81.8	22.9	65.2
Crop Rotation	39.1	9.1	51.4	34.8
Other	14.0	18.2	17.4	8.7

Table 4-7 displays production training needs as identified by farmers in the areas of crop protection (89.1%), management (46.4%) and crop rotation (39.1%). Most respondents (89.1%) pinpointed a need to be trained in crop protection including the use of pesticides and other chemicals. This implies that other, less effective, forms of pest and disease control have up to now been practised. Now while pesticides and herbicides, among other agrochemicals, can be effective in crop protection, they carry strict use, mixing and storage instructions, and of the 89.1% who identified a need for crop protection training, many did not know how to classify chemicals according their names, speaking instead about the colour of the substance. This was worrying, given the toxicity of some of the substances. Some also were not sure how to mix the substances properly as they could not read the labels, and without the ability to read the labels, one can easily endanger oneself, others, and the consumers of the final product. Applying the recommended dosage becomes problematic when the farmer has difficulty in combining the chemicals in the correct concentrations and does not know how to calibrate the sprayers for application of the pesticide. Pesticide handling and application demand careful and thorough training.

Another reason for appropriate training in crop protection is that agro-pesticides are expensive to procure and unless crop protection is effective, yields will be low and/or

unmarketable because of their poor quality. Irresponsible pesticide use also pollutes the environment, especially water resources and beneficial insects. These challenges indicate the need for appropriate development approaches making use of tools and equipment that farmers are already familiar with, even such homely utensils as enamel mugs and empty food containers. Thus an approach that focuses on the development of human capital in its unique context is vital.

Some of the farmers (39.1%) wanted training in crop rotation although some said they had received it before. This may be an indication that there was no platform for previously trained farmers to share their knowledge with their peers. It also suggests that for crop rotation to be widely adopted among SH farmers, a larger number of them (a 'critical mass') will need to receive appropriate training in this methodology.

Crop management training was identified as another need by 46.4% of the respondents. The women felt that they needed training in how to grow new crops, and how to improve those already under cultivation. After an exploratory market awareness workshop on crops which could improve income, the farmers in Mashushu particularly wanted to learn how to grow sweet potatoes, cabbages and yellow maize which they felt would be easier to sell and would fetch a better price than the white maize and other crops they were then growing.

4.3 Marketing Knowledge and Practices

We have seen that some of the Mashushu farmers viewed growing new crops as the main key to unlocking market access. But as long as other production, institutional and marketing obstacles remain in place, the growing of new crops is unlikely on its own to pave the way to market access, let alone success in a competitive market environment. Some of the obstacles in question are weak extension support for marketing and a lack of linkage and liaison with the relevant external organisations and institutions. In the case of Mashushu, an additional obstacle is the isolated location of the village and the bad access road. The Steelpoort farmers were also quite interested in growing new crops, particularly those that may have a higher market demand than their usual vegetables. The Rambuda farmers, enjoying better market access than the other communities, appeared to be reasonably satisfied with their crops. Some farmers indicated that crop choice should be theirs without direction from the extension department and other entities. One of them stated: *This is democracy; I can grow what I want*. This suggests that in the quest to improve farmers' market access, one should not

impose, but instead should work in cooperation with the farmers, particularly if their way of growing has served them well in the past: the approach to farmer development is indeed crucial. Chikozho (2005) found that farmers would only change the way they did things if they thought the new way would simplify production and marketing, be cheaper and be amenable to adoption in stages.

Although most small-scale farmers grew crops in the first instance for household consumption, sales of agricultural produce nonetheless constituted an important source of income for the farmers in this study.

Table 4-8 Sale of produce in the three study areas

Location	Sale of produce		Totals
	Yes	No	
Mashushu	13	6	19
Steelpoort	9	5	14
Rambuda	15	3	18
Totals	37	14	51

From Table 4-8 it is evident that most of the farmers sold some of their agricultural produce. Still, most of them related how difficult it was for them to sell their produce and cited as major obstacles their limited market knowledge and high transportation costs. In addition to this, most farmers harvested the same crops at the same time, leading to local oversupply. The small number who claimed it was easy to sell had contacts and links with external buyers. A large number of farmers were interested in finding other crops to grow that were suitable to their area; this would diversify the crop range and thus reduce oversupply.

Several marketing strategies were employed by the farmers at the study sites. These included roadside and farm-gate marketing, transportation of produce to informal and formal markets, and produce exchange with farmers who grew different crops. The sales occurred largely in Steelpoort and Rambuda where there were established communication and transport networks with external players. In Mashushu, surrounded by mountains, isolated, and with poor access roads, sales proved to be much more difficult. Some of the farmers were asked whether market access considerations guided their crop production decisions; one of them answered:

> *This is what we eat with my family, we don't use contracts, we just grow and then call the buyers.*

In Steelpoort, the farmers offered produce for sale at the roadside where drivers who worked for the mines or for schools would buy, as would local residents. The farmers in Steelpoort had concluded a kind of social contract among themselves whereby they agreed to sell produce worth at least R30 a day on a rotational basis so as to ensure equitable business opportunity. Having sold produce worth R30, a farmer would wait until everyone else had made sales to the same amount before making another sale. If no further sale was made, the excess produce was taken home to the family or fed to animals. Some farmers were not satisfied with this arrangement:

> *The customers are not enough; it is common to feed goats from the markets and to make green manure for the vegetables.*

The farmers also relied on informal traders from neighbouring towns and villages who came to buy produce in bulk. This is in line with previous research which showed that most SH farmers sold most of their produce at the farm gate (Shiferaw et al., 2008). A few of the Steelpoort farmers, however, were selling their produce to supermarkets in Jane Furse (a nearby rural town). When interviewed they said that the supermarkets preferred produce to be delivered in bulk, and that this presented a challenge for most farmers operating as individuals. So here is a clear opportunity for interested farmers to pool their efforts and produce and, working together, to derive the benefits of selling in bulk to the formal market. For such an initiative to succeed, institutional arrangements among the farmers involved will need to be improved. They will moreover have to learn how to function as a unit that plans and markets co-operatively. Issues such as trust, openness in the sharing of information, are of critical importance here, for mistrust and secrecy among members of a co-operative undertaking is a recipe for failure. The encouragement of group and co-operative initiatives among SH farmers is in line with the sustainable livelihoods analysis approach, in particular the social and human aspects thereof that this study argues for.

In Mashushu, the community lies in an enclosed valley, with difficult road access and traffic passing through. This geographical handicap significantly limits the markets they can access. The farmers mostly planted during the rainy season because their uncemented irrigation canals have suffered considerable damage. Most had resorted to growing maize because they could exchange it for maize meal. A milling company from Tzaneen (a nearby town) offered farmers an 80 kg bag of maize meal in exchange for an 80 kg bag of grain maize plus R145. The farmers were dissatisfied with this arrangement, but had no alternative: *The millers*

come, they take an 80 kg bag of maize and R145 and give us mealie meal in exchange. We do not sell maize as it has a low price, at least this way we have mealie meal.

In Rambuda farmers sold locally and to informal traders from Sibasa and Thohoyandou, which are nearby towns. The informal traders bought mostly sweet potatoes and green mealies. Most of the farmers sold larger quantities of produce at a time to informal traders and smaller quantities to local customers. The problem with this trade was that the farmers did not always know the prices prevailing elsewhere, for example at the Johannesburg Fresh Produce Market (JFPM) or in the City of Polokwane, which they could then use as a reference point for pricing their own produce. A few farmers had however taken advantage of the JFPM and sold mostly green beans and peas there. The JFPM transported their produce to a pack-house in Levubu (a nearby town), where it would be stored in cold rooms and then ferried to Johannesburg (Table 4-8). A JFPM agent facilitated the various processes whose somewhat higher costs were at least offset by the better prices the farmers received for their produce. Most of the participating farmers had taken to sending a shipment to the JFPM at least twice a week.

Table 4-9 Ease of selling of produce at the three study localities

Location	Easy to sell	Hard to sell	Do not sell	Total
Mashushu	4	13	2	19
Steelpoort	2	7	5	14
Rambuda	7	8	3	18
Total	13	28	10	51

In the study only 25% of respondents indicated that it was easy to sell their produce to outlets such as supermarkets. Difficulties in accessing markets, in particular the more lucrative ones, impact negatively on farmers' livelihoods and can lead to loss of produce and diminished income generation. But income generation is not affected by poor market access alone; it arises also from the limited availability of production resources and from possibly flawed decisions regarding crop type, land size, manure/fertiliser use, quality and volumes/yields. Some of these factors may be behind the responses of the Steelpoort farmers. For it may seem surprising at first sight that a small irrigation scheme situated in an area of high population with nearby mining enterprises (with high buying power) should encounter difficulty in selling its produce. In some cases the choice of high-value crops, the timing of harvest in

order to cater to more affluent urban dwellers (e.g. fresh mielies) may improve producers' market access and secure better prices.

Another possibility, which Rambuda's geographical location would favour, is for farmers to organise themselves into co-owned institutions such as secondary co-operatives and then sell produce as a collective to markets in Sibasa and Thohoyandou. It needs to be borne in mind that this kind of initiative often necessitates the involvement of buyers/agents and liaison with extension officers and NGOs; and these must be willing to be people-centred and sympathetic to the farmers' concerns Marketing-knowledge gaps.

Due to the limited land and poor water access at times, some farmers "rented" land from fellow community members. Murugani (2013), in a study in the same areas indicated that problems around tenure security could form an obstacle to improved farming methods and expanded agricultural production and could reflect a knowledge gap with regard to innovative "rental systems" suitable for the tenure system. These constraints were found to play a role in keeping SH farmers' development stagnant.

Many knowledge gaps were observed in relation to marketing, the first being SH farmers' conception of a market which was envisioned as a physical structure instead of as a process characterised by the operation of push and pull factors throughout the production and marketing chain. The farmers believed that the mere presence of a physical structure would attract buyers to their area. But this proved not always to be the case.

The second gap identified was value adding. Farmers packaged and priced their produce according to local standards that were not informed by formal-market benchmarks. This was more evident in Steelpoort where farmers sold a big bag of spinach for R10 as against a possible R50 in supermarkets. At this site it was observed that R10 was the going price for most commodities (a bundle of fresh onions, beetroot or a packet of tomatoes). It emerged that this price had been agreed on by the members of the scheme, and had remained unchanged for some years. The farmers were not equipped to track prices or the demand and supply movements of produce marketed elsewhere and seldom received market and price information. These problems are not unique to the farmers in this study. Other researchers have identified the repercussions of market complexities on players with little information, particularly if they operate in markets which are not well integrated with formal-market networks (Barrett, 2008).

The third gap identified was farmers' inability to differentiate between characteristics of their produce that they deemed to be satisfactory and the kind of quality demanded by formal-market outlets. They mistakenly assumed that the physical characteristics of their crops at harvest (size, colour, lack of visible defects, etc.) were enough to satisfy the formal market's quality requirements, of which they seemed in general to be unaware (Baiphethi & Jacobs, 2009). But even supposing they were aware of those requirements, some supermarkets have adopted *Codex Alimentarius* standards which would be expensive and difficult for SH farmers to meet (Arias et al., 2014). Although most of the participants in the study could not differentiate between what they deemed to be satisfactory harvest characteristics and the quality standards demanded by supermarkets, the fact that some farmers in the study sent produce to the JFPM shows that some of it is of acceptable quality. This point was reiterated by most of the extension officers. The lesson is that willing participants should be encouraged to grow their produce co-operatively in the expectation that the pooling of resources and knowledge will lead ultimately to an increase in both its volume and quality. The irrigation scheme offers a means for facilitating such a development.

Although a few farmers had begun selling their produce in formal markets and could teach their colleagues how it is done, there were those who were not easily convinced. They felt that using an agent, as required by some formal-market arrangements, was a waste of money. They also did not welcome losing money to the tax and municipality charges which are attendant upon bringing one's produce to the market for sale. They were not convinced by the argument that these are standard charges paid by most farmers who use formal markets. These financial concerns aside, an extension officer also raised the issue of untrustworthy agents, reporting cases where farmers had approached him to act as a mediator in disputes with agents. Other farmers, however, seem to have engaged trustworthy agents and most could be heard punctuating market-related statements with *my agent told me to….* Still, some were not convinced. A young farmer was heard to say

> *Do you know that to get your product from here to the pack-house costs money, from the pack-house to Johannesburg costs money, you also pay for the pallet, the net to protect and cover your produce, you then pay for your produce to be sold at the market, you pay the agent and you pay tax! All that money is going to other people- you will only work for them.*

It seems that information sharing is not common outside friendship and family circles in the schemes. Consequently, some farmers who also wanted to start selling to supermarkets had trouble finding out how to initiate the process. Those farmers in Rambuda and Steelpoort

who already sold to formal markets mostly said of their peers who did not that they were not interested or did not deliver produce on time.

It was clear that farmers varied in their levels of expertise and that the difficulties they encountered also varied. Interventions aimed at farmer development and empowerment should take these variations into account and not treat farmers as a homogeneous group, even when they participate in the same scheme.

4.3.1 Pricing and sizing knowledge gaps

Table 4.7 shows that 56.9% of the respondents were interested in producing vegetables that met supermarket standards. Some respondents, while not sure what these standards were, felt that knowing what to aim towards would help them; they felt they could raise the quality of their produce to an acceptable standard once they knew what it was. The few farmers from Steelpoort supplying the Pick 'n Pay supermarket in Jane Furse soon became aware of their need for quality training and of their shortcomings with regard to product presentation and packaging. The farmers in Rambuda, who mostly sold to informal traders, seldom expressed concern about quality standards. But those Rambuda farmers who sold their produce to the Johannesburg Fresh Produce Market (JFPM) were cognisant of the differences between the systems, as they were of the cost differentials. These variations were also observed in a study dealing with SH farmers' market access (Baiphethi & Jacobs, 2009). It may be inferred that the absence of specified standards in informal markets may disadvantage farmers attempting to gain access to the formal sector. Baiphethi and Jacobs (2009) showed that SH farmers are often ill-prepared to meet the higher quality standards obtaining in the formal-market system. Mdluli et al. (2013) demonstrated that SH farmers aspiring to enter the formal market stand greatly in need of proper training in the areas of safety and quality.

As the Mashushu farmers have limited access to markets because of their geographical isolation, they may have felt that market awareness training, while helpful, would not be of immediate use in their current situation. Even so, their produce was deemed to be of good quality by the study's researchers and a practitioner in the team. But the Mafefe farmers were hampered by low yields that may not meet supermarket yield delivery requirements. Also, their produce (for example, bundles of spinach, onions or beetroot) was not packaged in accordance with the standardised sizes, weights, descriptions and pricing that supermarkets insist on. Making good these deficiencies through appropriate training would not only better

equip them to enter the formal market but would benefit their on-farm selling too. Beyond all this, the Mashushu farmers unfortunately were not conversant with the advantages of checking their prices against market prices, or indeed with the means of doing so. In a country that has widespread cellular telephone coverage, this should not have been the case; that it was (and is) the case has worked greatly to their disadvantage.

An extension officer noted that reliable pricing information for agricultural produce is available from DAFF and Rural Development: *Every Friday I get information on produce prices/kg from DAFF which is accurate. The DAFF has a contract with JFPM to give us their prices.* Yet a total of only 5.9% of the farmers at the three study sites made use of this information.

4.3.2 Financial knowledge: practices and gaps

Most of the SH farmers interviewed identified the non-availability of capital for investment in agricultural production as a major constraint. Unemployment in the rural areas, including the three study areas, is high and poverty widespread. What little money there is has to cover household expenses, family and social obligations, and also farming expenses such as tractor hire, the purchase of fertiliser, and planting costs. The difficulty of obtaining capital for agricultural investment has locked most SH farmers into subsistence production. Previous research in rural Africa shows that with access to finance and credit, SH farmers may be able to increase production and, with it, income (Barrett et al., 2001).

The local financial institutions with which most SH farmers have dealings are stokvels (savings clubs) and burial societies. The participants in the study belong mainly to the latter (burial societies), but one cannot borrow money from them. Those who belong to stokvels complain about the high borrowing costs – in some cases as high as 30% per month. Stokvels are more popular in Mashushu, where 63.6% of the respondents are members. Unfortunately, however, the local stokvel appears to be less interested in financing agricultural investment than in covering burial costs. Still, institutions such as stokvels could potentially be a source of credit for small-scale farmers, although for small amounts of money only. Some researchers have suggested that community initiatives be set up with the aim of making small loans to SH farmers who are not eligible for bank loans (Field et al., 2010).

While SH farmers are aware that banks offer loans, most have never bothered to apply for one as they have no collateral and, in any case, even supposing their application were to be

approved, they are dissuaded from applying through a fear of the consequences of a payment default. Chikozho (2005) found that similar concerns were evident in Tanzania; this implies that most African banking institutions are not designed to meet the needs of SH farmers whose land is administered by customary authorities, such that the farmer holds no formal title to it and technically, therefore, is without any formal source of income (Chikozho, 2005). Similarly, in the communities under scrutiny in the present study, some farmers possessed only permission-to-occupy documents (PTOs).

Unaware of other ways of obtaining credit, the farmers perforce relied on what they had. It appears that no NGOs exist whose purpose is to offer micro-finance to SH farmers – or, if they do, the farmers have not heard about them. The present study's sustainable livelihood analysis framework indicates indeed that livelihoods are derived from, and sustained by, the interaction of all five assets, including financial ones. Most participants in this study had very limited access to the last named. It is however important to recognise that improving access to financial resources is unlikely on its own to lead to the desired outcome if farmers are still deficient in the human and social skills needed for applying, distributing and managing those resources effectively. Another financial knowledge gap identified was record keeping. When asked how much their largest customers bought, most farmers could offer no more than an estimate as records had not been kept. Keeping reliable financial and production records would help farmers to better plan and budget for future seasons. Such records are after all the only basis on which extension staff can assist farmers to improve the management and productivity of their enterprises.

In summary, most of the farmers had little financial knowledge though a number recalled having attended some short financial-training courses. This leads one to question their efficacy while lending support to this study's central thesis: that building and enhancing social and human capital is the key to smallholder agricultural development.

5. INSTITUTIONAL AND ORGANISATIONAL ARRANGEMENTS:

WOMEN'S ASPIRATIONS AND EMPOWERMENT

This chapter discusses institutional and organisational arrangements for water and land in relation to women's aspirations and empowerment, dealing first with water-related issues followed by land related issues**.**

5.1 Introduction

As indicated in the definitions of an institution discussed in Chapter 1 (see section 1.3.1), when people find that institutional expectations fail to correlate with their own experiences they may well form themselves into organisations that ignore misconceived institutional rules. Much depends on policy makers having sufficient foresight to make sure that the institution's norms and expectations truly match the needs of the people whose livelihoods they are meant to support. Disharmony between institutions and organisations can threaten institutional control and influence over what happens in the local context, and lack of regulation can disrupt strategies for sustainable livelihoods.

This study is premised on the notion that institutional and organisational context shapes people's access to assets, their use and enhancement of those assets to improve livelihoods, and their overall goals and aspirations. This leads on to the question of how closely these aspirations are in line with the currently accepted forms of women empowerment (Field et al., 2010). We argue that the institutional and organisational approach to development needs to be people-centred, sensitive to people's needs and aspirations and enhancing their agency. It is also important to be aware of the heterogeneity of women farmers and their various stages of development. While some may benefit from interventions that lead to increased capacity and expansion others may benefit from consciousness raising and exposure to alternative ways of livelihoods (Agarwal, 2003; Niehof, 2004: Chikozho, 2005).

5.2 Water: Institutional and Organisational Arrangements

Comprehensive reforms of water-related institutions in South Africa have been under way since 1994, concurrently with major political and economic reforms. The institutional changes in the water sector cover policy, legal and organisational dimensions of water

allocation and management and affect all water sub-sectors, including environmental allocations. The reform process culminated in a new National Water Policy, a National Water Act and a National Water Resources Strategy (Backeberg, 2005). Two statutes, the National Water Act (DWAF, 1998) and the Water Services Act (DWAF, 1997), confirm the break from previous practices and the new emphasis on equity and efficiency in water management and decentralization of management responsibilities at the catchment level (Orne-Gliemann, 2008). Water user associations (WUAs) are provided for in the NWA, which defines them as water management associations with restricted objectives (Backeberg, 2003). In terms of our chosen definition in this research, WUA constitute organisations.

There has been an expectation that WUAs would assist smallholder irrigation scheme with development (Backeberg, 2005), but this has not yet materialised. This study found that almost none of the participants knew about WUAs and thus none belonged to any, indicating that WUA expectations and norms had failed to take root in the organisational activities of the local people. We found that there had been no effective implementation of the intended purpose of the WUA, which is to be inclusive of both the commercial and small-scale farmers. This underlines the need for clear understanding of local organisations to promote development when external parties are involved.

In a different study involving a sample of 45 smallholder irrigation schemes from Limpopo Province, it was reported that 28 irrigation schemes were part of a WUA. However, of these 28, only one effectively participated in its WUA's activities. This further indicates that even where the local people know about the WUA there are only minimally involved in its activities. Payment for water in these 28 schemes, which was linked to WUA membership, was taken care of by the Department of Agriculture on behalf of farmers and a number of studies have indicated that smallholder farmers would face financial difficulties if they had to pay for the water themselves (Van Averbeke et al., 1998; Speelman et al., 2008; Yokwe, 2009; Speelman et al., 2011). This may consequently be a disincentive for small-scale farmer participation in the WUA.

Social development, economic growth, ecological integrity and equal access to water remain key objectives of the new water resource management dispensation. To give substance to the statutes, new management entities had to be established at regional and local levels – respectively catchment management agencies and WUAs – emphasising a largely decentralized and participatory approach to water resource management (Bembridge, 2000).

Little attention has been given however to the way these institutions for water access and use must work together to optimise water access and water use by local communities. One of the biggest problems, especially with national or external institutions, has been lack of responsiveness to local needs and difficulties affecting local communities, coupled with failure to heed existing knowledge systems and arrangements by which local people creatively manage and navigate their needs. Instead, the external institutions insist on devising strategies that are meant to liberate local, poor, and supposedly rural and traditional rural communities by introducing them to supposedly civilized ways of managing water access and use. As highlighted, this approach might have led to the disjuncture, lack of coordination and cooperation between the national (or external) and local (community-based) agencies responsible for managing water access and use.

Access to water is a function of institutional arrangements, processes and organisations that govern this access. As indicated, some of the relevant institutions and organisations to water management are located outside the communities where water is needed. This makes coordination across these institutions and organisations all the more necessary.

This study identified a variety of relevant institutions and organisations, both internal and external to the communities in question, and the effect they had on water use and accessibility. We found that lack of coordinated interactions, processes and relationships between the internal/local institutions and organisations and external/regional institutions and organisations compromised water accessibility and use in the three communities under study, and we outline here the various arrangements, structures and processes that chiefly affected access to water and its usage in the study areas. In attempting to understand how these factors affected water use we discuss these institutions, organisations and processes according to a three-level hierarchy of government/state level, agency level and local/community level.

5.2.1 Institutional arrangements at the state and agency levels

Participants in Steelpoort and Rambuda reported that they had not interacted with nor received any support from government on issues of water use and management. However, the participants in Mashushu had met with government officials to discuss the repair of their irrigation infrastructure. The only state presence in the three areas was in the form of extension officers, linked to the Limpopo Department of Agriculture who were not responsible for water supply and management. The absence of Department of Water and Sanitation (DWS) and the seeming lack of support from government on such an important

issue was raised as a great concern by participants in all three sites. Farmers perceived the lack of interaction with the irrigation scheme members as undermining the knowledge that they could gain in terms of water scheduling management. Although the local communities had developed their own ways of managing water use, the limited roles of the state and external agencies meant that critical aspects of water use and management that extended beyond the capacities of the local communities could not be addressed or attended to.

It is our view that increased participation of the state agencies, for instance, could bolster and empower the local communities by providing them with the necessary resources (financial, knowledge or skills). This also means that the state institutions are missing the opportunity to learn how these local communities navigate water management and use could inform state policies and interventions to empower local communities. Mutual and active reciprocity between local and state/external agencies is needed if issues of water use and management are to be addressed in ways that provide sustainable empowerment to the local communities. Such interaction could also enhance the understanding by communities of state policies and regulations with regard to their access and use of water.

For economic development and improved livelihoods there must be linkages between the irrigation schemes and external institutions such as markets and extension services. For instance, information could be made available on what, where, when and how to grow the crops and on market access. This could encourage robust mutual relations between internal and external players to the benefit of sustainable livelihoods. Innovative interactions between schemes and external stakeholders could also enhance growth, management and expansion of the schemes. Van Averbeke et al. (2011) note that irrigation committees, if left alone, find it difficult to enforce rules among their members. Assistance from extension services is vital to ensure farmers abide by rules.

5.2.2 Institutional arrangements at a community level (Ramabuda, Mashushu and Steelpoort)

In all three study areas, what were formerly called irrigation committees have now been renamed as water user committees. This should ostensibly transform the water user committee to make it part of a local WUA as stipulated by the Water Act 1998. However, group discussions with the participants indicated that the marriage between the local (community-level) institutions and statutory institutions of water management has not been easy, explaining the apparent lack of linkages with other water users in the WUA. A

discussion of these difficulties in given below in the account of the Mashushu irrigation scheme (section 5.2.1.2 below).

One significant finding was the importance of marriage for enabling women to access an irrigated plot in the schemes. The tradition in these communities was that the husbands inherited land from their families and then allocated it to their wives. While divorce was uncommon, it was apparent that a woman's chances of retaining land after divorce were thin. As reported by one elderly woman:

> *If my son got divorced, it would not matter who was at fault in the marriage. If it was my son who is at fault, I would consider continued land access to my daughter-in-law.*

This highlights once more the critical significance of marriage in influencing women's access to important livelihood assets such as land. For single and unmarried women, access to land is more precarious because land access appears to be influenced by women's association with men – either through marriage or through a male relative, such as a brother or other relative from the woman's natal family. The aspiration to attain better livelihood and food security through land use is shared by almost all women in these communities. However, single and unmarried women as compared to married women faced deeper challenges in these shared aspirations due to the manifest problems in access to resources. Further interrogation of aspirations between married women and their husbands is required to ascertain their impact on the assets women need to achieve these aspirations. Therefore it is important to explore institutional and organisational ways of strengthening individual access to secure water and land use for women, whether married, unmarried or single.

5.2.2.1 *Rambuda study site*

At the Rambuda irrigation scheme, a member from the scheme was elected to be a part of the WUA but no meetings have ever been scheduled. WUA membership comprises traditional leaders, farmers and Water and Sanitation officials. At this scheme, as in other sites, the chief is the custodian of the resources in the community. There are two men who report to him on land, farming and water issues. There was a water committee, comprised of a chairperson, treasurer, and 10 to 12 members. The committee was reported to have a number of functions, and was mainly involved in scheduling of water in the scheme. One person was responsible for irrigation scheduling (when to close or open water) and all farmers in the irrigation

scheme knew the dates and times when the water would be opened so they could use the water. They all had a roster indicating which dates they would be irrigating their fields.

Another function of the water committee was to ensure that all members of the irrigation scheme paid a fee (R10 a month), which was normally used to repair the canals. The committee, (functioning as an organisation) was also responsible for keeping the canal clean, and a day was scheduled when all members would work on canal cleaning and maintenance instead of working on their fields. There were processes to reprimand people who broke the 'rules of engagement' in the irrigation scheme. For example, if people failed to pay they would miss the chance to irrigate their field, but this was said to be rare as all were keen to have their fields irrigated. The need for water was so dire that precautions were reportedly necessary to stop people from stealing water and redirecting it to their fields when it was not their turn to irrigate their fields. Punitive measures for this transgression included reprimand and one-month prohibition from using irrigation.

Two farmers in this area used drip irrigation on their green bean field. However, these were knowledgeable farmers, who were brothers, one of whom had worked in commercial farming where he learnt the skill of drip irrigation. The other farmers were reluctant to adopt this method because it required piping (which was unaffordable) because they needed to know more about crops suited to this type of irrigation. Government provision of tractors was mentioned as another intervention that could help to increase productivity, even though this could put added pressure on water management with extension of cultivated land creating increased demand for water.

When members were asked about the extent to which women are involved in water management there seemed to be general awareness of the need for a gender-balanced approach to water use. Women were reportedly given a voice and allowed to participate in the irrigation scheme without restraints, even though some women felt it was not women's place to be in these committees – indicated by conflicts from time to time that led some women to delegate responsibilities. Another difficulty faced by women farmers was that they were still expected to carry out their responsibilities at home in addition to committee participation, increasing the burden on their capacities.

Based on our observations, Rambuda participants had notably more developed farming enterprise plots and a stronger market-oriented focus in their production. Compared to the

two other sites there was a marked difference in levels of activity according to the number of people on site engaged with the farming enterprise. Farmers appeared to have more entrepreneurial spirit and be more interested in what they were doing. More people exhibited strong commitment to farming and even very old women were still involved. This was also evident in their fields which clearly showed their dedication and hard work. The Rambuda farmers expressed strong desire to learn new things such as better methods for farming and for water use. However, there were sometimes contradictions in what participants said. For example, concern was often expressed that government kept introducing new ways of doing things when they felt their old ways were working just fine.

Perhaps this highlights the need for the intervention initiatives in this area to pay more attention to the ways the local people presently approach farming and water use, as a starting point for identifying where knowledge and skills improvement programmes can best supplement or complement existing practices. It was however clear that Rambuda had a very strong sense of community. People rallied around each other more, delegating roles and responsibilities in ways that harnessed the multiple skills, knowledge and social capital of each member of the community. People often had supper together, drawing on their deep familiarity with one another in deciding what people could do or how they could be deployed to the maximum benefit of the whole community. They operated more like what Wenger (1988) calls a 'community of practice' which develops when people interact with one another and with the world, learning collectively from in pursuit of various enterprises. As Wenger puts it,

> Over time, this collective learning results in practices that reflect both the pursuit of enterprises and the attendant social relations. These practices are thus property of a kind of community created over time by the sustained pursuit of a shared enterprise. (Wenger, 1988).

The shared enterprise, in this case, was the practice of farming; and the members appear to have learnt ways of success working together. The Rambuda farming community had a special history that bound them together was evident in the ways people interacted; they all knew one another, knew each other's grandparents, and knew how many children were in each family and what their names were. Indeed, there was a sense that Rambuda community members operated as this one big family, and this accounted for their relative success in water use and access management. A community of practice operates according to certain rules of engagement, both tacit and explicit. While the explicit is known by all who are

involved in a particular practice, the tacit may not be articulated yet remains a crucial element of that practice. This sense of community and family was also evident among farmers, where those with cars would wake up early in the morning to take their own and others' produce to the market in distant places. Even though farmers expressed a wish for more assistance from government, their sense of agency was evident in their ability to do a lot of things themselves, particularly activities relating to marketing their produce. For example, while farmers in Steelpoort struggled with issues of trust among members, farmers in Rambuda pulled their green beans collectively and had found an agency that sold the crop for them in places like Johannesburg. They would then agree on how they would split the profit, and this appeared to be working well for them. They also sold maize as a collective.

Another strength possessed by this community was the wide range of age groups that were involved in crop cultivation – from youth in their early 20s to very old ladies aged around 80. Even though some youths were not directly involved in the irrigation scheme, they were involved in crop cultivation at home and this instilled the culture and value of water use and crop cultivation in general.

5.2.2.2 *Mashushu study site*

At the Mashushu site, an application to join the WUA was sent to Water Affairs in 2003 but there was no feedback. There was a water committee at this site, which reported to the chief on any water-related or land issues. An irrigation committee was made up of members from the irrigation schemes, who were elected from the water committee. Mashushu farmers migrated from what was locally known as an irrigation committee and has now been replaced by the formal WUA. Although the process of changing from the former institution to the present one began as far back as 2004, and only recently, according to the respondents, has it gained acceptance in the community. Difficulties arose with decisions on power, roles and responsibilities of the 'external' statutory institutions and the 'internal' community-accepted institutions. Furthermore, the community took time to arrive at an understanding of water management in the context both of their local realities and of the 'new' institution named WUA.

Farmers on this site complained about the shortage of water for crop cultivation. There was only one water reservoir, and participants reported that it took 15 hours to fill this tank, which only supplied the community with water for one day. There appeared however to be

consensus among farmers and extension officers that the problem they faced was not lack of water per se, but ensuring adequate supply to the communities. Farmers in the Mashushu scheme made very clear points about how they thought government could improve their access to water but expressed disappointment that government did not consult them on issues relating to their own livelihoods. For example, they felt that government needed to build dams (water reservoirs) in 'strategic' locations, and install pipes to enable the available water to be distributed and used effectively.

An example was given of a farmer who had installed a funnel system that trapped water from the mountain together with pipes through which the water flowed into his household. He sometimes provided his neighbours with water. The problem with this was that it deprived downstream water users, which reportedly led to conflicts. In other cases, people reportedly just put pipes in the canal and drew water to their houses, especially those in close proximity to the canal, which affected supply of water to others in the irrigation scheme. People said they found canals work best for them because they aren't labour intensive, and they wanted government to provide them with more canals. Participants felt that a more coordinated strategy would help address this issue by making sure that water which has been collected is shared equitably among all water users in the communities.

The extension officer was highly visible in Mashushu, and went out of his way to assist the farmers with issues pertaining to access to water. He helped people fix canals where they were broken, making repairs with old pipes from the failed irrigation schemes.

Very little marketing was observed at Mashushu. Farmers appeared to cultivate mainly for domestic consumption, although they did have a market for maize and collected maize in a storage house where it was milled into mealie meal and sold to the community. They also produced seed maize, which they either used or sold for planting in the following season.

5.2.2.3 *Steelpoort study site*

According to the respondents, Steelpoort irrigation scheme has never had a WUA. However, the Lebalelo Water User Association, made up of six mining houses and other users, is in existence in the Tubatse region (SRK News, Undated). The extension officer responsible for this irrigation scheme confirmed the absence of a WUA on this irrigation scheme. As in Mashushu and Rambuda, there is a water user committee made up of members of the irrigation scheme. There's also a roster for irrigation as in the other two sites. The water user

committee collected fees from members of the irrigation scheme for repairs and cleaning of canals. It was only extension officers, who were always there to assist and advise – particularly with crop production. Participants reported problems relating to water use which included a lot of dirty nappies and people washing clothes in the canal. Although there are standalone taps which are supposed to be the main source of water, participants reported that these taps supplied water once a week only and there was therefore a huge shortage of water generally.

People who live along the canal got water from the canals, but those living far from the canal got water from the main river. A dam was reportedly being built for water purification, but to the local community's disappointment, all the water from this purification plant was being pumped to Polokwane, leaving the local people without clean water. In the spring, people depended on water stored in Jojo tanks, which is reliant on rainfall. Limited rainfall during spring clearly means that there is a severe water shortage, seriously curtailing local scheme members' water resources. Participants reported that they had to share water with animals, and that some people used the same river to wash clothes and cars that was also used for drinking and cooking, exposing the community to water-borne diseases. There is also a nearby mine which competes with the locals for water. The upstream location of the mine allows it to monopolize water use at the expense of the community. Uncertain group dynamics among members of the irrigation scheme also gave rise to occasional conflicts when, for example, individuals speaking out very strongly are regarded as trying to dictate to others – the sort of difficulty which could be easily addressed by educating community members about group collaboration, for which the starting point should be how the local people are already engaging with the issues that affect them.

Women in this community were observed to be very assertive and outspoken in meetings, and they also dominated in terms of numbers. Men were mostly quiet during meetings, even though they still held chairmanship positions. Some women expressing concern took the view that men participating in the scheme were sometimes lazy and reluctant to work as hard as most women did – and interesting reversal of accepted cultural norms and stereotypes about women in rural areas. Even though these women lived in traditional households and were bound by the cultural norms that viewed women as subordinate, they nevertheless demonstrated agency in negotiating their livelihoods, and did not allow men to hold them back. Most young people in Steelpoort were not interested in farming. The majority of young males reportedly sought employment in the mines, as farming was not well regarded as a job

or profession. There were also huge issues of trust that prevented farmers from entrusting their produce to others for sale to the agency.

Farmers' concerns ranged from transport costs that would have to be factored in on their profits to the fact that sales could take time to be processed while cash (however meagre) was needed for daily subsistence. Also, because people did not trust external agencies or each other to be honest about what priced their produce might fetch, they preferred to sell their produce in the local market along the main road. Farmers in Steelpoort commented that they had the potential to market their produce much more effectively by selling to supermarkets but did not trust this 'new and different' way of marketing, citing the added risk of delayed payments and being required to plant only one type of crop. They suggested that younger people with a higher appetite for risk might perhaps be better suited to market-oriented production. Sadly, the scheme attracted little interest from young people, who favoured other career paths despite the high unemployment rate.

5.3 Land Access Institutions and Organisations

Land is a crucial resource in rural areas where livelihoods centre on agriculture, especially in the poorest provinces of South Africa. Institutions that govern land user rights in rural South Africa include the state and traditional authorities at a local government level. Land is communally owned, which means that the state remains the owner and a traditional authority (TA) led by a chief is an administrator of the land's user rights, with no individual ownership title. However at a community level, the socio-cultural context strongly influences access to land user rights, particularly where women are concerned.

Land access and user rights for women in these contexts will often be made stronger by marriage or representation by a male head or male relative (Thamaga-Chitja et al., 2010). Women, who are in a slight majority in the South African population, turn to agriculture to improve household food security in poor households (Stats SA, 2012).

In empowerment and enhancement of social and human assets for individuals, people-centred institutions function as 'vehicles' of agency. Institutions house legislation and policies through which they execute programmes that match their mandate. At a community level, the socio-cultural context sets these often unwritten yet powerful 'policies' and 'rules' of behaviour.

This section presents data on land user rights in the study areas in relation to the socio-cultural context and livelihoods. Land user rights in the study areas were found to be the same; where slight differences exist these will be highlighted.

5.3.1 Awareness of existing land laws

At provincial and district levels, the officials were aware of the changes in the land laws in South Africa since 1994. Acknowledging that there were new land laws, they noted that giving land to people was not their responsibility because the land in these communities was tribal. The three tribal authorities, or their councillors, acknowledged that land laws may have changed, but without affecting the way community members accessed land in their communities, since it was a tribal land.

Most farmers in the study were not aware of a change in the land laws, indicating poor social capital among farmers and their community. Of the 28% who said they knew about the changes, most (75%) had heard about government giving restitution to people who had been forced off their land during the apartheid era and relocated to homelands. About 13% of the respondents spoke of government proposing to take their land and giving them the option of being employed as workers on these farms. These respondents also spoke of their chief giving land to residents, unlike the previous system where land was given by government. A small number of respondents (8%) claimed that they knew of the change in land laws, but when probed further, spoke of government officials talking to them about planting the same crop throughout the scheme to improve market access: *'Some people from government were coming here advising us to plant one crop together so we could improve market access.'* Answers such as these show inability of some farmers to differentiate between officials or departments and misconceptions as to what the government was doing with regard to land reform. This indicates that the farmers had never interacted with government officials about policies, and that the only officials they had seen were from the Department of Agriculture. Most respondents were not aware of any changes, which raise questions about the way government disseminates information when communicating with farmers.

Sources mentioned by these farmers which they relied on for information on land policies were the radio (25%) and Department of Agriculture officials (25%), but with half of the respondents saying they didn't remember where their information came from (Table 5-1) Given the widespread unawareness of these policies, maybe *imbizos*, meetings and workshops were not an ideal strategy for government communication with the farmers.

Previous activities in the communities indicated to us that most farmers did not attend meetings outside of the scheme committee meetings. So there might be something to be said for provincial officials also handing out informative material that could be put up in the various community centres.

Of the farmers who were aware of the new policies, only 75% indicated that they liked the `proposed changes; the remaining 25% did not like the policies because they understood them to mean that government was going to take their land away from them. In the words of one respondent, *'No we are not happy about the new changes. We want to work on our own and do not want government to control the irrigation scheme.'*

One change attributable to the transformation brought about by new laws since 1994 was that in the three communities, and also at provincial level, women's access to land had improved. Once women do become holders of land rights they could be in a better position to influence policy.

Table 5-1 Institutions and Land Law Awareness

Question	Themes	Discussion
Land access in the community	State in partnership with traditional authority	Traditional Authorities function as a third tier of government in administering user rights. There have been several laws explored to govern communal areas including the now defunct CLaRa in the three study areas.
What do they give to show the land is yours?	▪ Documentation (Permission to Occupy: PTO) ▪ Pole with a number to demarcate plots with a record at the traditional leader's office ▪ Verbal agreements Between community members	▪ When land is given by the traditional authorities, there is some evidence that it has been transferred to an applicant ▪ Most farmers interviewed had a PTO document ▪ Some farmers still have the old poles that demarcated their poles from their neighbours' in the beginning, as well as receipts ▪ Some respondents said because the land had been given to their husbands, they did not know if any documentation had been given and if they still had it. Highlighting the non-participation of some women in land decisions at the time of plot allocation ▪ Apart from this, farmers who did not own land had access to lease land from plot owners in the schemes through verbal agreements (chief is informed) ▪ These local arrangements gave the residents and farmers security within the context of land use in the scheme.
In whose name is land registered?	▪ Gender transformation	▪ Most land was registered in the name of the husband indicating that land allocations were mostly made out to men ▪ Some women were able to take over their deceased husband's land in their names.
Knowledge of land laws	▪ General lack of law awareness ▪ Knowledge of local changes in practice ▪ Misconception of knowledge of changes	▪ General findings suggest that farmers were not aware of the changes in the land laws since 1994 ▪ A few farmers had heard about land restitution in other farms ▪ Misconceptions of what government proposed to do in the new land laws seemed to have added to confusion about land laws.

Question	Themes	Discussion
Information sources.	▪ Radio ▪ Meetings	▪ A small percentage of farmers said the radio and local meetings were where they had learnt of the new laws. ▪ Provincial officials mentioned holding district *imbizos* for public consultation and input on proposed changes, particularly before each budget pronouncement. ▪ The majority were not aware and this suggests that government's information dissemination strategies may not work with the rural farmers.
Farmer perception of proposed land law changes.	▪ Opportunity for growth ▪ Reducing of freedom	▪ People had different perceptions of how the laws could affect them. ▪ A few young farmers saw working as a collective as a way of progressing while older farmers appeared more satisfied with the *status quo*.
Has land access changed in the last 20 years?	▪ Synergy between government, traditional leadership and local authority ▪ Recipients receive documentation ▪ Land access unchanged ▪ Scarcity of arable land	▪ More feasibility studies for development have been witnessed and planning documentation is often given to farmers. ▪ A few felt that the tribal authority still allocated land to the community, so there had been no significant change. ▪ Arable land was becoming increasingly scarce in all three communities which have led to interested land owners 'leasing' out land from other community members.

5.3.2 Marriage and access to land

The three communities had mixed views on the effect of marriage on women's land rights. Somewhat more than half (55.7%) of the respondents thought that marriage strengthened a woman's land rights as she was given user rights to her own plot of land for as long as she was married. In addition to acquiring new status and respect through marriage, having a household to feed, coupled with her husband's support in a dispute, strengthened a woman's land rights. Another view, held by 13% of the respondents, was that marriage weakened a woman's land rights; women moved from their natal homes to their marital home leaving stronger natal secondary rights to gain weaker marital secondary rights. Due to land scarcity, the new wife would find the land already in use and the land would be in the control of the elders. Some married women felt that since the land user rights were vested in the husband, not the wife, in the event of divorce they would be forced to leave the land and their livelihood. They regarded the few single women who had land user rights in their own names

through the traditional authority as more secure, having stronger rights because then the woman was the one in charge and had no fear of being chased away.

It appeared nonetheless that in some cases married women were sometimes recognised as legitimate user right holder when their husbands died. Most (73.9%) respondents in the three communities felt that widows should by right inherit the land previously registered in their husband's names and be stewards over the land until the children grew older. It seemed that the prevailing customs in the study areas assured widows of land use security when they became widowed. Married daughters could not, however, inherit land from their natal homes when the parents died; study participants reported that unmarried daughters only inherited land if there were no sons or if the sons were not interested in agriculture. Although inheritance of land was a significant access point for widows in these communities, it was mostly not helpful for other categories of women. Other studies have found that land belonged to the extended marital family, and that the widow could gain use of the land by observing mourning rituals and working on the land to feed the children (Chapoto et al., 2011; Cousins & Hornby, 2009). Non-inheritance by daughters was attributed to possible loss of the land to the daughter's marital family (Yngstrom, 2002).

A hierarchy of rights existed in the customary rights arena, where husbands had stronger rights because the land belonged to the husband's family. Generally, where new land allocations were made to married households, the land was allocated to the husband because he was the household head although an exception was encountered at Steelpoort (Sekhukhune area) where the land was often registered in the names of both husband and wife. Women in the other areas did not question the practice as it was part of the culture. Widows' rights were strong as long as the children were young; as the sons grew older the widow's control diminished. A mother-in-law had stronger land rights than her daughter-in-law, to whom she could also allocate land if she had it, but because in most cases widows were holding land in trust for their sons they usually allocated land to sons rather than daughters. Within the household, sons were seen as having stronger land rights than daughters, because sons used the land as potential heirs. However, daughters in Vhembe could inherit land in a caretaker capacity if both parents died and the other siblings were younger, or if the other siblings had no interest in farming.

Institutions for both land and water access are crucial for quality of livelihoods in rural households. Institutions and organisations are critical at external and internal levels informed

by policy, legislation and the socio-cultural domains from which the 'rules of the game' are 'written'. Institutions can either enable or disable efforts of farmers based on approach and people-centredness. The following section will discuss empowerment of women farmers and their aspirations within the institutional and organisational contexts.

5.4 Women Empowerment and Aspirations

Table 5-2 indicates the overall five domains of empowerment (5DE) score of the three irrigation schemes where 56.5% were empowered in at least four domains according to the index. Decomposing the data to the individual community shows that Mashushu had the highest proportion of empowered women with a 5DE index of 0.79. In addition 63.6% of the female farmers were empowered. Steelpoort had the lowest 5DE score and was the only community where a majority of farmers were disempowered.

Table 5.2 Women Empowerment Index in the study areas

	Mashushu	**Steelpoort**	**Rambuda**	**Total**
Disempowered Women head count (H)	36.4%	56.5%	41.7%	43.5 %
Empowered Women head count (1-H)	63.6%	43.5%	58.3%	56.5%
Five domains of empowerment (5DE scores)	0.79	0.74	0.79	0.77
Five domains of empowerment index	0.8679	0.808	0.875	0.875
Modified WEAI	0.886	0.815	0.884	0.86

Although the WEAI indicated that just over 50% of women participants were empowered, the average empowerment (5DE) scores show that the women were empowered in at least three domains. However, true empowerment in relation to livelihoods and food security is linked strongly to input in productive decisions, access to credit and time use satisfaction in the context of the index. These aspects had the lowest scores across all three schemes indicating that although access to resources and making decisions related to production earnings were evident, meaningful change required time-use and access to credit aspects of the index to be addressed. This confirms our argument that within the sustainable livelihood asset framework, human and social assets are indeed critical in capacitating people to use the tangible resources best to transform their livelihoods.

5.4.1 Production activities

Production decisions include what to plant, how much of it to plant and where to plant it. The decisions on crop type and scale of planting are linked to the management of risk relating to choice of food crops vs cash crops. Those who have a higher risk appetite tend to operate on the higher echelons of the agricultural value chain. This study shows that most farmers were in fact involved in the actual work on their fields, with just 6.38% and 11.4% using only hired workers to work in their fields, respectively at the scheme and in the village. Agricultural production using the block method of irrigation coupled with contract farming would dictate viable choices of crops for all scheme farmers. However, this would really depend on strong institutional arrangements, which are not currently found.

Although Table 5-3 shows that 65.9% of the women said they controlled their own farming activities, it is unlikely that household heads, mostly men, are not involved. It remains the case that land rights in communal areas are effectively vested in male heads, giving them a stronger voice. Furthermore, culture and tradition in the rural areas studied would impact the autonomy of women's farming activities; institutions such as marriage and traditional leadership would in other words define the rules on being a woman farmer in such communities. This became particularly clear when we spoke to certain male respondents who believed they owned everything related to agricultural production and other household assets. Training or sensitization on gender equity can make it easier for women to control their farming activities, but its main focus needs to be on men in these communities.

Adopting the block method of irrigation scheduling and use of wetting front detectors (WFD) (WRC Report No 1135) is likely to raise productivity and produce quality and make the irrigation schemes more competitive in the market. The use of these detectors, though quite technical, is manageable at SH farmer level. Wetting front detectors were successfully used at the Tugela Ferry and Zanyokwe irrigation schemes where it was shown that the fixed irrigation scheduling in use supplied inadequate water to meet peak water requirements of crops and also that the water distribution was uneven (Mnkeni, 2010). Innovations like the WFDs can thus improve water use efficiency and raise crop yields and offer potential to extend the area under production, what with water insufficiency being reported as a concern at Rambuda and Mashushu. WFDs are not very expensive and the Limpopo Department of Agriculture has irrigation specialists who can train both farmers and extension staff on their use in managing irrigation. Changing to the block method would on the other hand entail

major changes in the institutions at the irrigation schemes. Firstly, the choice of crops would have to be based on sound market research, a task which the irrigation advisers may not be confident about. Secondly, the farmers would have to centralise operations and costs related to land preparation, seed and fertiliser, and also for crop protection to make sure that substandard management by individual farmers will not adversely affect the rest of the block crop. It is also likely that most farmers would resist the shift to the block method unless they are first taken to see schemes where the method is operating successfully before getting into discussion on adopting the method.

Training to raise the level of management and yield of crops must be targeted at both farmers and extension officers. When training is done by external stakeholders, the extension staff also needs to attend. This has the advantage that in addition to acquiring new knowledge they will also get to know what and how their farmers have been trained. In this report it came out clearly that extension staff needs some retraining to be more effective, since several of the farmer training demands encountered in this study, such as institutional arrangements, leadership, etc. had not featured in the training extension officers received at college. The Limpopo Department of Agriculture needs more extension specialists with training in socio-economic issues (e.g. agricultural economists and extension specialists).

Table 5-3 WEAI – a descriptive analysis

Domains	Indicators	Description
Production	Input in	48.2% of the female farmers decided on what to grow at the irrigation scheme,
	Agricultural work done by	37.8% female farmers worked on their own fields
		59% of household members worked on the home gardens
		41% of household members worked on the village fields
	Autonomy in production	65.9% of the women said they controlled their own farming activities.
Resources	Ownership of resources	33% of the women said they owned the land they were using
		60.2% owned their own hoes for production (69.6% belonged to female farmers)
		2.2% owned their own tractors
		21.6% owned cattle (40% belonged to female farmers)
		5.75% owned donkeys (7.69% belonged to female farmers)
		24.78% owned goats (45% belonged to female farmers)
		46.5% owned chickens (50% belonged to female farmers)
		4.9% owned ducks (9.1% belonged to female farmers)
	Purchase, sale or transfer of assets	64.17% of animals sale were decided by farmers (51.16% belonged to female farmers)
		57.5% had decided to buy their own hoes
		2.2% had decided to buy their own tractors
	Access to and decisions on credit	There are largely no formal credit facilities available for farmers in the areas.
		11.1% borrowed from friends and family (60% of belonged to female farmers)
		10.6% from the stokvels (58.3% belonged to female farmers)
		2.7% from formal institutions (50% belonged to female farmers),
		and 4.9% from informal ones (81% belonged to female farmers).
	Decide to borrow money	48.9% of the respondents (75% belonged to female farmers) decided how the money was spent and 28.6% it was a joint decision
Income	Control over use of income	Most farmers (men or women) said they controlled their income from farming (74.5%).
		48.9% of the farmers decided how they used borrowed money but 28.6% said it was a decision for the household jointly
		44.8% of the female respondents controlled income from their business
Leadership	Group member	17.3% had positions in the scheme (58.9 belonged to female farmers)
		About 90% of respondents belonged to at least one group (73.57% belonged to female farmers)
	Speaking in public	Older women in the scheme were not afraid to speak out during focus-group discussions and workshops held by the research team. Younger women spoke less
		68.6% were comfortable speaking in public.
Time use	Workload	The women were observed to start their days very early. They would prepare their children for school first and then go to the fields. Those without other female adults at home had to cook in the evening for the family. All these jobs were part of those ascribed to women in the gendered division of household duties.
	Leisure	Because the researcher spent most of the day in the field, they were not aware of any leisure activities in the areas. Women often went to church on some days which seemed add an element of leisure and joy to the women's lives. During weekends family functions and church normally took most of the respondent's time.

5.4.2 Resources

According to the respondents, 33% of women (mostly older than 50 years, 53.3% being widowed) 'owned' the land. It is important to establish how the ownership came about, since

other studies have indicated that being widowed is an important way in which ownership of property may be acquired (Thamaga-Chitja et al., 2010). Further probing established that land had been inherited from deceased husbands or that women were using land belonging to their natal families. It is also important to investigate the role of tradition and customs as either impediments or enablers of property transfers. In addition it emerged that 60.2% of the farmers, mostly women, had ownership of small non-mechanical items of production equipment such as hoes and knapsacks for spraying pesticides, in most cases reflecting the fact that they were the ones who did the actual work in the fields. Those who did not have these basic items borrowed them from their neighbours, or used their hands if the work was light.

With respect to livestock, some farmers in this study owned cattle (21.6%), goats (24.78%) and chicken (46.5%). Women farmers made up 40% of those who owned cattle, which are usually owned by men – possibly to be accounted for by the high proportion of widows (22.1%) in the sample. Goats and chickens are usually owned by women and here female farmers accounted for 45% and 50% respectively.

No formal credit facilities are available for farmers in the areas, although the long tradition in South Africa of informal lending arrangements known as *stokvels* also extends to rural areas. Burial schemes were quite popular in the communities and though members contributed monthly there was not much they could do in terms of decision making in such structures. More needs to be known about why credit schemes seem to be limited to burial insurance (and now more recently annual grocery bulk buying) rather than any mutual arrangements for credit in agriculture.

5.4.3 Control over income

Most farmers (men or women) said they controlled their income from farming (58%). Where someone had started a business enterprise, he or she mostly controlled the income, or if someone borrowed money for the household to use, that person was likely to decide how the money was to be used. Another important source of income was the grant which the household received monthly, and this study shows that the household head was mostly responsible for deciding on how that money would be used. However, it is not clear what their understanding of control was and how decisions were made about what to spend the money on. Intra-household dynamics may affect how income is used but they were not easy

to establish – although it is likely, given cultural practices, that the household head would have a strong say over income use.

5.4.4 Leadership

Some respondents in this study held leadership positions in the scheme or in community or religious organisations and other arenas. There were those communities' members however who did not feel comfortable speaking in public at meetings. The comment by one female respondent that *'I do not like to speak at meetings, I am new here, I moved 20 years ago and people still remember that'* reflects a feeling of persistent exclusion regardless of her having raised her family in the community.

Most respondents were members in an irrigation scheme which has a leadership structure. Although the participants previously reported that a democratic process of voting took place for leadership positions, it is likely that such elections are affected by cultural assumptions about male and female roles in the community which favour men in chairing positions. Training in gender sensitivity could liberate men to acknowledge the potential contribution women can make towards efficient management of the irrigation schemes.

5.4.5 Time, leisure, & women

Although no quantitative time survey was conducted, observations and conversation showed that women's time is contested. Women reported waking up at early hours to prepare children for school and do other household chores before venturing out to the fields, and having to rush back home to complete chores and do new ones such as meal preparation. Thus it is likely that women in this study experience time poverty with little time for leisure. It would be valuable to explore the implications of introducing males to traditionally female activities in the household to ease the burden for farming women that was seen in the limited studies. Training on gender equity for male farmers and the traditional leadership seems one potential way to ease women's responsibilities if it could persuade men to take on some of the burden of household chores. Training the farmers in labour-saving technologies such as use of herbicides would also alleviate the burden and tardiness of hand-hoe weeding. Based on this analysis of WEAI it can be provisionally said that empowerment was weak for the women participants in this study, especially in time use, leadership and ownership of resources.

5.5 Women's Aspirations and Institutions

Our findings suggest that women have multiple aspirations, not all of which are necessarily related to agricultural activities. This corresponds with other research findings showing that women's aspirations include constructing their own houses, sending their children to university, getting employment, and other hopes besides (URDT, 2012). In our study, the focus was instead on aspirations relating to women's participation in farming and other agricultural activities for their livelihood hopes, one facet of which is the role of institutions as vehicles and catalyst for realising these aspirations in advancing their empowerment.

5.5.1 Aspirations and goals related to production

SH farmers in sub-Saharan Africa account for most of the rural poor and food insecure (Dorward et al., 2004). It is not surprising then that their aspirations centre on providing food for their households and increasing production (Rutaisire et al., 2010). Table 5-4 shows that there were farmers in the study who expressed hopes that in the next 10 years they might own a tractor, have access to improved irrigation facilities, have access to improved seed, improve their agricultural skills and have access to more land. The next section considers production aspirations related to livelihood hopes.

5.5.1.1 *Providing enough food for their families*

Top priority for the farmers was production for the household, as shown in previous studies of the same farming groups and communities in this study (Murugani, 2013) and confirmed in the continuous data collection phase of this study. For 42% of the farmers, planting choice was determined by what they would consume with their families and what they had always grown. The researchers established in a previous visit that the farm was a significant source both of vegetables and of petty income for the households (Murugani, 2013), and during this visit they observed furthermore that harvesting vegetables and legumes for household consumption was a source of pride for the women.

Table 5-4 Production-related aspirations in the next 10 years

Farmers' Aspirations	Percentage (%)	Mashushu (%)	Rambuda (%)	Steelpoort (%)
Own a tractor	63.8	36.4	85.7	43.5
Improved irrigation facilities	49.3	54.5	65.7	21.7
Use improved inputs	43.5	36.4	68.6	8.7
Increased agricultural technical skills	36.8	-	57.1	22.7
Acquire more land	33.3	-	60.0	8.7

These findings are no surprise, since many rural households are food-insecure (Lemke et al., 2012), and since women are the main caregivers in their families and must see to it that there is enough food for all members of their families (Kent & MacRae, 2010). Asked why they farmed, one woman responded, '*I have no job, and my family needs to eat. This is where our food comes from.*' Another said, '*We are poor, growing some of our food reduces the money we spend on food*.' No mention was made of farming as a desirable option.

From these two responses and several others it is clear that farming is an important source of food. This was particularly true in Mashushu which is about two hours from Polokwane, the nearest large city, so local food prices were high. The farmers preferred to grow maize which they could process into maize meal, because they felt it was that cheaper than buying maize meal from the shops. Noting similar reports from a number of areas, Barrett (2008) makes the point that when SH farmers have inefficient markets they attempt to produce a significant amount of their own food. But the farm also played a huge role in the food access strategies of the Steelpoort and Rambuda communities who had better access to shops. Aliber et al. (2010) similarly underscored the value of SH agricultural production to savings at household level.

5.5.1.2 *A good quality of life*

While good quality of life is not strictly an agricultural aspiration, it is a by-product of successful planting and marketing (Barrett et al., 2001). All women wanted an improved quality of life for themselves and their households. In focus-group discussions, the women expressed dissatisfaction with the conditions under which they lived, worked and raised their families. One contentious issue was drinking water quality, as municipal water was not always available and sometimes households had to fetch water from the canals which had been polluted by detergents and litter upstream. One respondent said,

There is no water in the taps, it only comes once a week sometimes and the water we get is not enough. We need more dams so that some of the water can be used in the homes then we can irrigate our crops.

Another farmer speaking about water pollution in related discussion said:

People take their laundry to the canal and wash their clothes there. Some dump disposable nappies, other pour detergents into the canal; they do not care that it will affect our crops because they are not farmers. And they do not want to clean the canals; at the end of the day we all go to the canal to fetch that dirty water for drinking and household chores. If I had money, I would dig a well in my yard.

Asked about what she would improve in the scheme one elderly woman responded,

This system of watering (flood irrigation) is good, but I am old now and it is getting harder for me to do. I would like it better if they gave us something like the drip irrigation. We just need pipes. It will make watering easier.

Other women were more interested in producing and finding a buyer who paid well so that they could have enough money to send their children to schools and tertiary institutions.

5.5.1.3 Acquiring additional resources.

A major limitation for women's agriculture was restriction of one's agricultural activities in the scheme to the piece of land that one had rights to because there were no free plots. This can be seen as a consequence of population growth and continued intergeneration inheritance (Agarwal, 2003, ECA, 2004, Tsikata, 2003). When asked how they apportioned the land for a mix of crops, the common answer was *'I grow what I can on the land I have'* and 88.2% of the farmers responded that they would grow more if they had the land and were assured of a market. There are other plots of land outside the scheme but Limpopo is a dry area and irrigation would be a problem outside the rainy season, which makes the irrigation scheme very attractive. For a minority of farmers, the overriding problem was the money needed to work the land they used, and because of this they only worked on a portion of their land.

The irrigation scheme members are a small proportion of the community. Some respondents who were not members of the scheme felt that having some land in an irrigation scheme would help them and their households. A woman working at a local community initiative said,

If I could get some land in the irrigation scheme I would take it. These people make money, and we buy from them. I grew up farming, but my husband's family did not have land in the scheme. If they could give us another scheme, we would be happy.

This comment is probably representative of the feelings of other non-scheme members. It also reinforces research showing that rural households with land are less poor than those without (Barrett et al., 2001). Having secure access to land would open many opportunities for these rural households. It is thus reasonable to conclude that in the communities in this research having access to irrigated land is socially and economically important.

An improvement some farmers (43.5%) wished for (see Table 5-4) was being able to use certified seeds and fertilisers so they could increase their yields and the quality of their produce. Where irrigation water is available, this would increase harvests and household food significantly and, potentially, the earnings a farmer could expect (Namara et al., 2010).

In view of the expense and inconvenience associated with hiring a tractor during planting season, some farmers felt it would be better to own their own tractors. Some respondents also noted that the tractors were often unavailable when one needed them. Research has shown that controlling the use of such essential resources is important for timeous planting and harvesting (Mushongah & Scoones, 2012). Overall, the diversity of members in the schemes, including both men and women, each with his or her differing resources and influence, may keep women at a disadvantage since they have less power in traditional communities. This has happened frequently in the past, where improvements have not necessarily benefited the targeted women (Cornwall, 2003).

The farmers also wanted to acquire more technical skills in the production of established and proposed crops, in which they felt that the Limpopo Department of Agriculture (LDA) could assist them. Some respondents had already gone for training, and other wanted to be offered the same opportunity, although training was in general not widely attended. Some farmers had attended at least one course given by the LDA officials or other organisations, while 46.4% of respondents had not attended any training offered by their extension officers. About 60% of the farmers consulted the extension services no more than once a month, if at all, in spite of the extension officer being available at least once a week. Similar apathy was also observed when the researcher was conducting the Marketing Awareness Workshop. The extension officers visited in the three study sites were responsible for more than two farmers groups. In addition to providing farmers with technical support, they were also required to do some administrative work, and this limited the time they actually spent with farmers. These findings correspond with those of a study by Aliber et al. (2010). On South Africa's second economy which highlighted the high number of farmers and extension officer was expected

to work with and in which it was also observed that the extension officers rarely came to the field unsolicited unless they were doing a demonstration.

Some of the production-related aspirations expressed by the respondents are attainable but buying a tractor, improving the irrigation scheme's infrastructure and acquiring more land may be beyond the reach of many farmers in the study and continue to hamper achievement of these aspirations unless there is intervention by government or other external agencies. SH farmers in Steelpoort and Rambuda had in some cases already started selling in formal markets and were encouraging other farmers to join them, but the others were largely unwilling because of the expense involved, poor market information and the costs associated with selling in formal markets. Some SH farmers in Rambuda had also attempted to form a group selling only sweet potatoes, hoping to raise funds for buying a tractor, but the initiative had not been very popular, with only a small uptake.

5.5.1.4 *Market-related aspirations*

The farmers' general and production oriented aspirations make it clear that they see themselves as players in formal markets in the next ten years. Although they had varying successes with informal trading, many respondents were interested in trading in formal markets (see Table 5-5).

Table 5-5 Market-related aspirations in the next 10 years

Farmers' Aspirations	Percentage (%)	Mashushu (%)	Rambuda (%)	Steelpoort (%)
Formal market access	71.0	72.7	77.1	60.9
Financial success	65.2	72.7	77.1	43.5

A substantial majority (71%) of the farmers in the study wanted to sell their produce to supermarket buyers and to other formal players. Their aspirations may have been fuelled by the presence of some among them who were already getting significantly higher returns from the formal market, and there was a general feeling that entering the formal market would translate to higher income from their produce. These farmers felt that this could be the start of growing market access and more profits, as has been found in other studies which suggest that SH farmer market access is a way to improve and diversify rural livelihoods, provided that there is demand for the produce (Barrett et al., 2001; Dorward et al., 2003). If the SH farmers in this study could identify products where they would have a comparative advantage in production, concentrating on those would increase their yields and profits (Barrett, 2008).

Focusing on special and rare products could assist in capturing niche markets and in other market access arrangements such as contract farming, although observations suggest that much attention will need to be given to building production capacity and helping farmer to understand markets and their related risks.

Table 5-5 also shows that the farmers associated improved market access with financial success. Most participants (65.2%) saw themselves evolving into more successful farmers modelled on the large-scale producers – a natural perceptions since this is the face of successful agriculture in most of Southern Africa (Cousins & Scoones, 2010), and farmers will aspire towards what they see (Field et al., 2010). But what SH farmers did not seem aware of was associated risk such as price fluctuations related to demand and supply, revealing unawareness of a fundamental economic principle (Barrett, 2008). One way to extend their understanding could be study tours to visit other successful farmers and observe their operations. What could also extend market access opportunities would be connecting communities such as Mashushu to the nearby Tzaneen Peppadew factory for possible contract growing of the high-value crop.

Important to remember is the diversity among farmers, as we clearly saw in this study. Some were comfortable with selling their produce at the farm gate – mostly elderly and resource-poor farmers who did not have the capacity to take their produce to the commercial market and were more risk averse. Chikozho (2005) observed this in his study where he likened producing for the market with uptake of new technology, noting how differing conditions and requirements may exclude poorer farmers. Any farmer empowerment interventions take account of this diversity, as there are bound to be some farmers who don't have the capacity or the appetite for risk to enter the commercial market. We believe that women empowerment (for household food security) is not well served by the assumption that large-scale commercial farming is the model for farming success. For many SH farmers it will be impossible to absorb the pressures and challenges of commercial farming unless they have captured a niche market and have the capacity to supply. The flexibility of their informal farming settings means that they are presently able to change and adapt prices in response to demand and supply in the informal market far more easily than they could do in the competitive formal marketing arena where the price is determined by formal market forces (Barrett, 2008).

While extension officers are not marketing agents, they play a significant role in linking SH farmers with market information and potential clients. Some extension officers in the study spoke of how, in line with Department of Agriculture programmes, they informed SH farmers of opportunities related to new crops for which a market has determined. However, the farmers were reluctant to adopt these new crops even though the extension officers said these were opportunities with potential for the farmers to earn millions. It is not clear whether appropriate production and crop management support is part of the package with introducing new crops to small farmers. Also curious in all this market access debate is the apparent absence of any input by the National Farmers Union.

Strategies to empower SH farmers who want to take their produce to the market should be designed in a way that prepares them for the power dynamics in large-scale commercial farming. Our experience is that some of the commercial markets may not be able to cope with an influx of small farmers' produce, although research shows that world markets have become increasingly integrated and that there is a rising global demand for fresh fruits and vegetables (Murphy, 2010). There may be initial shocks, but these could be overcome with enough will power at the appropriate levels. The SH farmers may need to be organised so that they can sell in bulk and thus be attractive to the larger markets and so that they time their production to meet the demand in the market, steps that could also reduce the cost of transactions for them.

In conclusion, the findings point to the complexity of rural women empowerment in regard to land and water-use for household food security and improved livelihoods. Institutions play a crucial role as vehicle and catalyst for access to land and water and ultimate achievement of goals and aspirations. For sustainable livelihoods, empowerment approaches must be sensitive to people's needs, capabilities and aspirations, and enhancement of agency must be a central focus for transformed institutional policies and programmes in support of this empowerment.

The study conducted in Limpopo shows that small-scale irrigated agriculture is an important livelihood activity for rural households, that older married and widowed women dominate agricultural production in these communities, and that possessing or having access to an irrigation plot increases the likelihood of someone engaging in agriculture, since food gardening was often limited by inadequate water access and unsuitable land.

The farmers' knowledge with regard to variety of crops for planting and the planting methods were largely consistent with established practices, although there were also knowledge gaps with regard to fertiliser application, new and appropriate farming methods, produce marketing and watering practices. The study also shows that agrochemical approaches may not improve farmer productivity due to lack of finance to purchase the fertiliser. This strengthens the case for agro-ecological approaches that rely on knowledge rather than external inputs to improve farmer productivity. The critical role played by extension officers was demonstrated by their presence in the three communities. Interviews with two of the extension officers responsible for Rambuda and Steelpoort have shown that extension training and extension programme support is crucial for farmer livelihoods. Equally important is engaging more with farmers on farming options such as agro-ecological approaches that could be better suited to their resource-limit situation than commercial agrochemicals use, which, from this study, is evidently a key area of concern.

Our findings lead us to suggest that before training is proposed for small-scale farmers there should be participatory discussion with them that enhances their own agency in establishing what training they need. Importantly, farmer training should support and encourage knowledge transfer between trained and untrained farmers. Extension officers need on-going training with a focus on services for small-scale farmers services appropriate to their needs as resource-limited farmers, such as agro-ecological approaches where knowledge becomes more important than external inputs. Appropriate training tailored to the needs of resource-limited farmers can extend the choices open to them and lead to the development of new niche markets for produce grown according to agro-ecological principles. In the age of climate change this is important to consider. Also needed is help from experts in crop diversification so that local farmers introduce high-value climate-appropriate crops. In all of these training programmes, special attention should be given to stimulating the interest of unemployed young people to encourage their participation in agriculture. Here the issue of market access is important because financial reward rates very highly in the minds of young people weighing up their career options. Some people believe indeed that it is essential for young people who engage in agricultural activities to receive some direct monetary gain if they are to develop an interest in farming.

SH farmers differ from commercial farmers and need interventions targeted on improving their livelihoods. Knowledge development among formerly marginalised communities is important but an approach of 'depositing' or 'banking' information may undermine valuable

local knowledge that could instead be brought to the fore. This kind of priority shift that makes communities feel valued can add strength and sustainability to partnerships and outcomes. For the 'outsiders' seeking to raise awareness, it can work as an empowerment lens, revealing new information but leaving the mechanism of the empowerment process to the communities. Nor are SH farmers a homogeneous group and they should not be treated as such. Some farmers are able to produce for the market, others first and foremost for subsistence with perhaps limited selling of excess produce. Although the farmers have established ways of producing, marketing and handling their finances, deficiencies in fertiliser use and exposure to other potentially suitable production systems such as agroecology put a limit on their success. Notable gaps in marketing information flow, exposure to formal markets and pricing also limited the growth potential of their operations.

The minor differences in aspirations and goals between the communities show that the local context plays a significant role in shaping farmers views of success and agency, notable particularly in varied approaches to market access. There is also a relationship between the constraint, needs, goals and aspirations articulated by the farmers which shows that they are aware of what solutions could work in their community and also what is acceptable within the confines of local culture and tradition. The farmers' goals and aspirations could be attained with government intervention and other stakeholder participation but there is only so much that SH farmers can do with their limited land, undocumented land rights and restricted skill set. Some long-term mentoring of the current crop of farmers is required and also a way to attract younger household members.

The irrigation schemes on which this study has focused would be the ideal target community for any intervention. The schemes are already have rules and regulations in place and members who are committed to working in the scheme, albeit individually. The Limpopo Department of Agriculture is a key partner institution and, particularly in the person of the resident extension officer, will play a significant role in coordinating events and facilitating interaction with the farmers. Market representatives also have a crucial role to play in working with the SH farmers.

The Table 5-3 shows that the women participants in this study were poorly empowered, especially in relation to time use, leadership and ownership of resources. One potential strategy for partnership on the empowerment journey with the women farmers and the communities they live in could be to explore the organised women structures that exist in the

churches and the opportunities these may offer for developing women's' agency within structures they already know and respect. Women leaders in the church could be important leaders of change. Women organisations in the church have created leadership widely acceptable among women which could be tapped into on the production front to further women's aspirations and to organise and explore how they can be effective for improving the performance of such women farmers. The next section presents women's aspirations in relation to the institutional context.

6. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This research report presents findings of a study that investigated the empowerment of women in relation to land and water access, use and security, and to knowledge generation for improved food security and livelihoods, in three districts of rural Limpopo: Vhembe (Rambuda), Capricorn (Mashushu) and Sekhukhune (Steelpoort).

Empowerment was investigated using a mixed method approach that provided a comprehensive understanding of water and land use security for farmers in the chosen study areas. One component of the study was sustainable livelihoods asset (SLA) analysis which specifies five necessary assets for deriving livelihoods. In a departure from conventional approaches to agricultural development, this study focused on human and social livelihood assets as key factors in empowerment through enhanced agency, assets which furthermore support a people-centred approach to development. The mixed method approach was executed using individual open-ended questionnaires, focus-group interviews, observations, and the Women Empowerment in Agriculture Index (WEAI).

6.1 Water Availability

Rainfall in the Limpopo Province is variable. There was a notable deficit between monthly rainfall data and the monthly potential evaporation data, indicating a need for irrigation in all study areas. Water supply was found to be adequate at two of the irrigation schemes (Steelport and Rambuda) but quality of the irrigation infrastructure and water management affected availability of the water. Water supply in the third site (Mashushu) was found to be limited. Competition for water between agriculture and the burgeoning mining industry in Limpopo, especially closer to Steelport, was reported as a concern. Local farmers in Steelpoort commented that limited availability of water for crop cultivation was reducing productivity, highlighting the continued problem of water access for those who historically did not have access to water and now wish to expand production.

6.2 Knowledge, Needs and Constraints

The farmers exhibited adequate knowledge for crop production, but when benchmarked against established production knowledge and practices, gaps were observed and expressed in technical aptitude, chiefly in relation to measurement of agrochemicals. (The farmers need

calibration tools that match their literacy levels, a problem that could be solved with items found in the environment such as used food containers. Knowledge gaps and needs were also identified in relation to marketing and finance.

There was also incomplete knowledge about the appropriateness of various farming systems. Most of the farming was agro-chemically based agriculture without being complemented by beneficial agro-ecological approaches, although some farmers admitted having had previous training in measures such as crop rotation. It would be premature to conclude that indigenous agro-ecological approaches are disappearing in these communities, but they tend to be undervalued and overlooked, probably as a result of a general dismissal of local knowledge systems that characterised the colonial attitudes in the early 19th century (Ferguson, 2007). Furthermore, the training which extension officers had received focused on resource-demanding agrochemical cultivation with little or no attention to support for agro-ecological practices. One way to improve this situation could be to appoint extension staff who are also trained in agro-ecological practices and could raise awareness among farmers about the value of the existing knowledge systems in their communities. This could be an important and cost-effective strategy, especially in regard to the sustainability of interventions, as it will be based on local community solutions that are less reliant on externally purchased inputs.

Although most farmers showed good production skills, they commented that their production choices were not always market-linked and market-informed. Market intelligence was mostly poor, although the Rambuda farmers were notably more entrepreneurial and had longstanding experience of both formal and informal markets, including the Johannesburg Fresh Produce Market. Steelpoort farmers were found to be risk averse and locked in a non-formal market because it guaranteed some daily income. Mashushu farmers on the other hand had great difficulty accessing markets due to lower yield resulting from inferior infrastructure and poor road access, yet nonetheless had experience with niche markets for seed maize and coriander. Overall, information on market prices was lacking among farmers which limited the scope of their decision making.

Knowledge gaps were also found in policy awareness among farmers. Farmers did not know the land and water policies that affected their access to these resources and could not give an account of the changes over time in these policy arenas. This was not surprising since many farmers had limited literacy and no opportunity to engage with the policies. This pointed to a gap in information flow from relevant institutions.

6.3 Institutions, Organisations and Empowerment

The study findings point to the complexity of rural women empowerment with regard to land and water-use for household food security and improved livelihoods. Institutions play a crucial role as vehicle and catalyst for access to land, water and ultimate achievement of goals and aspirations. In the study, both internal and external institutions affected farmers' livelihood outcomes. Internally, traditional authorities and socio-cultural institutions such as marriage influenced access to land user rights for women in their various categories. Externally, more work was needed to improve farmer understanding on land access laws and procedures, particularly water access and licensing regulations. The water user association remained an unknown entity for the farmers, not considered in their extension support, so that that farmers were unaware of discussion on water use affecting their livelihoods. For sustainable livelihoods, empowerment approaches must be sensitive to people's needs, capabilities and aspirations, and enhancement of agency must be a central focus for transformed institutional policies and programmes in support of this empowerment.

The Women Empowerment in Agriculture Index showed that the women in these three areas had a degree of empowerment in production and access to some productive resources but were disempowered when it came to time use satisfaction, leadership and credit access. These findings showed that women suffer from time poverty due to gendered division of labour and prevailing social norms, as was also indicated in focus groups.

The study confirmed the well-documented tensions between statutory laws and the lived experiences of women, particularly in communal areas such as those in this study. The findings showed that women were often accorded a minority status, and that their right to access land was largely tied to their relationships with men. This left various categories of women vulnerable and in some cases led them to endure adverse relationships and associations to retain access to land. This points to the urgent need to affirm women's lives in their own right beyond the current tendency of constructing their life opportunities as dependent on men. It can be incorrect to assume that transformation to advance the empowerment of women means disempowering men.

The study has generally illustrated strong dependence on land by women in the study areas, and their crucial roles and responsibilities in improving food security and livelihoods. What is in question is their empowerment to carry out these responsibilities. The study identified a number of issues that need to be addressed. Firstly, the women farmers interviewed in this

study were long-term users of water and land for agricultural purposes but remain largely uninformed and unaware of the changes in land and water policies since 1994. Although they interacted with extension officers in agriculture, farmers' grasp of land and water access policies and procedures was found to be poor, which limited their capacity and their voice to influence policy, access and user rights for both water and land. This suggests a problem with the way government structures communicate information on land and water policy reforms. According to their responses, none of the farmers had been involved in any of the consultation processes leading to the revision of water and land policies that very directly affected them. This absence of participation by smallholder farmers, particularly women, in deliberations about water and land issues means that no account was taken of their potential contribution and that policies emerged which failed to empower them for improved food security and livelihoods. The study argues that government and development agencies must adopt a people-centred approach in which there is a clear focus on enhancement of women farmers' agency whereby they have reinforced capacity to achieve household food security and improvement of livelihoods.

Also clear from the study is that women in these areas, through practice and through interaction with their extension agents, have indeed acquired production skills. Gaps nonetheless remain in agronomic knowledge relating, among other things, to agrochemical application, policies, institutional processes and market access. It was also established that the high cost of fertiliser limited its use by the farmers and leading to lower than expected yields. In addition, local knowledge was found to be loosely structured and based on oral and informal transfer of traditional knowledge. This study further proposes that appropriate agro-ecological methods be investigated and adopted to improve smallholder farmer productivity in these communities, and that this be accompanied by appropriate extension officer training. It also proposes the introduction of newer, profitable niche crops suitable to these areas that would raise income levels. The study also proposes that the youth in these areas be included in the agricultural value chain and in the various agricultural training programmes that would equip them with the required skills for profitable agriculture and improved livelihoods.

Shaped by their context and their agency, the smallholder farmers had a variety of production and life aspirations, goals, constraints and needs. This study proposes a partnership between government and communities to address constraints and needs so that aspirations and goals become attainable. Mentoring would also help farmers to attempt new practices. Inclusion of younger family members would also increase the chances of developing a new generation of

smallholder farmers with market-oriented aspirations. This research recognises that the farmers' market aspirations would be more attainable with collective marketing that would also improve their voice and market appeal.

In addition, this research confirms that institutions and norms play an important role in regulating access to resources and services for members in a community. In their communities patriarchy determined access to resources and determined the 'acceptable' ways in which men and women could behave. This limited women's individual and collective agency. Most smallholder farmers could not access the requisite services to allow them to produce commercially. Consequently they remained largely excluded from formal markets because they did not meet produce quality and quantity requirements.

Finally, the research consistently showed the importance of participatory and inclusive approaches which locate the farmer at the centre of agricultural development. External stakeholders may contribute the means of empowerment but it is important to give each community space to chart its own path to change.

6.4 Policy Recommendations

- Policy changes must be responsive to livelihood needs of those who have previously lacked access to water for agri-based livelihoods. A water access reform that balances the poor's water needs with those of commercial users who currently hold water licences.
- Extension approaches need to be people-centred, learner-centred and informed by the literary levels and technical aptitude of farmers (e.g. using appropriate calibration tools that farmers could easily get hold of, such as used food containers).
- Comprehensive needs assessment in the communities concerned, especially where there is a predominance of rural women among the farmers is recommended for a people-centred development approach. Variations among groups of farmers are to be noted to guiding a practical implementation of people-centred policies and programmes related to sustainable livelihoods.
- Strategies are needed to improve sustainability of water use for farming in the face of competing demands in these rural areas for other basic needs such as drinking water and water need by large corporate projects such as mines.
- Water supply infrastructure is in need of support, particularly in the Mashushu irrigation scheme, to conserve supply for farming and to resolve problems of competition in water use.
- Socio-cultural factors that often impede access for women call for close engagement with custodians of these. It is important to create greater awareness and contradictions between in statutory provisions of access to land for all people and the barriers determined largely by the socio-cultural context.
- Initiatives to include young people in identified roles along the agricultural value chain (e.g. book-keeping and marketing) are an important priority for rural poverty alleviation.
- Gender needs to be foregrounded as a critical variable in support of water access for sustainable rural livelihoods, particularly in relation to land user rights for all categories of women.
- Foster and facilitate agricultural extension approaches that prioritises by women farmers in input decisions, access to credit and public speaking related to agricultural development.

- Prioritise a sustainable livelihood asset framework approach with rural farming extension services with a focus of human and social assets development alongside the other assets with a key aim of capacitating farmers in using and stewarding natural and physical assets to transform their livelihoods.
- Device locally relevant mechanisms to modernise smallholder farming to be more responsive to the imperatives of commoditized livelihoods system while introducing agro-ecological approaches in the 21st century.

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APPENDIX A

CAPACITY BUILDING & TECHNOLOGY TRANSFER REPORT:

WRC PROJECT NO K5/2082

EMPOWERMENT OF WOMEN THROUGH WATER USE SECURITY, LAND USE SECURITY AND KNOWLEDGE GENERATION FOR IMPROVED HOUSEHOLD FOOD SECURITY AND SUSTAINABLE RURAL LIVELIHOODS IN SELECTED AREAS IN LIMPOPO

Project Leader -Dr Joyce Chitja

Team: Dr JM Chitja; Dr N Mthiyane; Prof I Mariga; Prof H Shimelis; Ms V Murugani Ms V Murugani, Prof P Morojele; Ms O Aphane; & Mr D Naidoo;

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CAPACITY BUILDING AND TECHNOLOGY TRANSFER REPORT

1 Introduction

The technology transfer activities included training of community members to be co-investigators in data collection and as interpreters using several workshops, scientific papers delivered at conferences. Seniors degrees were completed and awarded during the life of the project. The building of research capacity five registrations of students at the University of KwaZulu-Natal took place. These degrees include two PhD's and three Masters degrees. To date, two Masters dissertations have been completed and the students have graduated. The third Masters is analysis data aiming to submit in November 2015. The one PhD is writing up aiming to submit in November. The second PhD is also aiming to submit in 2015. Both PhD's are being written in a manuscript format, with one manuscript published. The second one paper is under review. Three papers are being prepared from the PhD studies and the research. In the following sections peer reviewed scientific publications and papers under review are listed. Conference (including upcoming conference) and workshop presentations are also listed.

2 PEER REVIEWED SCIENTIFIC PUBLICATIONS

a) Published papers and their abstracts

1. Reference: Vongai G. Murugani, Joyce M. Thamaga-Chitja, Unathi Kolanisi and Hussein Shimelis (2014). *The Role of Property Rights on Rural Women's Land Use Security and Household Food Security for Improved Livelihood in Limpopo Province. Journal of Human Ecology 46 (2): 205-221.*

ABSTRACT Small scale agriculture is a key land based activity for rural women, yet they own very little land. Rural land access is mediated by patrilineal customary law where women have mostly secondary property rights as wives. Consequently their land use security was derived from the family and other means of fostering accountability. As these have been lost with the developments in customary law, what is the source of women's land use security? Three communities in Limpopo Province were selected purposively; data was collected using a questionnaire, focus group discussions, key informant interviews and observation. Data analysis was through descriptive analyses and content analysis. The results show gendered access land access and secure access for mostly married women. In spite of their insecurities, women are motivated to farm for household consumption. A framework that recognizes women as land users and rural development is essential to strengthen women's land use security.

2. Reference: Thamaga-Chitja JM & Morojele P (2014). The Context of Smallholder Farming in South Africa: Towards Livelihood Asset-Building Framework. Journal of Human Ecology 45 (2):147-155.

ABSTRACT The need to support smallholder farmers by governments in developing countries has taken centre stage globally. In this regard, the South African Government's New Growth Plan puts agriculture, particularly the development and support of new smallholder farmers as an important area for development that could impact positively on poverty alleviation and household food security. In this paper, the researchers critically analyse the context of smallholder farming in South Africa, dynamics of market access and challenges facing smallholder farmers' agency. Analysis denotes how institutional dynamics related to socio-economic conditions of the farmers; the policy landscape and agro-climatic zones where farmers are located in South Africa are not well-geared towards positioning smallholder farmers for meaningful participation in the market. Furthermore, the historical marginalization of smallholder farming is explored to illicit challenges of the duality of farming in South Africa which is characterised by a well-developed commercial farming sector and a poorly developed smallholder sector. The paper proposes an asset-building approach linked to social-protection and institutional readiness as a basis for enhancing market access and farmer agency in order to address poverty and inequality in South Africa.

3. Reference: Naidoo K; Thamaga-Chitja JM & Shimelis H (2013). Towards sustainable livelihoods through indigenous knowledge & water use security: insights from small-scale irrigation schemes in Limpopo Province. Indilinga African Journal of Indigenous Knowledge Systems: Indigenous Knowledge Systems. 12 (2): 301-324.

ABSTRACT

Water is integral to sustainable rural livelihoods and household food security due to its key role in household use, small-scale and homestead farming. Water security is an emerging concept, having gained increasing attention over the past five years. The World Economic Forum describes water security as "the gossamer" linking global economic challenges such as: the systemic web of food, energy, climate, economic growth and human security livelihoods in rural areas are at risk due to poor access and supply of water, and resource limitation and degradation. The role of indigenous and local knowledge in navigating livelihood options was explored through a Sustainable Livelihood Analysis (SLA) among three purposefully selected, rural, female farmer groups to elicit the role of water in agriculture and rural livelihoods. Complimentary to the SLA, a household water audit was conducted to assess water supply, water availability and associated challenges. Face-to-face interviews were conducted with willing irrigation scheme members. Key informant interviews were held with officials from district municipalities, extension officers and the Departments of Water Affairs. Water Policy Analysis (WPA) was conducted for pronunciations and impact on water access, governance, organizational structures and institutional arrangements. Content Analysis and SLA were adopted as the main data analysis tools. Key findings indicate knowledge gaps in policy and implementation and a lack of understanding of water management structures. Discourse between the transformation agenda of water reform and rural lifestyles, thus elicited gender tensions among study participants. These complex issues resulted in poor livelihoods for participants, who experience poor water access for current and future water use. Competition for the water supply, coupled with climate change was also identified as a serious threat due to expanding mining operations in the Limpopo Province. The study concludes that water use management and water policy reform intentions require robust investments in the capacity building of small-scale farmers in rural areas to improve access to water and its management.

b) Submitted papers and their abstracts

Two papers have been submitted to the International Food & Agricultural Management Review's special issue of agribusiness & smallholder farmer linkages in early 2015. The two submitted extended are listed below:

1) **Thamaga-Chitja; Murugani VG & Mariga IV (2015).** *Livelihood asset building and market access among rural farmers in South Africa: an overlooked relationship that limits commercialization*

Abstract:

Markets are of fundamental importance in the livelihood strategy of most rural households, rich and poor alike. Furthermore, rural producers from developing countries face significant impediments in accessing rich countries' markets. There is enough evidence that smallholder market access constraints have been addressed by many researchers with regards to

empowering farmers. However, market access remains a topical issue today. A new discourse related to agricultural development policy is emerging and urgent, this new discourse is rooted in the social sciences, foreign to agricultural development policy and is called agency. This paper purports that improved market access for smallholder farmers depends on their livelihood assets and capabilities. Much has been done through agricultural development policies over the years but it focused largely on financial, physical and natural assets with the intention of improving market access. This new notion named agency indicates that improved focus on enhancing human and social livelihood assets needs to take center stage, in order for the financial, physical and natural livelihood assets to be used and improved by smallholder farmers such that market access amongst other agricultural objectives is achieved and sustained. Data collected through a mixed approach from selected Limpopo irrigation schemes on human and social livelihood assets of smallholder irrigation farmers indicate that although the farmers have been producing for several decades, they were still not market capacitated and market oriented in their production regimes, farming systems, business orientation and information flow. This paper suggests that agency enhancement is urgent because human and social livelihood assets are closely linked to determining. Historical disenfranchisement of smallholder farmers in South Africa has likely affected development of such capability. Is it not time to make this an agricultural development policy issue? The demands of interacting with markets require capable and empowered smallholder farmers able to link production decisions with market demand and supply forces. The paper highlights the need for a transformed extension service, mentoring and NGO involvement.
Key words: smallholder farmers, asset building, knowledge, skills, market access, agency

2) **Murugani VG & Thamaga-Chitja (2015).** *Do current institutions and organizations enhance smallholder farmers' capacity to partner with commercial farmers for market access: experiences from Limpopo irrigation schemes in South Africa?*

Market access for smallholders in the developing world is a long standing challenge, particularly when a dual agricultural system exists. South Africa has a large-scale, well-resourced and capital intensive commercial agricultural sector which mostly produces enough to feed the country and export. On the other hand, the smallholder sector, which is largely subsistence oriented, is poorly resourced with little market interaction. The differences in the sectors can be attributed to a series of agricultural policies which view the smallholder sector as subsistence oriented and with little capacity to contribute to the national economy.

Most smallholder farmers are of low socio-economic means and face long standing vulnerability to poverty and food insecurity. Their income poverty affects the quality of inputs and therefore the quantity and quality of produce. Furthermore, they also have little formal training in commercial production and little exposure to how formal markets work. These factors may negatively affect smallholder farmers' access to, and remaining in higher value markets. Sustained market access and presence by such farmers is urgent because improved market access would raise household income and possibly improve household food security and livelihoods on a long-term basis. Improved market access for rural farmers would also benefit rural women in general, since it is women farmers who drive smallholder and subsistence food production in Africa including South Africa, and are at the epicentre of these challenges.

Currently smallholder farmers largely sell their produce in informal markets which differ significantly from formal markets. Most smallholder farmers sell their produce at the farm gate, have no contracts and prices are largely negotiated regardless of produce quality, but this is different from formal markets where one needs a contract and prices are dependent on quality. Since higher value markets offer export opportunities and therefore mostly higher prices, partnering with commercial farmers who have experience in dealing with formal markets has the potential to improve smallholder market access in several ways. One approach included activating sustained solutions to market access which include strengthening of both push and pull factors where commercial and smallholder farmers partner to deliver sustained market presence and earn incomes that sustain employment and national and household food security.

The Sustainable Livelihoods Analysis (SLA) approach was adopted as a contextual framework for this study. According to the SLA the individual needs five assets (physical, natural, financial, human and social) to engage in a successful livelihood strategy. This study places emphasis on human and social assets as catalysts for enhancing farmer agency. This emphasis is made on the premise that if the farmers' capacity to analyse and process information is improved, then their ability to make decisions and engage with new opportunities will also improve. This is however, dependent on an enabling environment largely determined by local institutions and organisations which often set out the rules of "the game" and determine if the environment is enabling or inhibiting.

This study explored the role of institutions and organisations as vehicles of capacity enhancement for smallholder farmers. An analysis of the stakeholders and their role in capacity enhancement, particularly human enhancement of farmers was carried out in three irrigation schemes in Limpopo where farmers contend with these challenges daily. Their past experiences in interacting with organisations and institutions across the value chain for few commodities is captured and analysed. Farmers' interactions with commercial stakeholders and institutions were also captured. Finally the capacity and willingness to partner was also determined.

This study was carried out in Limpopo Province of South Africa. The province was purposively selected because it has a highly rural population, where many of these rural households are engaged in smallholder agriculture. The province has the largest number of irrigations schemes in the country and yet is among the poorest rural provinces in South Africa. There are also many commercial farmers based in this province and this offers an opportunity to study the potential partnerships. The study followed a participatory approach where mixed methods were employed in data collection. A questionnaire was used to collect data from purposively selected respondents, among them smallholder farmers, extension officers, district officials and market agents. The data was analysed using descriptive statistics using SPSS, theme and content analysis. Results show that there are weaknesses in approach to enhancing farmer capacities and agency in the programmes used by external organisations and institutions. Despite well-meaning intentions by these external players to bolster agency, they will require a desire by the smallholder farmers to partner with commercial farmers, where the smallholder farmers are in control and can look after their best interest. Results further suggest that stronger institutions that foster partnerships that ease entry and exit are important to facilitate market access.

3 International & Local Conferences & Associated abstracts

Presented research:

Three international conferences were attended and presentations were also made:

1. Naidoo D, Thamaga-Chitja & Shimelis (2012). Towards sustainable livelihoods through indigenous knowledge & water use security: insights from small-scale irrigation schemes in Limpopo Province. International Conference for Fresh Water Governance in the Drakensburg. (November 4-7).

2. Murugani & Thamaga-Chitja (2012). International Conference for Fresh Water Governance in the Drakensburg, South Africa (November 4-7).

3. Thamaga-Chitja (2014). Collaboration & Innovation Across the Food System-Engaging community and stakeholders for improved land-based livelihoods: Lessons from smallholder in Limpopo. Vermont, United States of America. (June 2014)

ABSTRACT:

South Africa's agriculture can be described as a dual form of agriculture where the well-resourced; large- scale agriculture is the mainstay of national food security. On the other hand, under-resourced smallholder and subsistence agriculture is practiced by the ultra-poor and mostly women in rural areas. This duality in agriculture mirrors the rest of the economy which is characterized by a developed economy alongside a large underdeveloped sector. The historically disenfranchised smallholder in South Africa experiences a myriad of challenges including inappropriate farming approaches, poor quality and quantity of produce, poor extension support and poor market access. An analysis of institutions that are relevant to engage in the process of fuelling a change of the agricultural system and improve market access for the disenfranchised was conducted based on three cases studies in Limpopo over a three year period. Emerging results indicate overlapping mandates of provincial, national and municipal mandates, "silo" efforts that do not result is mobilization and lasting change, weak livelihood assets and weak extension support. Possible solutions may include a collaborative effort of stakeholders at community, provincial government, national and the Non-Governmental sector guided by national development agenda. This paper concludes that South Africa urgently needs a practical collaborative effort and an alignment of mandate at a strategic and programme level of all stakeholders cemented by specific smallholder development and livelihood up-liftmen objectives.

Poster Presentation: University of KwaZulu-Natal's School of Agriculture, Environment & Earth Sciences (SAEES)'s Research Day, September 2014. ***Title: women empowerment in agriculture index – are female smallholder irrigation farmers in rural Limpopo province empowered? V.G. Murugani[1], J.M Chitja[1], R. Kajombo[1]***

WOMEN EMPOWERMENT IN AGRICULTURE INDEX - ARE FEMALE SMALLHOLDER IRRIGATION FARMERS IN RURAL LIMPOPO PROVINCE EMPOWERED?

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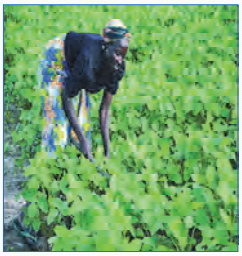
Introduction



Smallholder agriculture employs about 40% of rural women in developing countries but the women do not always enjoy the fruits of their labour because of patriarchy and other institutions which disempower women. Previously empowerment of women has been attempted through health, microfinance and education initiatives but it is only beginning in agriculture. If female farmers are adequately empowered in the following domains; production decisions, resources access, income, leadership and time use, this could improve production, market participation and household food security. Empowerment is a process which is closely linked to resources, agency and achievements. Also important is the enabling environment which can facilitate or hinder women's agency in agriculture and related activities. It is important to note that empowerment in one domain does not necessarily influence empowerment in another domain

Study sites

Methodology

The study was conducted in rural Limpopo Province in three purposively selected rural communities where households engage in irrigated and dry land agriculture. Data was collected from 226 respondents using an adapted WEAI questionnaire. The five domains of empowerment (5DE) index was used to determine empowerment in the five domains (agricultural production, resource access, income, leadership and time use) using weighted indicators.

SPSS was used to compute the index using the WEAI manual

A respondent was considered to be adequately empowered if they were empowered in 80% of the domains.

The results are shown in Table 1 and Table 2

Results

Table 1: Women empowerment head count and 5DE

	Mafefe	Steelpoort	Rambuda	Total
Disempowered Women head count (H)	31%	55%	39%	41.2 %
Empowered Women head count (1-H)	69%	45%	61%	58.5%
Five domains of empowerment (5DE index)	0.58	0.49	0.55	0.54

Table 2: Women Empowerment Dimensions

Variable	Mafefe Adequacy %	Mafefe Inadequacy %	Steelpoort Adequacy %	Steelpoort Inadequacy %	Rambuda Adequacy %	Rambuda Inadequacy %
5DE Index	57.61	42.39	44.91	51.09	55.09	44.91
Production						
Autonomy in Production	76	24	65	35	65	35
Input in productive decisions in food crops	57	43	52	48	54	46
Input in productive decisions in cash crops	70	30	70	30	50	50
Resources						
Assets	60.0	40	54.0	46	72.0	28
Livestock	67.5	32.5	39.0	61	39.0	61
Women with access to decisions on credit	28.5	71.5	15.0	85	16.5	83.5
Income						
Income	39	61	34.5	65.5	37.5	62.5
Leadership						
Public Speaking	51	49	45	55	57	43
Group participation	40	60	30	70	40	60
Time use						
Time	26	74	20	80	41	59
Workload	72	28	68	32	79	21

Results

- The average age of the farmers was 57 years and 58.8% of them were literate
- Table 2 shows only 58.5% of the women interviewed were empowered across all five domains.
- Across the three communities, Mafefe had the highest score for 5DE while Steelpoort had the lowest.
- Table 3 shows that most farmers were empowered in the production, resource access and leadership.
- While women are largely disempowered in the domains of income and time use security

Discussion

- Women are more empowered in production which largely falls under their control, owning resources such as non-mechanised farm equipment and small animals was also important because it allows the women some bargaining power over the asset.
- However, when it came to income, the women were largely disempowered as only 37% of them were adequately empowered this could be attributed to money being largely handled by men or that women are only interested in food crops which they do not sell
- Women were largely disempowered with respect to time because they spent more than 10.5 hours working at home and in the fields, this did not leave them enough time to engage in other potentially better paying activities
- The women are empowered in some domains and more work needs to be done to empower women in the income and time use domains.

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Upcoming international conference presentation:

1. JM Thamaga-Chitja (2015). Is it time for a new agricultural development policy discourse for smallholder farmer development in South Africa implications for food security and lessons from Limpopo, South Africa irrigation schemes. ***International Conference on Global Food Security***. 11-14 October 2015

4 Thesis Abstracts

Masters 2013:

1) **Nkanyiso Brighton Gumede (M.Agric. Food Security).** *Investigating water access constraints and land-based livelihoods for empowerment of rural farming women and implication for household food security: the case study of three irrigation schemes in Limpopo* Gumede:

Abstract: Agriculture plays an important role in rural livelihoods. However, poverty and food insecurity still persist in rural communities of South Africa where women are central to ensuring household food security through several livelihood activities including agriculture. Women engage in land-based livelihood such as irrigated agriculture to increase household food security and reduce reliance on cash to feed their households. However, poor access to water and insecure access to productive resources such as land threatens rural livelihoods and are a major constraint to poverty reduction in rural areas. According to IFPRI (2012)'s Women Empowerment in Agriculture Index (WEAI), access to production resources is an important domain for empowerment of women farmers. The aim of the study was to investigate dynamics under which rural women operate when accessing water to improve the land-based livelihoods that they engage in for improving livelihoods and household food security and to investigate the knowledge rural women possess or lack in empowering themselves for improved land-based livelihoods and improving household food security. Three small scale irrigation schemes from three district municipalities in Limpopo province, South Africa, were investigated using mixed methods approach, involving quantitative and qualitative approaches, was employed. Sampling of the participants in each irrigation scheme was done through purposive sampling. Structured questionnaires, administered to women farmers through face-to-face interviews, key informant interviews, focus group discussions and observations were used for data triangulation. The study revealed that women faced various challenges when accessing water which ranged from distant sources, unreliable

and inadequate supply of water and poor irrigation infrastructure to insecure land rights. Women engaged in irrigated agriculture and livestock farming. They possessed adequate knowledge on soil preparation, weeding and harvesting. However, lack of knowledge on water management and conservation, pest management and markets was observed as an impediment to women empowerment. Ensuring secure access to adequate land and water to rural women and providing skills and knowledge for agriculture and production while ensuring access to markets may contribute to empowerment of rural women and improved land-based livelihoods that rural women engage in to improve household food security which leads to poverty reduction.

2) **Vongai Gillian Murugani: MSc (Food Security):** *Land use security within the current land property rights in rural South Africa : how women's land based food security efforts are affected*

ABSTRACT: Rural women‘s land rights in South Africa remain secondary in spite of laws founded on a constitution that promotes gender equality. Patriarchal customary laws prevail and women‘s land rights and use security are inextricably linked to their relationships with their male relatives. Rural women are key producers of agricultural products due to historical and continued male outward migration, which has led to a feminisation of agriculture. Although women farm the land, their land use security is poor and can be further threatened by divorce or widowhood. Given that most vulnerable women are based in rural communal South Africa, how can their land rights be secured under the customary law framework? While the statutory law framework seems to provide a solution, it is less applicable in rural areas where customary law and traditional practices prevail. If statutory law cannot be superimposed on the existing customary law framework, how can women‘s land use be further secured to support their household food security efforts? What kind of framework can be introduced to strengthen women‘s land use security? A study was conducted in rural Limpopo Province to explore this complex and yet important question. A mixed methods approach comprising interview style questionnaires with a mixture of closed and open-ended questions, coupled with focus group discussions and observation was employed. Qualitative data from the focus group discussions and open-ended questions was analysed for common themes using content analysis. Quantitative data was analysed using SPSS to establish descriptive data, frequencies and establish the relationships between variables. Results of the analyses were used for building blocks to develop a land rights framework that is more gender sensitive and secures the rights of the actual land users. Women‘s land rights were largely confirmed to be secondary and land use security was linked to the continued

relationship to male relatives through marriage and natural blood lines. From these findings, a gender sensitive framework that enables and improves land-based food security efforts has been proposed.

Current Students 2015:

3) Vongai Gilliam Murugani (PhD – submitting 2015)
4) Thobeka Mkhize (M.Agric (Food Security)- subsisting in 2015/ early 2016
5) Denver Naidoo 2015/2016 submission; One paper published

5 DIRECT CAPACITY BUILDING IN RESEARCH SITES

Throughout the life of the projects several meetings in a workshop format were conducted. Youth from the sites were also co-identified with the community leadership. They were trained by the researchers and participated as data collectors and/or these young people also acted as liaison between the research team when other leaders were not contactable and ensured that communication flowed easier. Some local economic input also took place in the study sites. Catering services and transportations of farmer were procured from the community. The following section details capacity built the community.

From the ***Rambuda community*** the following community members joined the team as translators:

- Mr Robert Mutsinye (35)
- Miss Funanani Nedawaila (24)
- Miss Thabelo Netshieneulu (26)
- Mr Humbelani Makhathi (26).

The community members all held a matric certificates but were currently unemployed. The basis for selection was the ability to communicate in English and they were selected for us by the local civic organisation.

Specific one morning training of the Rambuda community members included:

- Brief explanation of research in development
- What is a survey?
- What is an interview?
- How to pose questions during a face-face interview?

- Actual translation of questions and consensus on words and local terminology
- Focus group discussion facilitation

The translators met with the researchers and went through the questionnaires to discuss the questions and the potential issues that could emerge during data collection. Gaining an understanding of these issues would help the translators to probe further. They were then given the opportunity to practice with each and translate the questions into uniform phrases for their own use. Apart from training in interviewing respondents using questionnaires, the respondents were also taught how to facilitate focus group discussions.

The translators also gained an appreciation of the land, water and livelihoods issues and how they impact their communities. Other additional skills were using the English language in a formal and business setup. These skills could be useful in future survey activities in their communities or other related activities. These young people have now been noted by the robust Rambuda Civic Organisation as having been exposed to research which may open other opportunities in the future. Beyond the research skills the research team engaged with the translators on their own dreams and aspiration and offered information and advice where possible.

Apart from learning the above, the actual research content helped to broaden the horizons of the respondents. It is hoped that it has shown them the links between the research topic and its effects on livelihoods in their community. Ideally this should generate informed dialogue and generate youth interest in agriculture. For participating in the research, the translators got paid a R100/day for a total of four days. The fee was discussed and agreed upon with the Civic organisation.

For the Steelport and Mashushu sites the University of Limpopo research students were employed as they spoke the language and were privy to research. They were oriented into the objectives of the study and trained on data collection tools related to this study Attempts were made to locate community youth but it was possible. They were:

- Mr Solomon Mangalo (25 yrs old, B.Com student),
- Mr Thabo Mpathi (26 years old, M.Sc student)
- Mr Puleng Seanego (25 years old, B.Sc student).

6 Data storage

All processed data will be stored at:

School of Agriculture, Environmental & Earth
African Centre for Food Security
University of KwaZulu-Natal
Carbis Road
Scottsville
Pietermaritzburg
3209
South Africa

APPENDIX B:

GUIDELINES ON THE EMPOWERMENT OF WOMEN THROUGH WATER USE SECURITY, LAND USE SECURITY AND KNOWLEDGE GENERATION FOR IMPROVED HOUSEHOLD FOOD SECURITY AND SUSTAINABLE RURAL LIVELIHOODS IN SELECTED AREAS IN LIMPOPO

JM Chitja, CCN Mthiyane, IK Mariga, H Shimelis, VG Murugani, KD Naidoo
PJ Morojele, OD Aphane

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Acknowledgements

The contributions made by the following organizations and people to the creation and success of these guidelines on the empowerment of women through water use security, land use security and knowledge generation for improved household food security and sustainable rural livelihoods are gratefully acknowledged.

- Steelpoort Irrigation Scheme in Sekhukhune District Municipality, the community of Gamalekane, their leadership and their extension department particularly Mrs Esther Monare-Motseo and Mr B Motong.

- Mashushu Irrigation Scheme in Capricorn District Municipality, the community of Mafefe, their leadership and their extension department particularly Mr Molatelo P Mosima.

- Rambuda Irrigation Scheme Vhembe District Municipality, the community of Rambuda their leadership, their extension department particularly Mr Mukhanu.

The Water Research Commission (WRC) for funding of this directed call and the WRC Reference Group members for guidance and support:

Dr AJSanewe	:	WRC Chairperson (2009-2012)
Dr NS Mpandeli	:	WRC Chairperson (2013-2016)
Dr GR Backeberg	:	WRC
Dr P Esterhuyze	:	University of the Free State
Dr N Monde	:	University of Fort Hare
Dr BC Mubangizi	:	University of KwaZulu-Natal
Dr B van Koppen	:	International Water Management Institute
Ms M de Lange	:	Consultant with Social Technical for Interfacing
Mr JA Denison	:	Umhlaba Consulting
Ms P Mofokeng	:	Department Agriculture Forestry & Fisheries
Ms G Schoeman	:	Schoeman and Associates
Ms P Dibete	:	Department of Agriculture, Forestry & Fisheries
Mr E Malatsi	:	Department of Agriculture, Forestry & Fisheries

List of Abbreviations

FAO	Food and Agricultural Organization of the United Nations
PRA	Participatory Rural Appraisal

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Preface

These guidelines provide an overview to empowering women to be water use secure for improved household food security and sustainable rural livelihoods that have been successfully implemented in the Limpopo province. The guidelines focus on how to enhance agency in women farmers through water and land use security for sustainable livelihoods. The guidelines aim provides decision-makers, extension officers, development practitioners and farmers with basic guidelines/principles on how to facilitate empowerment through agency enhancement in the agricultural sector. Empowering women would mean enhancing their capacity and capabilities to make purposive choices and to transform these choices into desired actions in their community and beyond. These guidelines emanate from project WRC project K5/2082/4 and acknowledge that context and situations are unique and adjustments are expected.

INTRODUCING THE PROJECT, ENGAGING THE COMMUNITY AND SEEKING TO UNDERSTAND THE FARMERS AND THEIR FARMING

1. Introduction

Secure access to irrigation water is an important requisite for smallholder agriculture in drought prone Southern Africa (FAO, 2004). Having secure access to water is an important determinant to whether farmers will engage in production all year round and use all their available land (Mahoo et al., 2007). Since water is a scarce resource which limits the productivity of most rural farmers, it is usually given to powerful members of the community. Similarly plot allocation in irrigation schemes may disadvantage women if they are allocated plots at the periphery of the scheme. Local water allocation may be governed by norms and practices which disempower women despite women being the majority of the agricultural workers in the world (FAO, 2013).

Water use security, is defined as the equal access to water and the continuous supply to irrigation water for a sustainable livelihood. Empowering women would mean enhancing their capacity to make purposive choices and to transform these choices into desired actions in their community and beyond. Empowerment is an iterative process with outcomes (Ginige and Richards, 2012). Empowerment is defined as enhancing the capacity of individuals or groups to make purposive choices and to transform their choices into desired actions (World Bank Institute, 2007). Empowerment is governed by an individual's agency and their context. Agency is defined as 'ability to formulate strategic life choices, control resources and decisions which affect one's life outcomes' (Malhotra and Schuler, 2005). Empowerment is synonymous with an increase in agency. The context is important because it shapes the resources and opportunities that the individual has and defines the exercise of agency by making some practices socially acceptable. Empowered women have a strong voice and can influence local policy and agricultural development (Galiè, 2013).

2. Introducing the project to the community

Firstly, the research team will identify a key informant who can introduce them and their project to the local leadership. If the project is taking place in a rural community, it is important to get the buy-in of the local traditional leadership and other important stakeholders and organisations which work with the farmers (Figure 1).

Secondly, the key informant and a representative of the local leaders will meet with the farmers and the project leaders to introduce the project and to assure them that the project has been approved by local leaders. This ensures cooperation of participants and buy-in.

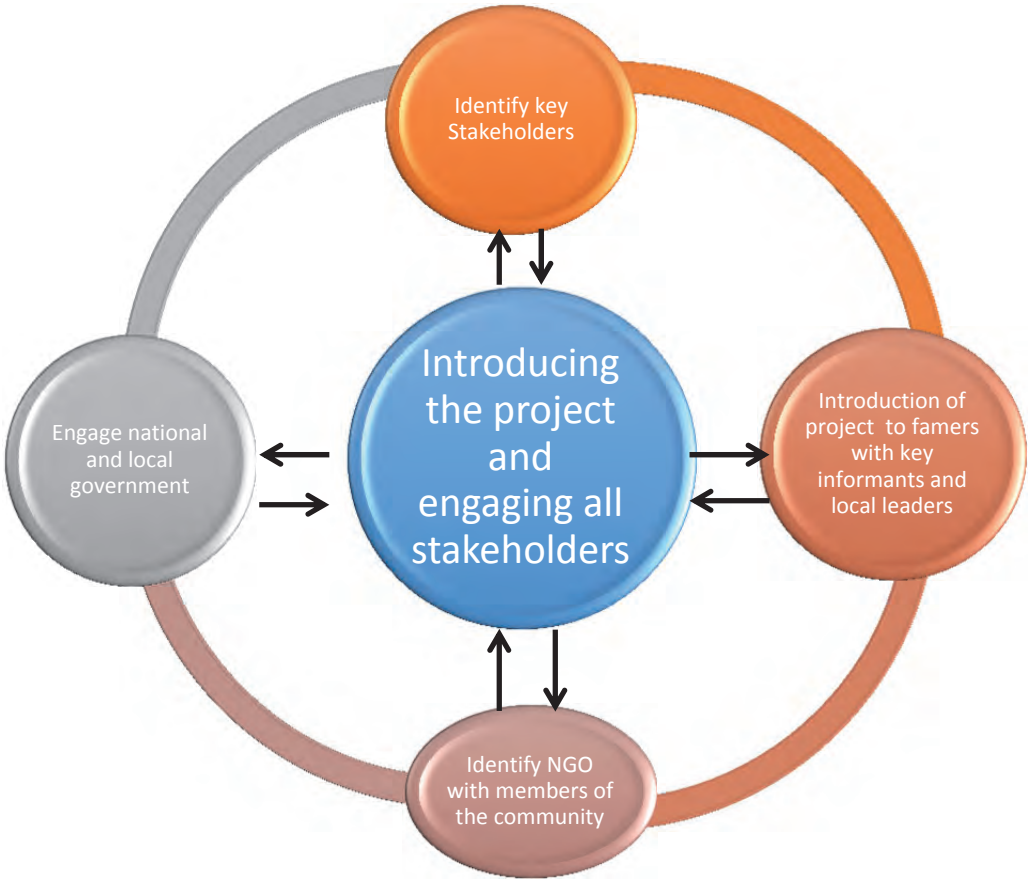

Figure 1: Community and Stakeholder Engagement

3. Conduct a baseline assessment of women's agricultural practices in the irrigation scheme:

Before any intervention can begin in a community, it is important for the outsider to understand the context and the people at whom the intervention is targeted. This can be done through having members of the project team spending prolonged periods of time to minimize suspicion and establish rapport with the community members, especially the farmers. The project team also needs to establish a good relationship with the extension officer(s) to understand the kinds of support provided to farmers, their (extension officers) experiences and views on extension in the community, and the challenges they face. Extension services are the key support 'structures' that farmers have, and are crucial for sustained empowerment of women and farmers in general.

Getting to know the community and the farmer in the irrigation scheme: Timeframe: 1-2 weeks. The following are guiding points to consider in getting to know the community and its farmers in order to understand the context:

- It is preferable that some members of the project team take residence in the community from time to time
- Spend time with the men and women together in the irrigation scheme
- Spend time with the women alone in the irrigation scheme
- Establish rapport and a relationship of trust with all farmers in the irrigation scheme
- Get to know as much as you can about who the farmers are – keep a ***journal*** (Figure 2) to make entries of your observations, conversations and reflections to refer to during the life of the project
- Ascertain who is active in the irrigation scheme, and why they are involved?
- Collect the biographic information: age, gender, household information, e.g. marital status, children, where the family members are; why they are farming and any information related to their farming
- Spend time getting to know the community, who the key role players are and the way of life in the community

- Hold / Conduct regular conversations with men and women farmers to establish how they view their context in relation to land access and land use: a participatory action research approach to identify problems and identify solutions is suggested.

Figure 2: Journaling

The approach in Figure 3 is suggested as a guide to a successful intervention. This process is cyclic and can be repeated several times over the period of the intervention. The initial conversations with the farmers will from the first stage of the intervention, and the aim will be to **understand the situation.** A variety of methods can be used to understand the situation, including, focus group discussions with farmers, informal talks with members of the community not in the irrigation scheme, transact walks, discussions with key informants, including community leaders.

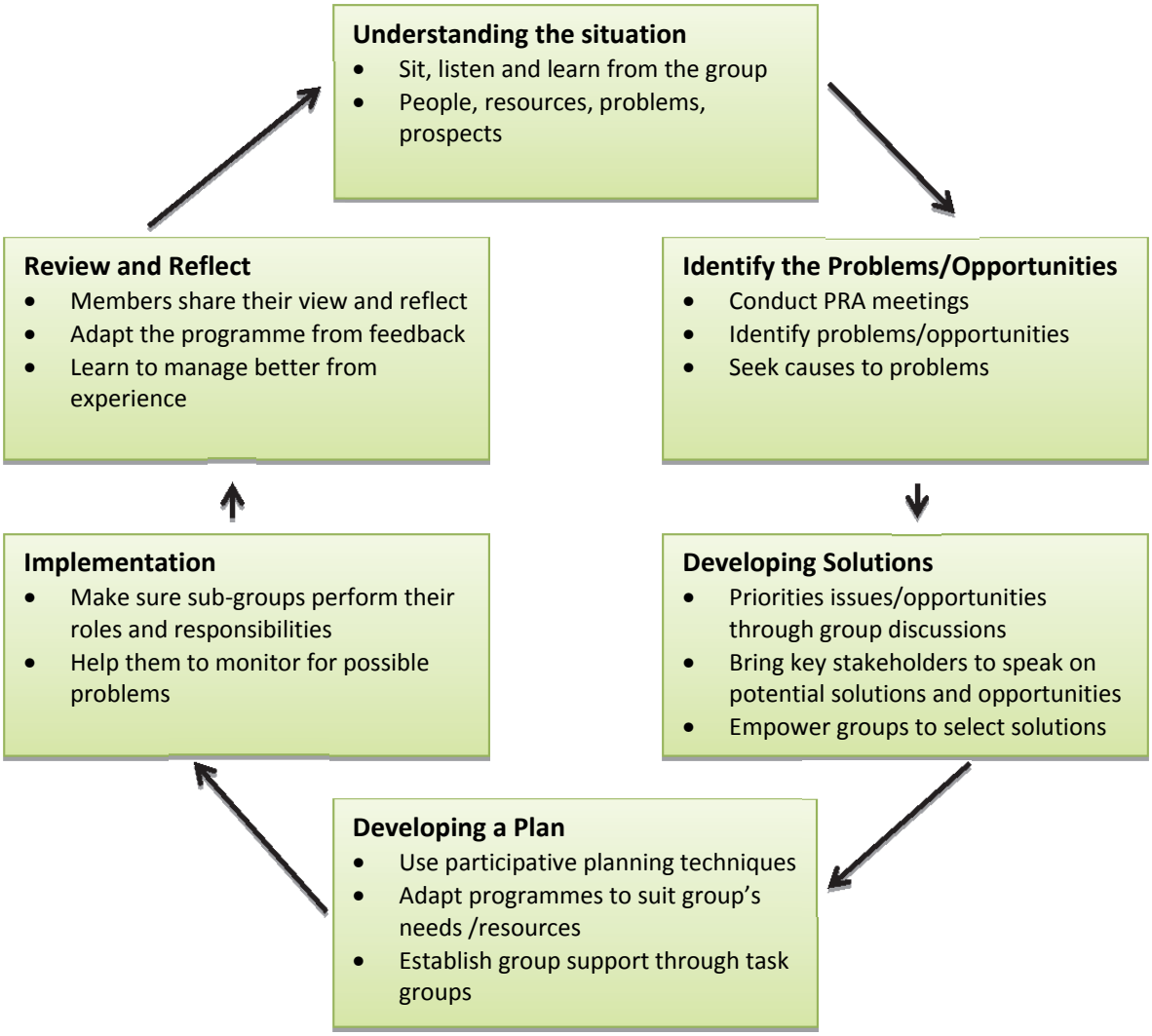

Figure 3: Adapted from FAO: A Reflective Approach to Empowering African Smallholder Farmers.

4. Understanding functioning and linkages/networks within the scheme

The initial conversations will be to understand how the irrigation scheme works at a bigger level. The project team will assess the extent to which farmers have established linkages among themselves, and to which they function as a unit with a joint vision and a collective plan of operation. Linkages and connections among farmers (as represented in Fig 3) are crucial for a vibrant irrigation scheme. When farmers share ideas and resources, try to solve their challenges and plan together, they are likely to achieve more than when they work in isolation. Farmer connectivity is also important for bargaining in the markets and for representation on the negotiating table with government and important outside farmer stakeholders. The project team may achieve this by facilitating a process where farmers identify strengths, but most importantly weaknesses in the way the scheme functions, and by highlight the advantages of operating as a collective.

While it is not advisable to exclude men farmers in the irrigation scheme, the intervention should use a gender lens, and all discussions pay special attention to how women's experiences are different from men's; and seek solutions to women' problems. The following questions will guide these discussions:

- Why are you part of the irrigation scheme?
- How is the irrigation scheme an advantage for you? How is it working for you?
- If you were not part of the irrigation scheme what would you lose?
- Do members of the scheme sit together and plan what they would plant in a particular year?
- If so, how do you decide what to plant and when?
- Is planning together working for you? How so?
- If you do not plan together, what are the reasons for this?
- Would you like to work and plan together what to plant, and when?
- How can you improve the way you work as an irrigation scheme?

- What would be the advantage of planning together (deciding who plants what, when) and pulling your resources together to achieve your goals?
- What would it take for you to achieve this (planning together and pulling your resources together)?
- What would be the strength of doing this?
- What would be the limitations of doing this?

To get farmers to see the limitation in them working individually in their little plots may take a while. It is important not to rush this stage, but to bring them examples of how this works in other contexts similar to theirs. The intention is to facilitate a new way of seeing and doing things and to encourage them to function as a connected entity as indicated in Figure 3. This approach also aims to transform women farmers to become life-long learners who in future will be able to confront their challenges without the project team. The supportive role played by extension officers cannot be overemphasized in the transformation of farmers from functioning in silos and to functioning as a dynamic and empowered unit to reach their goals.

This then raises questions and begins to challenge the way extension happens, and the approaches used by extension officers. They will also need to be reflexive in their approach to farmer extension, and use work more closely with farmers in 'tailoring' extension support towards the needs of the farmers.

The 'one-size-fits-all' approach to farmer support and development will have to be replaced by a more 'farmer-centred' approach which is informed by the local and 'situated' needs of farmers, particularly women farmers. The extension approach to farmer development will have to focus more on human and social asset development, with the view that this will enhance the ability of farmers to transform the natural/physical (water and land) assets for improved livelihood outcomes. The following attributes will be among those that will enhance farmer agency, and in which extension officers will need to focus.

- Confidence
- A sense of belief in one's self
- Trust among irrigation scheme members
- Self determination
- Pride

- Commitment
- Motivation
- Skills
- Goal-setting
- Planning.

The **extension staff** will certainly themselves need mentoring and coaching in this new approach of farmer development. It is suggested that initially students work as teams to continuously reflect on the challenges of the current extension approach in different communities, on lessons learnt, and on best practices in extension from developing countries. **Figures 3 and 4 are important for this internal examination by extension services and aiming to "produce" empowered farmers**. The challenges of empowering women farmers are complex and need a multi-pronged focus. These guidelines focus on how we can begin to effect change that will last by enhancing agency among women so that they are equipped with knowledge, skills and most importantly self-belief and confidence to seek assistance and support to address their challenges.

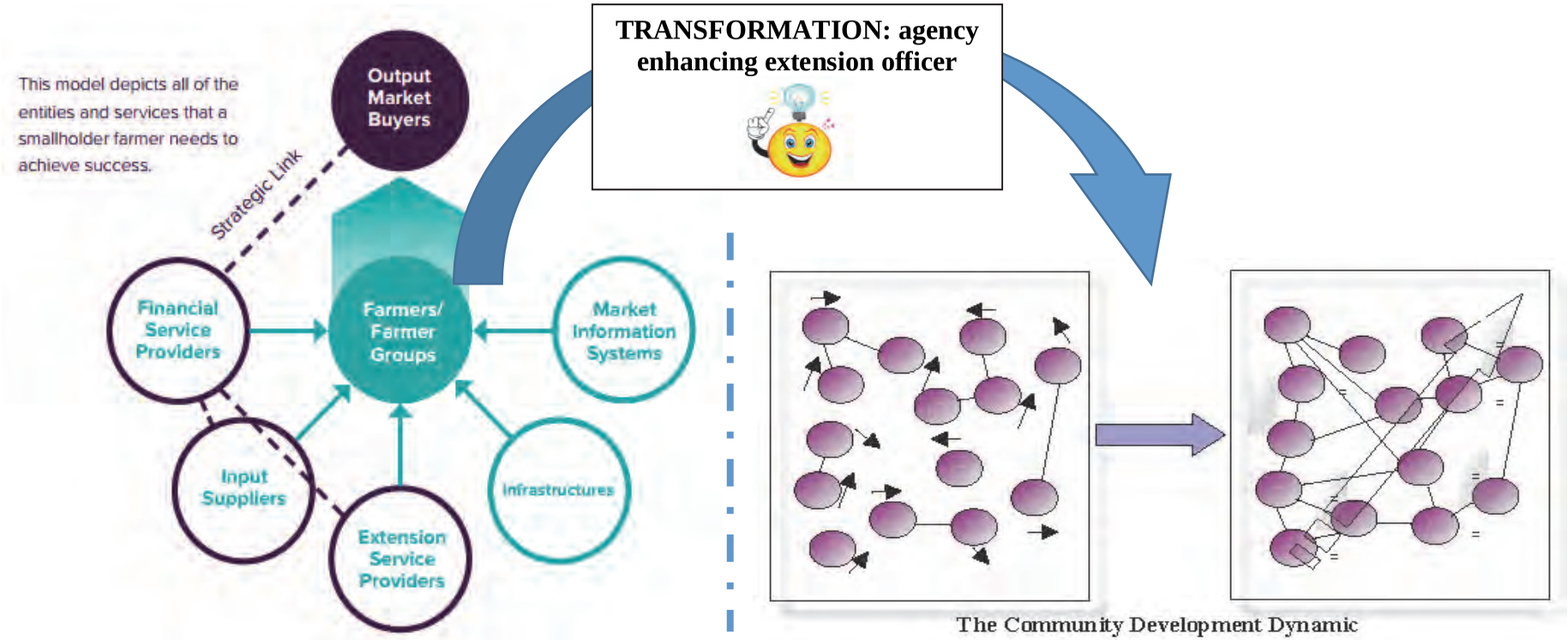

Figure 4: Farmer Connectivity and Enhancing Agency

Adjusted from: Opportunity International In: Microcredit Campaign (2015) and Steve Waddell In: Change, Learning & Network Development (2010).

- By this time it is probable that the farmers may give many reasons why this will not work. This second phase of the intervention, i.e. **identifying the problems and opportunities can commence.** The project team needs to structure the discussions (and intervention) to focus on **land and water access and use security**. This phase of the intervention is about actualising (Figure 3), i.e. building farmer connectivity and agency; and may begin with the project team conducting an assessment of the current land use practices in the scheme and the community. The following questions will assist in starting the conversations:
- How do men and women access land and water in the community? What processes are followed?
- How do different categories of women (single, married, divorced) access land and water in this community?
- How do men and women feel about how they access land in this community?
- What are your aspirations regarding land and water use?
- What problems do you experience in relation to how you access land for farming?
- What problems do you experience when using land for farming?
- How do you think these problems can be addressed? What role can you play?
- Who are the other stakeholders who can address these problems?
- How do members of the community access and link with the stakeholders?
- Do these linkages serve the irrigation scheme or the individuals who link with these forums?
- What are the constrains of being active on these stakeholder forums is any?
- What role can you play individually and collectively as a scheme to address these problems?

The participatory process of understanding the situation by engaging women in identifying solutions and identifying stakeholders to assist them is aimed at building a sense of ownership of the intervention. This process will allow the project team opportunities to identify the range of needs women have, and this knowledge will form the basis of the intervention. The process is also aimed at developing women's agency necessary for sustained change and empowerment.

Women farmer needs include appropriate farming and production knowledge and skills, financial knowledge, and knowledge of the markets. Equipping women with appropriate knowledge and skills enhances their ability to take decisions and to make informed choices. The project team will therefore need to conduct a knowledge and skills audit in the irrigation scheme in order to identify gaps to be addressed by the intervention. This can be done through focus group interviews, where women are asked what their needs are. In line with the non-hierarchical, participatory approach that values women's experiences and use these as a resources, conversations are used as the main method to collect data. The questions are only suggested as a guide to frame the discussion. Women farmers may be asked about:

- The types of crops they grow and when the grow these
- How they decide on what to plant, when
- The needs of the plants they grow, and how these are addressed
- The application of fertilizers
- The kinds of knowledge and skills they would still like to acquire, and why.

The project team or extension officer may also use observations to collect information about what farmers know and what they can do. This will assist in identifying contradictions, if any, between what farmers say they do and what they actually do. Team members need to spend time with farmers during the different farming seasons to observe their farming practices. They need to ensure, however, that their visits are not seen as 'inspection' visits; and need to be sensitive to the influence and impact of the local context on women farmers.

The project team need to strive for an approach that affirms the women rather than to see them as 'empty vessels' that need to be 'filled' with knowledge from the 'experts'. It is suggested that once the team (farmers and the researchers) have developed enough rapport with the farmers it **is time to develop a plans.** The following approach is suggested:

- women be divided into 'working groups', and that these should not be based on friendship but on the problem to be addressed
- each 'working group' is assigned a problem to work on with the assistance of the project team

- each ‘working group’ is assigned a ‘mentor’ or ‘coach’, who is a member of the project team or an extension officer
- working groups are given a time frame (+/- 2 weeks) to work out a plan of action to address the problem, and they are encouraged to meet outside of the project meetings
- each ‘working group’ presents their ‘plan of action’ to the entire group. This plan may, for example, entail inviting an outside expert to come address the whole group on a particular issue, constituting a task team to make presentations to the management of one of the mines around the irrigation scheme or a particular government department, etc.
- the plan of action is discussed in detail with the whole team (farmers and project team, extension officer)
- a decision is taken collectively to adapt, reject or accept the plan with special recommendations
- individuals are tasked with ensuring it is implemented within a particular time frame
- the project team plays a facilitating role to assist where farmers need help and providing resources where possible in the **implementation of the plan.** The project team also monitors the progress and identify problems that might hinder the success of the plan.

During the implementation phase the team meets regularly to **review and reflect** on how the implementation is unfolding. During these reflection meetings, women should share ideas, discuss problems, come up with solutions, reflect on why the plan is succeeding or not succeeding, and how they could have done things differently. The extension officer is important in facilitation and fostering that the women farmers talk and reflect continuously. In so doing, women will be learning collaboratively and taking joint responsibilities for their problems, failures and successes. This will hopefully be a start of collaborative planning and recognising the strength of working together, and networking within the irrigation scheme and with outside stakeholders. As a team, they can tackle one problem at a time or they may work on several problems simultaneously.

Figure 5: A facilitated session of women farmers conversing

This approach is likely to ‘force’ women farmers to start ‘talking’ to one another about real farming issues, and seeking solutions together to strengthen their scheme. This may assist in changing the way they work in silos even though they are in an irrigation scheme. They are more likely to develop connections among each other, and may start pulling their resources together. The project team, including the extension officer, plays a facilitating role here where they will assess the kind of assistance needed and draw in the relevant stakeholder to assist the farmers. Engaging in several of these cyclic participatory processes is likely to enhance women’s confidence and agency, and likely to lead to a more vibrant irrigation scheme where women feel more empowered as they tackle different issues related to their farming.

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