REVIEW OF APPROPRIATE ENTREPRENEURIAL DEVELOPMENT PATHS FOR ESTABLISHMENT OF SMALLHOLDER IRRIGATION FARMING BUSINESSES

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by

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EXECUTIVE SUMMARY

Significant efforts have been made by the South African government to revitalise the irrigation schemes with emphasis mainly on the improvement of irrigation infrastructure. However, most of these irrigation schemes remain under-utilised despite the huge government investments. The government's intention has always been about enhancing access to functional irrigation infrastructure in order to facilitate a transition of smallholder farmers from subsistence to market oriented production. However, although irrigation schemes and farmers generally underperform when compared to larger-scale agriculture, irrigation has historically led to a rise in farm income that was sufficient to lift poor households out of poverty, substantially improve rural livelihoods and drive economic development more broadly.

Smallholder irrigation is a strategic sector in South Africa's national development policy (Cousins, 2013). The national development strategy for the next 15 years identifies smallholder irrigation as critical to reducing rural poverty through increased income and employment. The sector has potential to contribute significantly to food security, income and employment creation. However, farmers involved in smallholder irrigation in South Africa remain largely inefficient, with low productivity and poor market participation. Smallholder irrigation schemes have not yet made any meaningful contribution to food security and employment creation.

The Water Research Commission has over the past 25 years been funding research for development projects looking at irrigation water use in agriculture. Through this campaign, the WRC funded research which was conducted by Denison et al. (2016), Obi (2016) and Wale and Chipfupa (2018). Broadly the research was about *investigating and developing appropriate entrepreneurial development paths for expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods on selected smallholder irrigation schemes in South Africa.*

The research was conducted in Limpopo, Eastern Cape and KwaZulu-Natal and the specific objectives of the projects were as follows:

- To evaluate natural, physical and financial assets with specific attention to irrigation farming potential.
- To evaluate human and social assets with particular attention to entrepreneurial spirit and management capabilities within incentives of secure land tenure, water use rights and leadership in organisational structures.
- To determine sources of livelihoods and opportunities to improve contribution by farming within available food value chains.
- To determine the aspirations and goals of farmers to expand irrigation crop production from homestead gardens to irrigation plots and/or from one to more than one irrigation plot.
- To formulate and test appropriate development paths for establishing sustainable farming businesses with crop enterprises to increase food security, profitability and employment opportunities on smallholder irrigation schemes.

The common challenges identified by the projects include:

- Lack of security of land and water tenure;

- Lack of access to finance;
- Lack of access to markets;
- Inability to meet market demands in terms of quality and quantity of produce and exploitation by middleman.

Following the completion of all these studies, the Water Research Commission undertook to review the three projects with the purpose of determining measures that will provide guidance on entrepreneurial pathways and make recommendations that support farmers to better participate in formal value chains. The specific aims of this review were to:

- Consolidate information gathered from different WRC studies and present it to a diverse stakeholder group (NGOs, Researchers and Government) in a way that allows them to engage with it and find ways to integrate the findings into their own work programmes.
- Engage with stakeholders to share information and develop practical mechanisms for the inclusion of smallholders in commercially oriented value chains. Make information accessible and present it in ways that can inform policy and decision-making.
- Make information accessible and present it in ways that can inform policy and decision-making.

As an introduction the review began by exploring different ways of defining entrepreneur and entrepreneurship, stating how different authors identify and characterised the concept. The smallholder agriculture and smallholder irrigation agriculture were briefly reviewed in the context of entrepreneurship.

The body of the review contains the in-depth evaluation of the assets with regards to entrepreneurship and smallholder irrigation agriculture. The authors evaluated human, physical, social and social capital as per study area. Human capital such as skills and education were found to determine the extent to which farmers and the community can be able efficiently use resources and assets in their environment in order to make profit or and improved livelihood. Access to physical assets positively impacts the farmers' ability to achieve their aspirations. Farmers endowed with physical assets such as livestock and farming equipment (pipes, sprinklers, water pumps, etc.) and land wants to expand otherwise than those without assets. Improved infrastructure can support increased social capital, making it easier for people to travel to meetings and ceremonies and participate in events. Social capital can be raised by becoming a member of an association which affects the performance of farmers greatly, simply by sharing experience among members. In an association which is often a group setting, members are able to share information with one another which would otherwise not be available to the general public. Lack of financial capital was found to hinder farmers from expanding and diversifying into new high value enterprises.

Different farmer typologies were identified and explained by the authors based on the nature of agricultural activities they engaged in and their ability to identify opportunities and take necessary risks of pursuing such opportunities. The typologies were also formulated based on where the farmers operated, i.e. within schemes, outside schemes as independent irrigators or home gardeners.

The appropriate entrepreneurial development paths formulated and presented by the three authors were reviewed and summarised. Wale and Chipfupa (2018), upon concluding their research, formulated three main entrepreneurial development paths, i.e.:

- Pathway for homestead and community gardens
- Pathway for independent irrigators and
- Pathway for scheme irrigators

Denison et al. (2016) suggested a framework of pathways consisting of 12 possible pathways:

- Pathway 1 – Start with home gardening
- Pathway 2 – Homestead to independent irrigated plot
- Pathway 3 – From homestead to scheme plot
- Pathway 4 – Intensifying and expanding the home garden
- Pathway 5 – From irrigated home garden to independent irrigated plot
- Pathway 6 – Expanding and intensifying the irrigated independent plot
- Pathway 7 – Irrigated home garden to scheme plot
- Pathway 8 – Expanding and intensifying the scheme plot
- Pathway 9 – Scheme plot to independent irrigated plot
- Pathway 10 – Independent irrigated plot to scheme plot
- Pathway 11 – Scheme plot to home gardening
- Pathway 12 – Independent irrigated plot to home gardening

The consultation process was conducted through a series of workshops held in each province where each study took place. The workshops were facilitated using a Role Playing Game (RPG). Role Playing Game is a technique used to simulate reality by creating an abstracted version of the region, its dynamics and stakeholder interactions. The notion of role playing takes participants out of their comfort zone by enabling them to openly play out their role in reality to view their influences and effects on the system. The role playing game was very innovative, it proved to be a useful tool that allowed people to engage and speak freely in a more informal and fun way. It should, however, need to be noted that the participants with dominating personalities may want to jump to each and every role wanting to contribute and this requires strong facilitation skills to monitor the game and allow other participants to voice out their views.

The stakeholder consultation revealed that there has been enough research conducted to determine the challenges faced by smallholder farmers in irrigation schemes. The challenges are quite similar across different provinces. The next step now is to conduct pilot projects based on recommendations arising from this research. Access to markets and funding are the most limiting factors hindering farmers from transforming into entrepreneurs. Land is identified as limiting in some cases; however, the stakeholder consultation revealed that land is rather underutilised. There are other community dynamics which make land to be inaccessible.

The project recognised that there are long term and short term interventions. Interventions relating to improving farmers' ability to access marketing, access to finance, skills development and training and giving support to the youth were identified as short term. While policy interventions, improvement of infrastructure and mentorship & knowledge were identified as long term interventions.

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1 INTRODUCTION

The institute of Natural Resources was appointed by the Water Research Commission (WRC) to review the appropriate entrepreneurial development paths for establishment of smallholder irrigation farming businesses. The WRC conducted research in three provinces, i.e. KwaZulu-Natal, Eastern Cape and Limpopo which was aiming to **review and evaluate appropriate development paths for expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods on selected smallholder irrigation schemes in South Africa".** The main authors or researchers who performed the study in different provinces were Wale and Chipfupa, 2018 in KwaZulu-Natal; Obi, 2016 in Eastern Cape and Denison et al., 2016 in Limpopo.

In KZN there were four irrigation schemes selected as study site:

- Makhathini Irrigation Scheme
- Ndumo-B Irrigation Scheme
- Bululwane Irrigation Scheme
- Tugela ferry Irrigation Scheme.

In Limpopo the research was conducted in two research sites:

- Thulamela local municipality, Dzindi Irrigation Scheme
- Greater Tzaneen, Julesburg Irrigation Scheme.

In Eastern Cape the research took place under three irrigation schemes:

- Zanyokwe Irrigation Scheme, Amahlathi local municipality
- Qamata Irrigation Scheme and Environs
- Tyefu Irrigation Scheme.

The studies sought to understand the challenges that smallholder irrigation farmers face, and to identify mechanisms to improve their water use efficiency as well as their participation in food value chains. What was clear is that a lot of information has been gathered to date, and an effective mechanism is sought to enable this information to be used by stakeholders so that opportunities are created for smallholders to establish and manage viable businesses that allow for income generation and job creation. The specific aims of this project are to:

- Consolidate information gathered from different WRC studies and present it to a diverse stakeholder group (NGOs, Researchers and Government) in a way that allows them to engage with it and find ways to integrate the findings into their own work programmes.
- Engage with stakeholders to share information and develop practical mechanisms for the inclusion of smallholders in commercially oriented value chains. Make information accessible and present it in ways that can inform policy and decision-making.
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2 REVIEW OF THE LITERATURE

2.1 Defining entrepreneurship?

Joshua Maluleke (2017) in his publication describes entrepreneurship as "a very slippery concept". He further explains that there are many different meanings which arise depending on the people with whom you are speaking. It is important that we note that entrepreneurs are not necessarily homogenous with respect to their backgrounds, interests, and gender and so on (Maluleke, 2016). In the literature review of the three research studies, the authors provided comprehensive definitions of "entrepreneur" and "entrepreneurship". The three authors agreed that the concept of entrepreneur has no single straight forward definition. It was highlighted that the use of the term goes back as far as the 1700's and a number of authors have undertaken to define it. Obi (2016) upon reviewing a number of definitions, explained entrepreneurs based on their activities or as a person endowed with knowledge, skills, initiative and spirit of innovating to achieve his/her set goals. Some of these activities include initiation, risk calculation, resource mobilization and setting up new businesses through the application of innovations to meet clearly-defined market demands (Einstein College of Engineering, 2011). Wale and Chipfupa (2018) highlighted that entrepreneurs need more than just their personal characteristics. They also need a range of competencies and abilities that can be learned or developed through training and experience. Entrepreneurship combines personal qualities with knowledge, technical and management competencies (Kahan, 2012 and Krantz, 2001).

Amongst many definitions presented by different authors in different context, Denison et al. (2016) selected two definitions formulated by Chell (2008) which fitted well with context of the study, i.e.:

- *Entrepreneurship is the ability to recognise opportunity while simultaneously figuring out whether there exist possibilities to tap the necessary resources to exploit it. Moreover, it is pre-existing credit (financial, social or intellectual capital) that entrepreneurs are given access to in order to exploit the opportunities that they have recognised.*
- *Entrepreneurship is the process of recognising and pursuing opportunities with regards to the alienable and inalienable resources currently controlled with a view to value creation.*

According to Maluleke (2017), in economic context, an "entrepreneur is the one who combines all the factors of production (land, labour, natural resources and capital) to make profit. Furthermore despite the lack of a universally agreed upon definition, entrepreneurship is characterized by five common features (Maluleke, 2016), i.e.:

- Calculated risk taking – the ability to take a risk that usually lead to benefits, is one of the defining traits of a successful entrepreneur.
- Innovation – this means creating new ways and methods of taking advantage of the opportunities in the business market; by studying the trends in the market one is engaged in, to anticipate and identify offerings/opportunities the competitors might not be aware of.
- Seizing an opportunity – an entrepreneur has to have the ability to see an opportunity.
- Efficiency and profitability – an entrepreneur needs to be organized and efficient in order to make it in the business space. Profitability is the fundamental basis for any successful business.
- Corporate citizenship – successful entrepreneurs are those who run their businesses as active and responsible corporate citizens who contribute positively in the communities where they

do business and strive to solve societal challenges as opposed to merely maximizing profits at all costs.

2.2 Smallholder agriculture in South Africa

Wale and Chipfupa (2018) classified South African agriculture into three main categories, namely: small-scale, emerging farmers and medium to large-scale farming. This classification is not only based on the size of land being farmed but other factors such as the general character of the business, with labour supply as a principal factor are taken into consideration (Carver, 1991). Across the three reports (Denison et al., 2016; Obi, 2016 and Wale and Chipfupa, 2018), smallholder and small scale are used as synonyms according to the author's preference. Denison et al. (2016) defined the term smallholder as the term used to refer to black African producers who farm in smallholdings. The term includes farmers growing in home-food gardens or homestead gardens, irrigated farmers and people farming in rainfed fields outside of the homestead. Characteristics differentiating small scale/smallholder from commercial farmers include scale and size of farm system, proportion of crops sold, household expenditure, and use of family labour, mechanization, capital intensity, financial ability and level of linkages with larger economic systems (Denison et al., 2016; Wale and Chipfupa, 2018). Wale and Chipfupa, (2018) found that smallholder farmers are faced with a variety of challenges which include drought, pests and crop diseases, scarce arable land with water, lack of market availability, old age, low level of education, limited availability of quality infrastructure, lack of good cellphone network connections and limited access to quality inputs. Denison et al. (2016) established that a poorly-functioning rural economy with undeveloped infrastructure, weak market linkages and poor agricultural support services isolates rural households from the mainstream economy and from important agricultural value-chains

2.3 Smallholder irrigation in South Africa

Smallholder irrigation is a strategic sector in South Africa's national development policy (Cousins, 2013). The national development strategy for the next 15 years identifies smallholder irrigation as critical to reducing rural poverty through increased income and employment creation (Mnkeni et al., 2010; Economic Development Department., 2011; Cousins, 2013; National Planning Commission, 2011). The sector has potential to contribute significantly to food security, income and employment creation (Bembridge, 2000; Vink and Van Rooyen, 2009). However, farmers involved in smallholder irrigation in South Africa remain largely inefficient, with low productivity and poor market participation. Smallholder irrigation schemes have not yet made any meaningful contribution to food security and employment creation (Van Niekerk et al., 2011; Jordaan et al., 2014).

There have been significant investments in the sector but the sector has failed to make a meaningful contribution to food security and employment creation. This poor performance has been attributed to, among other factors, the failure of existing agricultural development programs to develop the human and social capital to effectively manage the schemes, engage in productive agriculture and participate in high value markets. Inevitably, this has led to the inability to take advantage of the huge potential and opportunities presented by smallholder irrigation to transform rural economies (Wale and Chipfupa, 2018). The South African government policy direction is focused on the development of sustainable rural communities and improved employment opportunities and economic livelihoods. In this regard, priority attention should, therefore, be given to encouraging existing and new farming businesses to be undertaken on smallholder irrigation schemes.

Denison et al. (2016) reported that smallholder irrigation in South Africa is a small fraction of the total irrigation area. The number of black irrigation farmers is a small fraction of the national irrigation total, estimated at 150 000-250 000 individuals (de Lange, 1994; Backeberg, 2006). These are smallholders farming on irrigation schemes, independently, on their own (or leased) farms, or in home and community gardens. Based on the best information available, South African smallholder irrigators can be grouped as follows:

- Farmers on plots as part of irrigation schemes, estimated to cover 47 667 ha
- Independent irrigators, estimated to cover 30 000-40 000 ha – there are smallholder-irrigators who operate on their own outside of schemes
- Irrigated gardens, estimated to cover 10 000-20 000 ha.

It is worth mentioning that although irrigation schemes and farmers generally underperform when compared to larger-scale agriculture, irrigation has historically led to a rise in farm income that was sufficient to lift poor households out of poverty, substantially improve rural livelihoods and drive economic development more broadly (Denison et al., 2016).

2.4 Entrepreneurship in small scale farming or smallholder agriculture

According to Denison et al. (2016) farming is a business when it involves the sale of produce. They then defined entrepreneurship in smallholder farming as the production of crops and animals for markets. In his review, he also referred to the definition of Kahan (2012), which states that a small-scale farmer entrepreneur is someone who produces for the market; while LEISA (2012) equated small-scale farmers becoming entrepreneurial when they increasingly produce for markets with a profit motive, while Djurfeldt (2013) also considered participation in markets as a pivotal aspect of smallholder entrepreneurship.

Wale and Chipfupa (2018) highlighted that many studies of farm business processes are resistant to considering farmers as entrepreneurs. This reluctance comes from the existing views of farmers, particularly under state subsidy systems and as having been separated from the normal market process (Gasson and Errington, 1993). Additional reluctance originates from farmer identities that are formed primarily as producers rather than as business people (Van der Ploeg, 2003; Juma and Spielman, 2014). Bauernschuster et al. (2010) argue that African farmers, in particular, do not fit the modern characterisation of an entrepreneur. The argument is that they are often viewed as independent producers who operate outside the formal markets by consuming what they produce.

Denison et al. (2016) deduced the following points after reviewing entrepreneurship in the informal economy of South Africa:

- Business activity is tangible evidence of entrepreneurship;
- Entrepreneurship in smallholder agriculture can be equated to the production of crops and animals for markets;
- Professional and managerial skills are important for success in farming;
- Entrepreneurship among farmers can extend beyond agriculture;
- Opportunity and necessity are both important motivators for entrepreneurship in contemporary urban and rural South Africa;
- Capital investment and income can be used as indicators to predict to what extent entrepreneurship was motivated by necessity or by opportunity.

3 FACTORS AFFECTING ENTREPRENEURSHIP DEVELOPMENT IN SMALLHOLDER AGRICULTURE

3.1 Economic environment

Environment is a blanket term used to describe sub-factors such as availability of capital, labour, farm inputs and implements, and markets (Obi, 2016). Smallholder farmers lack capital to invest and transform into commercial farmers. This prevents them from investing in new businesses that have high production risks yet such may have a potential for capital formation and entrepreneurship development. Lack of capital, labour saving technologies, low farm input use, and markets and market information negatively affects the entrepreneurship drive and spirit (McElwee 2005; Sudharani, 2010). Development of smallholder irrigation farming will result in increased crop production and more marketable surplus. Therefore this has to be matched with improved market access and proper market distribution channels otherwise farmers might be worse off due to low farm gate output prices. Farmers are discouraged because the middlemen will retain most of the profit margin from the sale of farmers' own produce. Wale and Chipfuto et al. (2016) suggested that since the government is the custodian of policies in the country, a phased approach could be adopted where smallholder farmers are supported through different policy instruments to allow them to compete with established farmers in the food markets and then gradually weaned off to stand on their own.

3.2 Infrastructure

In most South African rural areas, lack of simple infrastructure is blocking off beginning and growing worthwhile farm businesses. Poor roads leading to markets, inadequate storage and market amenities and even irregular components of electrical energy create substantial barriers to growing farm groups (Kahan, 2012). According to Global Entrepreneurship Monitor (GEM) (2011), entrepreneurial spirit can be enhanced through improved infrastructure development, quality of the population in terms of skill building, research and development, and technology advancement. High transaction prices is one of the primary elements constraining the growth of smallholder agriculture in African countries and this can generally be attributed to bad infrastructure. An evaluation of the journey of any country that has efficiently developed its agriculture will continually pick out the provision of accurate infrastructure as a requirement for accomplishing higher tiers of agricultural productiveness and profitability.

Entrepreneurship is induced by well-developed information services, transport infrastructure and markets. A lack of infrastructure drives a wedge between prices farmers receive for their output and the market price, lowering the profits associated with technological adoption (ATAI, 2014; Gardner, 1992). Gavira (1990) reported that an inadequate public infrastructure could result in massive losses to producers. An example of such is the loss faced by Tanzania in 1988 where three regions lost 50% and 80% of cotton and rice respectively due to heavy rain that lead to roads being completely inaccessible (Gavira, 1990).

The improvement of infrastructure can contribute to improving agriculture entrepreneurship in several ways. Cross-country evidence on the impact of infrastructure on agricultural productivity shows advantageous relationships between productivity and the development of roads and irrigation. Improvement of infrastructure can minimize fees triggered by unsuitable transport routes that affect

the produce as well as enhancement of access to input components such as technology adoption would increase their access to the market.

Lack of infrastructure (lack of storage facilities) severely limits productivity. This includes post-harvest storage services and cold rooms which assist in retaining the quality of the products due to the perishable nature of agricultural products (Machete, 2004). According to Magingxa et al. (2009:50) assembly and storage points for farmers' produce are unsuitable for agricultural product. Additionally, smallholder farmers sell their produce immediately after harvest when prices are low due to lack of storage services which immediately minimizes their output value and productivity (Tollens, 2006; Magingxa et al., 2009). An improvement in infrastructure allows smallholder farmers the ability to better save their harvest which leads to a longer shelf life and less spoilt or damaged produce. When there are better storage facilities, farmers are able to sell their surpluses and supply consistently during the off season. With lack of infrastructure their inconsistency makes them less competitive in the value chain and this prevents them from fully participating successfully in the chain. Due to their inconsistency and low competitiveness, other role players in the chain (e.g. supermarkets) avoid working with them. Similarly, supermarkets choose to not work with smallholder farmers because they do not deliver the required quality products as regularly as they should and they do not invest consistently (Reardon (2005:29), cited by Baloyi (2010)).

3.3 Land tenure and land ownership

Smallholder farmers' entrepreneurial spirit is also negatively impacted by lack of land tenure security, which limits access to credit amongst numerous components in smallholder farming. Wannasai and Shrestha (2008) outline secure land tenure as the possession of personal land with land titles issued and the landowners who preserve this certificate possess unrestricted rights of sale, transfer and inheritance. According to Roth and Haase (1998:2), from an economic angle tenure insecurity is a "function of insufficient variety of rights or lack of key rights, inadequate period or lack of assurance".

Land tenure security is one of the major elements affecting water use productiveness. Secured tenure creates incentives to make investments and use resources more efficiently. Secure land tenure immediately increases productiveness by means of improving access to inputs through creditworthiness and collateral value of land (Roth and Haase 1998; Darroch and Mushayanyama, 2006). It also limits land disputes because there is a clear definition and protection of rights which increases productivity through increased agricultural investments (Roth and Haase, 1998). Farmers from the different reviews reported to have inadequate and poor-quality land and poverty of tenure security.

Tenure insecurity makes it impossible for farmers to access credit from formal lenders due to the requirements which include a clear and transferable title before lending is approved as credit from informal lenders is inadequate. As a result, land ends up not being fully utilised, productivity decreases and the economy is negatively affected (Machingura, 2007). Hussain et al. (2007) state that water value is higher in production of high valued crops (such as tree crops, coffee, etc.) however due to negative land security, funding in high-value crops is restrained and farmers have no choice but to cultivate plants with lower value which may not even have opportunities in the market; this in turn impacts their profit margins and entrepreneurial spirit. Land security constraints negatively affect smallholder aspirations to expand. Farmers dealing with land tenure security constraints are 4% less probable to be involved in expansion compared to those without such constraints (Obi, 2016).

Besides insecure land tenure that hinders farmers' performance, small plot allocation is another major problem that hinders high productivity by farmers. In a South African nationwide survey, it was found that at least 25% of smallholder farmers are approaching landlessness as they control less than 0.11 ha per capita. According to Jayne et al. (2010), "under the existing conditions, the ability of this bottom land quartile to escape from poverty directly through agricultural productivity growth is limited by their constrained access to land". This leads to the conclusion that small plot allocations are therefore inadequate for a producer to profit from economies of scale and to access markets through being able to supply large quantities.

3.4 Lack of technical skills

A lack of technical skills hinders farmers to move from homestead food gardening to smallholder plots. The technical aspects of farming such as record keeping on input material, how much they sell or consume causes farmers to have limited knowledge on the profit they make or potential profit they could make, this in turn leads to farmers being at the lower end of the bargain each time they enter the market (Wale & Chipfupa, 2018) . Another example that farmers need to learn as a skill is how to set up a production plan, in order to know which produce to harvest at a given time, to minimize flooding the market with the same produce that other farmers already have as this leads to a loss rather than profit. Another factor that hinders homestead food garden farmers to transit to smallholder irrigation is the generally low level of formal education which limits the knowledge that farmers have in relation to the farming sector such as technical skills (Obi, 2016).

4 EVALUATING ASSETS IN RELATION TO ENTREPRENEURSHIP

4.1 Human capital

KwaZulu-Natal

According to FAO (2001:28) human capital is defined as "knowledge, experience and skills possessed by people involved in the production process which is directly influenced by education and training". It is not only limited to education but also to the individual state of health. Education was found to be the main important variable in order for farmers to be more agriculturally productive and efficient (Wale & Chipfupa, 2018). Education assists farmers to understand and accept the complex scientific changes which prove to be difficult for illiterate farmers (Okpachu *et al*., 2014). Education for smallholder farmers can lead to an increased level of market participation as they will be able to better understand and utilize both technical and management operations (Montshwe, 2006). Therefore in order to improve agricultural productivity and water use productivity, human capital must be given attention.

Human capital affects the adoption and utilisation of technology which directly influences the decision making in resource allocation while directly influencing farm productivity (FAO, 2001). Hence, training and education can assist smallholder famers in improving management skills and farm operations such as the ability to apply and adopt the use of agrochemicals and innovative technologies (Wale and Chipfupa, 2018). In homestead gardening, the households' ability to manage their labour and take advantage of opportunities for economic activity is also constrained by the levels of education, skills and the health status of household members.

Wale & Chipfupa (2018) in addition reported that, smallholder farmers are often subsistence producers and are characterised as part of the rural poor. Literature highlights that more often and human capital has little attention although it is the foundation of improving farming operations and productivity (Fanadzo, 2012; Wale and Chipfupa, 2018).

Eastern Cape

Obi (2016) emphasized the importance to understand the roles of human capital, social capital, goals and aspirations to increase production efficiency and productivity. It was found that human capital mostly relating to the level of education and age of an individual had a positive correlation with entrepreneurial spirit (Hagedoorn, 1996; Braguinsky et al., 2009; Obi (2016). Human capital such as skills and education has been found to determine the extent to which farmers and the community can be able efficiently use resources and assets in their environment in order to make profit or a stable livelihood (Obi, 2016). On the other hand, farming experience as human capital was found to have a positive and significant effect on produce such as cabbage but in contrast to expected results, education was found to have a negative impact on cabbage production because individual with higher qualification tend to migrate from the less paying farming activities to formal employment thought to be more paying in terms of incomes (Barambah, 2007). In terms of maize production, both farming experience and level of education had a significant and positive relationship (Obi, 2016).

Limpopo

Ellis (2000) defined human capital as 'the educational level and health status of individuals and population'. While Scoones (1998); Krantz (2001) and Haidar (2009) defined it as 'the skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies'. According to Krantz (2001), one of the most important assets for rural households is their human capital. Human capital is the skills, knowledge and ability to labour and good health that enable people to achieve their livelihood objectives (DFID, 2001). Thus, quality of human factors such as household heads' skills level, health status and household size have influence on the household's ability to increase income and move out of poverty.

Similarly as in other provinces, Denison et al. (2016) reported that farmers with a high level of education, knowledge and experience are likely to be early adopters of new technologies and more efficiently productive than their counterparts. Elderly and uneducated individuals dominate in smallholder farming, indicating the 400 deteriorating labour productivity, output and motivation to adopt innovative technologies that can increase overall water productivity (Wale and Chipfupa, 2018). Regrettably rural households in South Africa are characterized by illiteracy and poor technological, financial and marketing skills as well as handicapped by illnesses, which results in major challenges in accessing useful formal institutions.

Another factor that plays a role in the productivity of farmers is the health status of the farmer (s) which may affect labour productivity positively or negatively as it is a major input in running a smallholder irrigation scheme (Denison et al., 2016). Chaminuka et al. (2006) similarly pointed out that households with a member suffering from chronic illnesses, like HIV/AIDS, are more likely to lose a high number of hours due to taking care of the illness unlike a household that has no ill members which only loses 0.34 hours per day of labour. Labour is also affected by age and gender as older individuals tend to have less energy for the required activities on farming and negatively affects the willingness of farmers to adopt new technology and practices (Badisa, 2011; Howley, Donoghue & Heanue, 2012). Female household heads dominated home gardeners while the heads of irrigator households were mostly male. Consistent with household headship, the majority of farmers in home gardener households were female while among irrigators, the farmers were generally male. Noteworthy is that, across household types, the household head was also the farmer in most households. Less female participation in irrigation farming indicates exclusion of women. However, the willingness of females to participate in irrigation should be established (Denison et al., 2016).

Smith (2004) pointed out that the benefits of irrigation farming spread wider linking to improvements in human capital through better nutrition and increased ability to pay for health and education. In addition they increase ability to save, to borrow and to invest in capital, which reduces vulnerability and contributes to overall production. Denison et al., 2016 reported that human capital indicators in the study showed that scheme and independent irrigator households are superior to home gardener households due to household size, number of aged adults in the household, lower unemployment rate and higher level of education.

4.2 Physical capital

KwaZulu-Natal

According to Wale & Chipfupa (2018), access to assets, especially physical assets, positively impacts the farmers' ability to achieve their aspirations. Farmers endowed with physical assets such as livestock and farming equipment (pipes, sprinklers, water pumps, etc.), among others, want to expand with more land than those without assets. Furthermore, cattle also act as a source of draught power and together with ownership of farming equipment; they enhance the farmer's ability to operate bigger land sizes. Thus, building the smallholder household's resource base in Makhathini and Ndumo-B increases the chances of realizing their aspirations for expansion needs by being sold for profit, this is critical for expansion, which needs financial resources (Kosec et al., 2012).

Access to markets increases incentives amongst smallholder farmers to expand land under production whilst limited access results in decreased produce and value (Van der Heijden and Vink, 2013; Sinyolo et al., 2016). Smallholders need readily accessible markets that offer competitive prices and hence decent returns to their farming. This will leverage their ability to increase land under production (Wale & Chipfupa, 2018). Wale & Chipfupa (2018) found that if a household does not possess, through ownership or otherwise, the physical assets that make farming possible, they fail to utilise the available opportunity. Furthermore, it was found that ownership of physical capital including agricultural assets such as plough, planter, tractor, truck or car, trailer/ cart and water tanks is quite low across all types of farmers in the two communities. Wale & Chipfupa (2018) also highlighted that ownership or access to other key physical assets such as transport, storage facilities and other agricultural equipment was low. The irrigation scheme needs to be functioning well in order for farming to be sustainable and physical assets such as schools, shops; health posts and roads need to be available for improved farming to contribute to better livelihoods.

Eastern Cape

According to Obi (2016), physical capital comprises of physical assets and infrastructure possessed or needed by a producer for the enhancement of productive activities. Physical capital often comes in the form of support needed to augment the living standard of the people or to enhance sustainable livelihoods.

Obi (2016) reported that in smallholder maize production, the tangible assets have a positive and significant impact. Therefore, for increased maize output, farmers need to increase land size under maize production, increase the use of improved seeds and increase the irrigation operation. In the study, physical assets were taken as durable items owned or accessed by the households such as irrigation equipment, ploughs, structures for storage and other post-harvest activities. It was found that smallholder farmers from the study areas had limited access to these physical assets which in turn limited their productivity and efficiency. This was found to be the same for financial assets (Obi, 2016).

Limpopo

According to Denison et al. (2016), physical capital plays a major role in production decisions and includes basic infrastructure and other productive resources that are needed by individuals or households to support livelihoods such as buildings, irrigation canals, roads, tools and machines. A well-developed physical capital base enhances the effectiveness and efficiency of sustainable livelihood outcomes (Krantz, 2001). Expansions in Limpopo were found to be limited by the lack of both physical and institutional infrastructure (Denison et al., 2016). Households in Limpopo were also found to have limited basic physical assets such as hand hoes and spades whilst these were common among smallholder irrigating schemes. On the other hand ownership of other assets such as wheel barrows was common amongst home gardeners and less common among smallholder irrigating schemes (Denison et al., 2016).

4.3 Social capital

KwaZulu-Natal

According to FAO (2011), social capital is defined as one's ability to utilise social networks and institutions. Social capital is considered as an important capital because it determines access to other capital assets such as land title, credit access and equipment, all of which have implications for resource allocation and hence productivity.

Improved infrastructure can support increased social capital, making it easier for people to travel to meetings, ceremonies and participate in events. Cultural observance and ceremony is important and the formation of committees and the increased ability within the communities to fund ceremonies is a positive aspect (Wale & Chipfupa, 2018). Increasing social capital in society can assist individuals with avoiding conflict, creating forums for negotiations and disputing resolution mechanisms, exploiting gains from increased specialisation and increase knowledge about the physical and social factors important in the production and marketing of agricultural produce (Wale & Chipfupa, 2018).

Despite the investments made so far in smallholder irrigation schemes, the literature shows that the performance of smallholder irrigation in SA is poor. It must be noted that social capital was weak as farmers were found to prefer acting as individuals than in groups for activities such as planting, commodity marketing, market channel choice and harvesting, which in turn leads to the inability to take advantage of the possible economies of scale and other benefits of collective action (Wale & Chipfupa, 2018). Smallholders with poorly endowed social capital have been found to be characterised by low entrepreneurial spirit, are risk averse and do not have a positive attitude towards information seeking. Thus access to psychological and social capital assets affect farmers' aspirations to expand irrigation farming activities (Wale & Chipfupa, 2018)

Eastern Cape

Padilla-Fernandez and Nuthall (2001) indicated that farmers' goals and aspirations influence farmers' decision making in farm management and this determines the level of productivity. According to Robert (2012), farmers with high level of entrepreneurial spirit are more likely to accumulate more social capital and this eases access to production assets and financial assets important for increased productivity. Nonetheless, rural farmers often confront high levels of poverty and this may reduce their enthusiasm to invest their scarce resources, thus killing their entrepreneurial spirit. Therefore,

for improved rural smallholders entrepreneurship, there is need to encourage accumulation of social capital through farmer groups and cooperatives (McElwee, 2005; LEISA Magazine, 2009; Tahmas, Hekmat and Davodi, 2012).

Social capital can be raised by becoming a member of an association which affects the performance of farmers greatly, simply by sharing experience among members. In an association which is often a group setting, members are able to share information with one another which would otherwise not be available to the general public (Obi, 2016). Roslan et al. (2012) argue that older farmers are more likely to be wealthier with more accumulated social capital as compared to youthful farmers. Accumulated wealth and social capital provides a stronger basis for older farmers to venture in more farm production risks than younger farmers. Obi (2016) reported results that were similar of that of Roslan et al (2012) whereby a positive and significant relationship between farmers' attitudes towards factors such as risk taking, age, educational level and social capital. In contrast, Dadzie and Acquah (2012) reported a negative and significant relationship between farmers risk taking attitudes and age, and education level, at Agona Duakwa in Agona East District of Ghana. Brauw and Eozenou (2014) reached similar conclusions for Mozambican farmers, while Trujillo et al. (2016) observed similar tendencies among Dutch livestock producers.

Limpopo

Social capital is defined by Gilbert and McLeman (2010) as the attributes of social relations from which members of formal or informal social networks can secure benefits and is often linked to trust, reciprocity and exchange within a community. Social capital refers to group memberships, networks, and trust relationships, upon which households draw in pursuit of livelihoods. Group membership often involves obligations to assist others in times of distress. Households' participation in local institutions and having relatives in the same area contribute to the resilience of vulnerable households. In many rural communities, it is common to have shared access to property such as grazing areas, forests and irrigation systems and social relations can help increase the stability of such systems (Denison *et al*., 2016).

People tend to develop social resources through networks and connectedness, through membership of formalised groups and by developing relationships of trust, reciprocity and exchange (DFID, 1999). According to Pretty & Ward (2001), societies with high levels of social capital are often found to have high levels of 'internal morality'' or self-discipline, with individuals balancing individual rights with collective responsibilities. Furthermore, vital aspects of successful social capital consider connectedness, networks and groups.

Social capital can assist households in times of crisis and providing ways to deal with different forms of stress in farming (Van der Geerst, 2004; Bell, 2012). Working as a group has been found to have several good results which include reduced transaction costs, expanded access to wider society, and reliable safety nets that most likely result in a successful farming operation (DFID, 1999). According to Denison et al. (2016) entrepreneurship is known as the relentless pursuit of an opportunity. This means that entrepreneur must be quite mindful, and seek and pick up opportunities, test and drop them if they prove not to be what they had thought whilst still using networks to draw efficient social capital for their irrigation schemes to allow exploitation of opportunities.

4.4 Financial capital

KwaZulu-Natal

Wale & Chipfupa (2018) reported that there is a lack of financial capital that hinders farmers from expanding or diversify into new high value enterprises in the Makhathini area. The study areas showed that most of the households survive on social grants with 90% of households earning R1600 per month or less. It was noted that the lack of title deeds within small scale farmers inhibits them from accessing credit and limits their investments (Wale &Chipfupa, 2018). Access to finance is a collective concern of smaller-scale farmers to expand their operations, engage in value-adding activities, purchase inputs and/or invest in new farm enterprises. Thus, lacking such access further limits their ability to take up new opportunities that arise. Eventually, this inhibits development of entrepreneurial behaviour (Kahan, 2012).

Furthermore, the study revealed that although farmers may have some sort of savings, they are fearful of taking loans because they may not be able to receive adequate profit from their operations to pay them off (Wale & Chipfupa, 2018). On the other hand, the study revealed that farmers are unable to apply for loans at formal financial facilities due to lack of collateral. The lack of financial capital also affects the effectiveness of entrepreneurial training offered to farmers. Findings show that after completing training, some Makhathini farmers discover they do not have funds to implement the new ideas, techniques and practices learnt. It is, therefore, imperative that this is taken into account when developing training programmes in the future.

Eastern Cape

The ICID (2007) defines financial capital as capital that includes international, national and local investments, mobilizations of savings and credit, urban-rural linkages with accompanying migration of labour, remittances, welfare and pensions, government grants and subsidies. In addition financial capital can be viewed as money that entrepreneurs and businesses use for procurement of inputs.

Obi (2016) found that both homestead gardeners and smallholder irrigators use social grants, remittances and pensions as major sources to cover for lack of financial assets. In addition, livestock and off farm activities were also used as secondary sources of income. Nonetheless it was found that in general smallholder irrigators received more income from crops than homestead garden owners while the homestead gardeners made more income from off-farm activities than smallholder irrigators which makes economic sense in terms of time usage (Obi, 2016).

Limpopo

Sen (2005) defines financial capital as the availability of cash or equivalent that enables households to adopt different livelihood strategies. This is likely to be in the form of savings from employment and access to credit in the form of loans. Access to credit is limited as rural poor households lack access to credit because they do not have the proper requirements such as collateral. This results in many households/ subsistence farmers with a lack of assets to be converted to cash in times of need, which leads to them being extremely vulnerable to any loss of income or entitlement failure (Denison *et al*., 2016).

Financial capital can be defined as stocks of money to which a household has access, which can be in the form of savings, income, remittances from family members working away from home, pension, cattle or as access to credit and may only be useful if converted into other assets or into consumption(Ellis, 2000). Financial capital is therefore vital because it can be easily converted into other livelihood capitals to support their household in times of stress. Once access to financial capital is gained it allows investments in physical capital, which can boost production (Ungar, 2011). Campbell (1999) suggests that financial capital can be improved by increasing access to credit, supporting the expansion of savings and loan clusters and increasing business management skills.

Generally, smallholder irrigators had a stronger capital base in terms of natural, physical and financial capital than homestead gardeners which suggests that participation in irrigation farming positively affects the overall capital base of rural households (Denison *et al*., 2016). The lack of financial capital was found to be one of the main challenges for homestead gardeners to move to being smallholder irrigators. Irrigated home gardening was reported to be practised mainly by households that have had the money to drill their own boreholes (drilling one borehole costs between R 25 000 and R 30 000 (Denison *et al*., 2016).

One of the key findings from the study conducted by Wale and Chipfupa (2018) was that there is an inherent diversity and heterogeneity among smallholders which complicates the implementation of rural development interventions in the sector. This means that the "one-size-fits-all' approach will not work when dealing with such farmers. Furthermore the diversity and heterogeneity should be reflected in strategies and policies to support smallholder farming (Wale and Chipfupa 2018). The heterogeneity refers to the farmer's attitudes, objectives, decision-making and resources and these factors affect a smallholder's entrepreneurial development process or their transition towards more commercial agricultural production (FAO, 2014).

Chapoto et al. (2013) also suggest that unpacking smallholder heterogeneity is critical in transitioning them to commercial farming. Capturing smallholder heterogeneity assists in identifying and prioritizing strategies for improving market access for different types of smallholders (Torero, 2014). Wale and Chipfupa (2018) highlighted that it is important to match farmers' needs with available support programmes. Successful implementation of these programmes depends on understanding the heterogeneity and the complexity of farming systems used by different farmers. They concluded that development pathways are likely to be different for the different farmer typologies. The study also highlighted the challenge the researchers and policy makers face when try to find the right balance.

"How far can we go to account for diversity and heterogeneity and how far can the policies be tailor-made or to what extent should interventions be specific to the different needs of farmers? Research on farmer typologies will give us directions on the way forward"

4.5 Farmer typologies from the KwaZulu-Natal case

In KwaZulu-Natal, Wale and Chipfupa (2018) defined and identified farmer typologies across the study areas using the Modified Sustainable Livelihoods Framework (MSLF). After a series of classifications and categorisation, the following clusters were developed:

4.5.1 Cluster 1 Farmers with access to information but limited access to credit

The cluster is composed mainly of elderly male farmers, with minimum education. Most are quite confident and optimistic in themselves and in the future of agriculture in their area, respectively. The group has the second highest percentage of farmers who are willing to take risks in farming, which is an inherent characteristic of entrepreneurs. This cluster has the highest percentage of farmers involved in cooperatives, social groups and in constant contact with extension officers. Regarding physical capital, the group has the second highest average value of livestock assets but other physical assets are limited. The major constraints facing farmers in this cluster are lack of access to capital, inadequate access to irrigation water and limited physical assets.

4.5.2 Cluster 2 Risk taking and opportunistic but limited access to credit

This cluster constituted 7.4% of the study farmers. It has the highest proportion of farmers who are risk takers and second highest with regards to farmers who will not be farming if they had other alternative means of livelihoods. Such farmers often exert the minimum effort and they seek to engage in farming because it is the only available opportunity. They do not believe that farming is a lucrative business. The cluster has farmers who are relatively young compared to other groups but cluster 6. Their livelihoods are diversified and dominated by social grants, temporary employment and irrigation farming (17%). Access to credit, physical assets and land is a challenge for this group of farmers. A significant proportion of these farmers also report water access challenges whilst social capital is limited.

4.5.3 Cluster 3 Risk taking and opportunistic

The cluster is composed of elderly farmers, mostly female and least educated, but surprisingly, they have high confidence and are willing to take more risk and are opportunistic. This means that they are prepared to take any opportunity coming their way as long as it has potential to increase their income. However, they are unable to cope with external shocks such as drought and other natural disasters. Their major sources of livelihood are social grants, irrigation farming and remittances. Access to land and water is a challenge.

4.5.4 Cluster 4 Ambitious, optimistic and social grant reliant

Farmers in this cluster are committed to farming – they are not just farming because there is nothing else to do. These farmers are mostly female, less educated and with relatively larger average household size compared to the other clusters. The dominant livelihood sources are social grants, contributing about 78% of the average total annual income for households in the cluster. Livestock and physical assets are limited and farmers report that access to water is inadequate. Use rights of irrigated land is at an average of 1.23 ha, the second highest among all the clusters.

4.5.5 Cluster 5 Mixed farming and physical capital endowed

This cluster consists of more entrepreneurial irrigation farmers. They are mostly male farmers, risk averse, less educated and coming from households with the second largest household size. The major livelihood sources for these farmers are irrigated crop production, social grants and livestock farming. They are well endowed with both livestock and physical assets. The cluster has the highest proportion of farmers with access to credit. Irrigated land use rights are quite high at an average of 6.7 ha per

farmer, compared to farmers in other clusters. Social capital is fairly high although approximately 43% are not members of any cooperative. Access to water is a major challenge, constraining agricultural production and productivity of these farmers.

4.5.6 Cluster 6 Young and educated

This cluster is composed of young and educated farmers from larger families. The average age is about 37 years while average number of years of schooling is 10. A considerable percentage of the group indicate that they are unable to cope with external shocks and do not enjoy new challenges and opportunities. Their livelihood sources are mainly social grants, irrigation farming and remittances. Access to credit is very limited while livestock and other physical assets are low. Water seems to be a major challenge whilst land tenure security can be improved. Social capital (social networks and access to extension) is fair but it can still be improved, especially by increasing participation in social groups or cooperatives.

4.6 Farmer typologies in Limpopo

In Limpopo, Denison et al. (2016), for both project sites Greater Tzaneen and Thumela, used a cluster analysis to categories farmer typologies. The project sites were found to comprise of different farmer typologies, with Thumela having seven classes and Greater Tzaneen having three classes.

In Thumela

There were seven classes of farmer typologies identified in Thumela, below they named and briefly described.

4.6.1 Class 1 Rural dweller households

This class had the lowest degree of commercialisation of farming, the lowest farm asset value, the lowest agricultural income, and the lowest income from other entrepreneurial activity. On average, entrepreneurial activity, including gross farm income, contributed only 11.2% to total household income. The latter was below the upper-bound poverty line of R12 830 per person per annum.

4.6.2 Class 2 Rural survivalist entrepreneurs

This class also had a low level of commercialization and small farm income. However, they derived a large proportion of their income from rural business activity other than farming. They were labelled ‘survivalist’, because their average household income was close to the upper-bound poverty line and would be well below this line were it not for the income derived from their enterprises, suggesting that ‘necessity’ was probably the motivation for their doing business. This class was second largest and contained 21% of the home gardener households, and about 17% each of the two groups of irrigator households.

4.6.3 Class 3 Entrepreneurial farmers

These farmers had the second highest level of commercialisation in farming, and the second highest gross farm incomes. Their enterprises were profitable; they derived a large proportion of their household income from entrepreneurial activity (60%) despite relatively low incomes from

entrepreneurial activity other than farming, which justifies both the 'farmer' and the 'entrepreneurial' label.

4.6.4 Class 4 Petty portfolio entrepreneurs

These farmers were labelled petty portfolio entrepreneurs. The 'petty' was added to signify that without business income their household income would be below the poverty line. The label 'portfolio entrepreneur' signifies their involvement in both the business of farming (70% of gross income realised as sales) and other rural enterprises.

4.6.5 Class 5 Economic smallholders

These were termed economic smallholders because the class contained about 20% of the two types of irrigator households but none of the home gardener households. They stood out from the pack by their exceptionally high ratio of gross income to total operating expenses, suggesting very limited use of purchased resources in their farming system, despite a relatively high degree of commercialisation.

4.6.6 Class 6 Portfolio entrepreneurs

This class of farmers resembled the petty portfolio entrepreneurs but had higher household incomes, suggesting that 'opportunity' was more likely to have been the motivation for engaging in 'business' than among petty portfolio entrepreneurs.

4.6.7 Class 7 Small scale capitalist farmers

This class consisted of farmers with an exceptionally high household income and the very high contribution of farming to that income, as well as a very high degree of commercialisation and a very high farm asset value.

Greater Tzaneen

Greater Tzaneen consisted of only three farmer's typologies, rural dwellers, subsistence irrigators and entrepreneurial smallholders.

4.6.8 Rural dwellers

These farmers were farming entirely for subsistence purposes. On average, rural dwellers had the lowest agricultural income, and the lowest income from non-farm entrepreneurial activities of the three classes of households

4.6.9 Subsistence irrigators

This class consisted of scheme and independent irrigators. The subsistence orientation of their farms was evident from their very limited engagement in produce markets. They have a limited level of commercialisation and their income from farming was substantially higher than that of the rural dwellers.

4.6.10 Entrepreneurial farmers

This class was characterized by a high level of commercialisation and high gross farm income. Entrepreneurial farmers also had a slightly higher average value of farm assets than the other two

groups. Farming for markets was very important for the livelihood outcome of entrepreneurial farmer households, contributing nearly half of their total household income

The different topologies identified shows that there is a great deal of heterogeneity in the smallholder irrigation sector and therefore it is important for government to realise that the one size fits all approach is not appropriate when developing policy and the development interventions for smallholder farmers.

5 APPROPRIATE DEVELOPMENT PATHS / PATHWAYS FOR ESTABLISHING SUSTAINABLE FARMING BUSINESSES

The concept of 'pathways' seems most commonly used to describe the observed change in patterns in livelihoods and strategies typically linked with a conscious decision in expectation of improved outcomes (Denison et al., 2016). Pender et al. (1999), with a specific focus on natural resource management but applicability to the current context, define development pathway as follows:

A development pathway represents a common pattern of change in resource management, associated with a common set of causal and conditioning factors. The causes and consequences of such pathways are likely to be different and the opportunities and constraints affecting natural resource management decisions likely to differ across development pathway. Across and within development pathways there may be differences in agriculture and natural resource management strategies at both household and collective levels (Pender, Scherr and Duron, 1999).

5.1 Development pathways identified in KZN

In KZN, Wale and Chipfupo (2018) formulated three development pathways in which they emphasized that when transforming farmers through these pathways, the focus should be on farmers that have shown interest in expanding their irrigation farming activities and have a high entrepreneurial spirit. The pathways, however, also provide direction of how the farmers that are less interested in expanding could be supported to effectively farm to secure their livelihoods.

5.1.1 Pathway for homestead and community gardens

Homestead and community food gardening are mainly for subsistence purposes. The study showed that the scale of crop production and sales made from their produce cannot make any significant economic contribution to the local economy. Thus, the most realistic option available for transformation of homestead and community food gardening is a process that entails availing opportunities for those interested in expanding irrigation farming, to access more land, gain critical business and entrepreneurial skills, increase their scale of production and enhance access to more profitable markets.

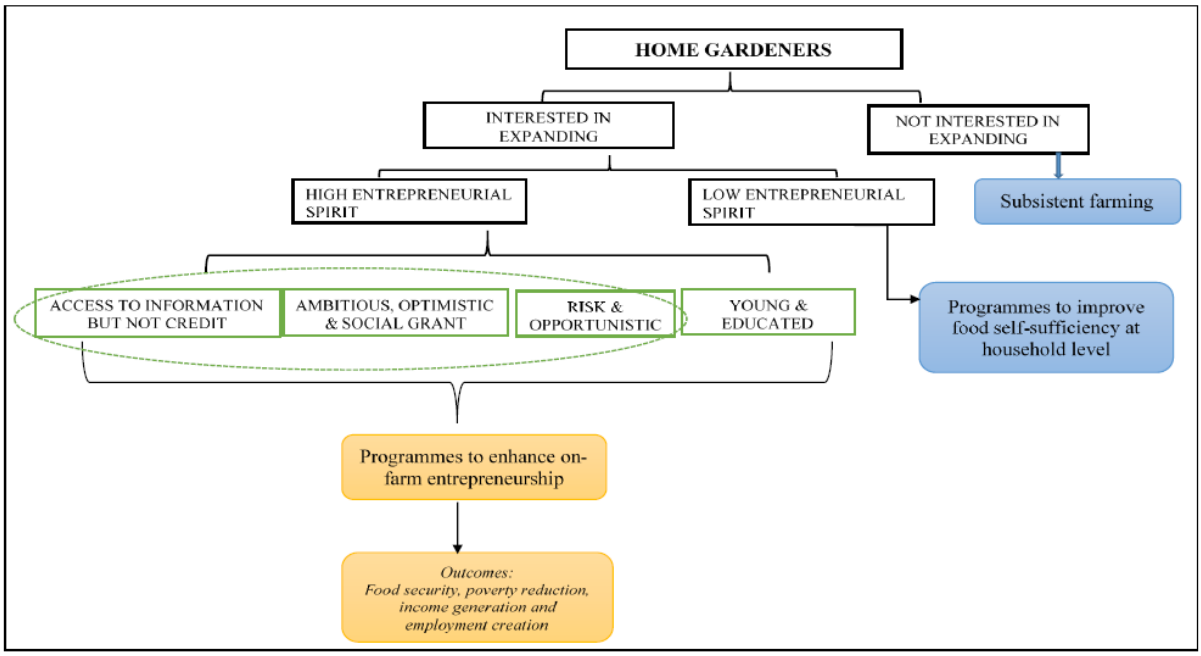

Figure 1: Development pathways for homestead food gardeners to transform to successful farm entrepreneurs (Wale and Chipfupo, 2018)

The above development pathway suggests that support should focus more on farmers that have shown interest in expanding their irrigation farming activities and have a high entrepreneurial spirit. The other homestead and community food gardeners can still be targeted with food security-related interventions meant to enhance food self-sufficiency at household level. The interventions proposed for transforming homestead food gardeners to farm entrepreneurs were:

- Improving access to productive land
- Skills development programme with focus on aspects of agricultural production/ farming; Irrigation water management and Business and entrepreneurial skills
- Enhancing access to credit for new or expanded schemes
- Enhancing access to farm mechanization services
- Enhancing market participation.

5.1.2 Pathways for independent irrigators

It was also decided that pathways for transformation of independent irrigators should focus on farmers with a high entrepreneurial spirit. All independent irrigators with high entrepreneurial spirit, regardless of their interest to expand crop irrigation activities, should be targeted.

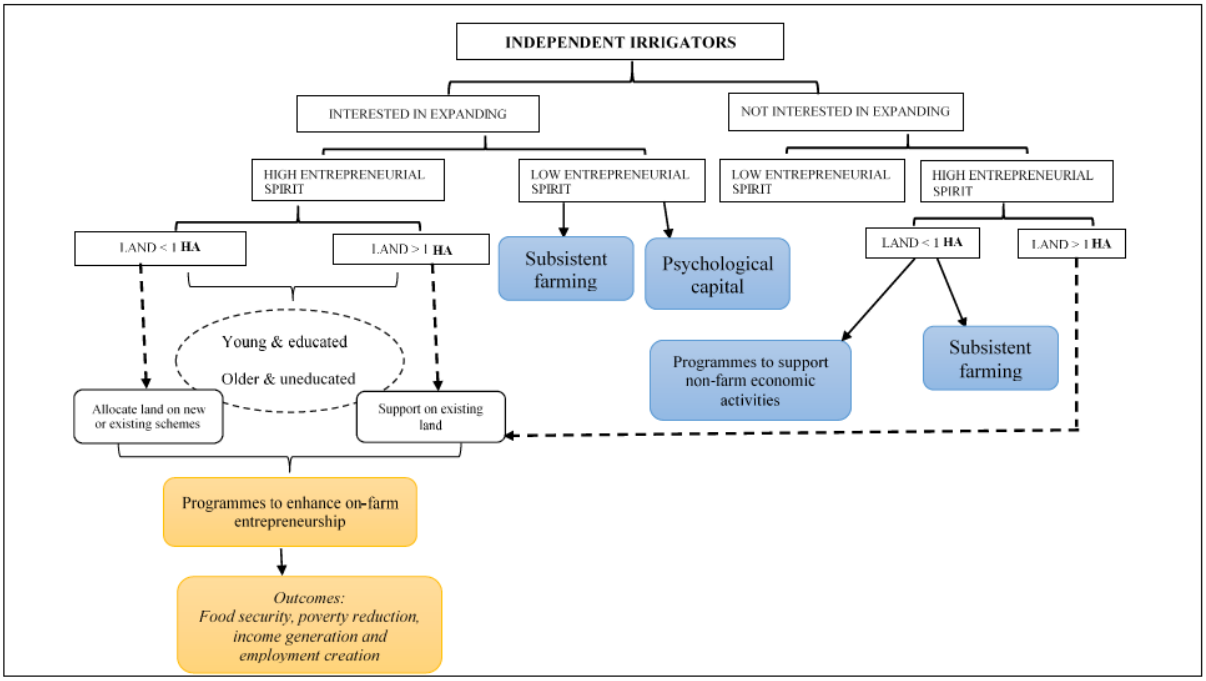

Figure 2: Independent irrigators with higher probability of developing into farm entrepreneurs

Interventions for transforming independent irrigators into successful entrepreneurs include:

- Creation of land clusters – Clustering will make delivery of tailor-made support services (such as extension and marketing) less costly and impactful.
- Improving water supply for agricultural production.
- Skills development with focus on aspects of agricultural production/ farming; Irrigation water management and Business and entrepreneurial skills.
- Enhancing access to credit and high value markets – The approach should utilise revolving credit funds to improve access to credit by independent irrigators. The marketing strategy should focus on infrastructure development meant to reduce the transaction cost of accessing product markets, i.e. investment in packhouses, distribution hubs and roads.
- Focusing on economies of scale / reducing transaction costs – make farmers understand and appreciate the importance of collective action institutions and make them take advantage of economies of scale (in input purchase, access to services and product markets) and reduce transaction costs (in accessing inputs, services and markets), the clustering approach suggested above will create an institutional structure that can be utilised by independent irrigators.

5.1.3 Scheme irrigators pathway

The intervention for scheme irrigators should focus on on-farm entrepreneurship development within the schemes rather than expansion of land. The entrepreneurial development of this pathway includes:

- Providing capacity building for full land utilisation.
- Intensification of production.
- Encouraging production of a diversified range of high value crops.

- Promoting efficient utilisation of water.
- Skills development – There is a need for more focus on business and entrepreneurship skills development, especially on changing production technology and market demands.
- Market transport support systems.
- Introducing a concept of "Buddie" farmers – concept promoting peer farmer support mechanisms.

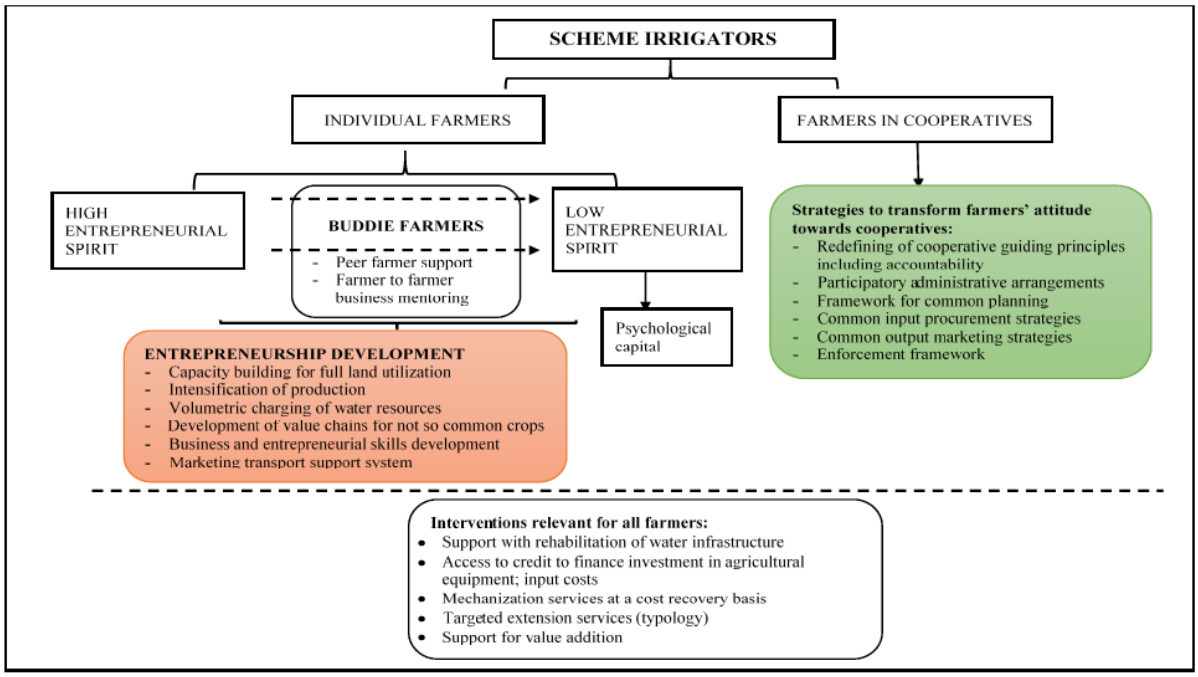

Figure 3: Entrepreneurship transformation programme for scheme irrigators

The main take home message in developing the pathways in KZN was that policy and decision makers should account for small scale farmer's heterogeneity and the complexity of their farming system. The "one size fits all" approach does not work and technologies, extension services, farm management practices, innovations and development pathways have to speak to the heterogeneity (Wale and Chipfupa, 2018).

The findings from this study indicated that transformation of the smallholder irrigation farmers should be context-specific, depending on farmer typology and development domains of each area. Differences in the agricultural potential, institutions and infrastructure that enhance (or otherwise) market access and access to livelihood assets affect the extent to which growth can be achieved in the smallholder irrigation sector for each area.

The most important acknowledgement made when developing the pathways was that not all smallholder irrigators have the potential to be successful as on-farm entrepreneurs. Therefore, programmes aiming to transform farmers should be directed to interested farmers with high entrepreneurial spirit. However, with this said, programmes supporting subsistence farmers who are farming to secure household food security should also be implemented.

5.2 Development pathways identified in Limpopo

The outcomes of research conducted in Limpopo yielded a development of a "framework of pathways". In this framework, there are 12 possible pathways/trajectories from a household while there are three destinations, i.e. irrigated home garden, scheme plot and independently irrigated plot.

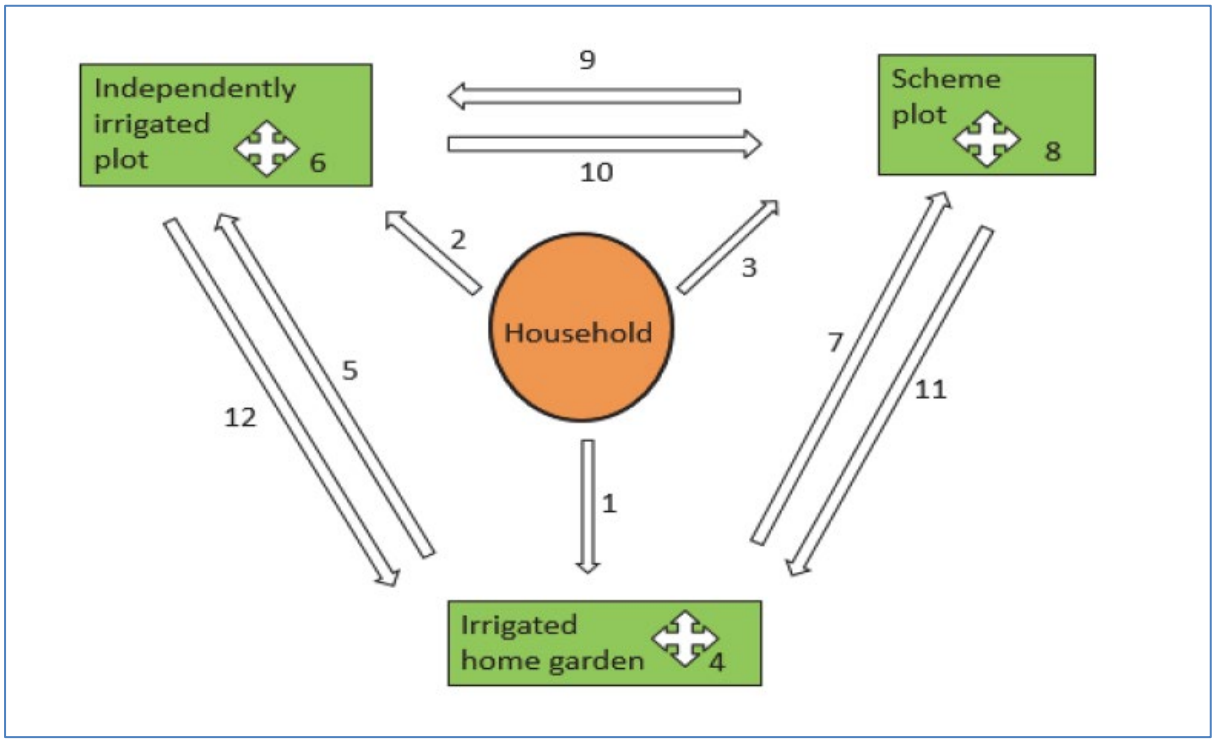

Figure 4: Development pathways frame in Limpopo (Denison et al., 2016)

The pathways defined by Denison et al. (2016) were:

- Pathway 1 – Start with home gardening
- Pathway 2 – Homestead to independent irrigated plot
- Pathway 3 – From homestead to scheme plot
- Pathway 4 – Intensifying and expanding the home garden
- Pathway 5 – From irrigated home garden to independent irrigated plot
- Pathway 6 – Expanding and intensifying the irrigated independent plot
- Pathway 7 – Irrigated home garden to scheme plot
- Pathway 8 – Expanding and intensifying the scheme plot
- Pathway 9 – Scheme plot to independent irrigated plot
- Pathway 10 – Independent irrigated plot to scheme plot
- Pathway 11 – Scheme plot to home gardening
- Pathway 12 – Independent irrigated plot to home gardening

The take home message from the framework is that the pathways leading to scheme plots and home gardens are easier to pursue and achieve, while the pathways leading to independent farming have significantly greater obstacles but with interest and action incentivized by the prospect of higher rewards, they are achievable. Access to arable land was found to be one of the key factors limiting

expansion from home-gardens to farming at larger scale on arable lands. While numerous other factors such as water, aspirations, finance, knowledge, capability, markets, etc. must also be assessed as limiting factors to an expansionist or intensification trajectory.

The most immediately accessible development routes are those centered on home gardening and irrigation-scheme farming (pathway 1, 3, 7, 11 and 12 – **lower risk pathways**). These pathways are perceived by farmers to have fewer challenges and lower risks than independent irrigation. Providing greater institutional structure and certainty in water and land tenure institutions, alongside upgrading of irrigation infrastructure would be essential interventions to facilitate these pathways.

High risk pathways (2, 5 and 9) – with these pathways the main difficulties/challenges are effective market access, land tenure uncertainty (which limits their willingness to invest on-farm in the form of fencing and piping, etc.), and water uncertainty (both licenses and physical resource access to dams, rivers, pipelines) and it was concluded that these should be the priority areas for improving these farmers.

Denison et al. (2016) proposed strategies aiming to address the challenges faced by small scale farmers. The strategies were categorized into land tenure interventions, market and knowledge interventions, water infrastructure investments and water regulation and water management interventions.

5.2.1 Land tenure interventions

These interventions would include identifying and securing irrigation land for small-scale farmer settlement outside the former homeland areas. This strategy is taken from what was proposed by Cousins (2014) which talks about finding irrigation land for small scale farmer settlements on existing white owned schemes. Furthermore, leasing on communal land has proven to be rather difficult, or rather impossible, therefore it was also proposed that the government legislates individually-held title deeds on irrigation land under traditional-tenure.

5.2.2 Market and knowledge interventions

Market access becomes a challenge to individual farmers as they often struggle to meet market demands in terms of quantities and quality of produce. Therefore, it was recommended that this challenge can be overcome through forming cooperatives. This proposal is not attractive since the concept of co-ops has not been successful. Their failure is mainly due to the fact that they are formed with the notion of getting access to state resources. Co-op formation as suggested in this case would have to be for a common purpose such as collective marketing. Farmers could also benefit from opportunity to optimise local procurement, by targeting various smallholder groupings to supply fresh produce and semi-perishables.

The study highlighted that the small scale farmers are not part of the formal value chain and hence do not contribute significantly to the broader economic development. Another aspect of developing pathways would be to create value chains with access to fresh produce markets. This will require the establishment of linkages in the value-chain and monitoring and evaluation thereof. Pilot studies of this nature are recommended and would focus specifically on: supply to local supermarkets; access to

local government procurement tenders (hospitals, schools, etc.); and access to the national fresh produce markets used by many independent farmers.

5.2.3 Water infrastructure investment

Options for water infrastructure include investing in rainwater harvesting technologies that could allow home gardeners to harvest water use it for irrigation. This technique will provide water for supplementary irrigation in summer as well as for water to practice winter cropping on small parcels of land in the home garden. Irrigation in the homestead or on irrigation farms requires significant infrastructure investment, therefore programmes that can provide grant and/or loan funding for bulk and infield irrigation infrastructure were recommended.

5.2.4 Water regulations and irrigation management

The absence of water-use licenses and the widespread insecurity related to both the legal right of use, and the quantity that can be used, presents a high risk to smallholders and is a critically limiting factor. Therefore it was proposed that there should be dedicated support to acquire water-use licenses. Intensive effort is needed to establish self-financed, farmer managed irrigation institutions on schemes.

In conclusion, water tenure security, land tenure security and access to markets were found to be critically limiting issues in relation to expansion, both within schemes, moving onto schemes as well for independent irrigation pathways.

5.3 Development pathways in Eastern Cape

The main finding from the study conducted in Eastern Cape was that smallholder irrigators have more monetary goals and view farming as a source of income while homestead food gardeners view farming mainly as a social activity. The smallholder irrigators are focused on expanding their farm business, increasing maximum farm income and accumulating wealth while homestead food gardeners viewed farming as a lifestyle and social medium with less focus on business/development oriented goals (Obi, 2016). The research revealed that although smallholder farmers are faced with challenges such as lack of access to natural resources, there are irrigation schemes such as Qamata irrigation scheme which have adequate water and rich soils, and therefore have the potential to contribute to the food value chain and more broadly.

Linking the smallholder irrigators with markets is one of the main interventions required to transform smallholder irrigators into successful entrepreneurs. Improvement of irrigation technology, a conducive socio-economic and demographic environment, and provision of physical structures are vital for transformation of smallholder farmers, in addition to institutional arrangements for managing the facilities to deliver value. A participatory and innovative governance arrangement was proposed where a system would consist of producers, agro-input dealers, the transporters, the storage facility operators, the processors and millers, the retail traders, the government/policy level, non-governmental entities, so that all whose interests are accommodated within the value chain.

6 STAKEHOLDER CONSULTATION

After conducting a thorough review of the three studies; multi-stakeholder workshops consisting of government officials from different departments, i.e. Department of Agriculture, Rural Development and Land reform; farmers from the respective irrigation schemes and NGOs were conducted. The first workshop was held in Polokwane on the 10th of October 2019. The second one was held at the Institute of natural Resources on the 15th of October 2019 and lastly in Eastern Cape, it was held at Fort Cox Agricultural College on the 6th of November 2019.

6.1 Facilitation method

For this work the facilitators used a different and more innovative method/approach to facilitate the workshops. The reason for exploring such a method was to stimulate more interaction and participation among the participants. This approach involves the use of a Role Playing Game (RPG). Role Playing Game is a technique used to simulate reality by creating an abstracted version of the region, its dynamics and stakeholder interactions. The notion of role playing takes participants out of their comfort zone by enabling them to openly play out their role in reality to view their influences and effects on the system. The RPG is used as an interactive participatory, training and planning tool with the aim of enabling participants to self-analyse their situation and develop their integrated thinking and planning abilities. The benefits of role playing include:

- The ability to unpack complex dynamics, relationships, interactions, issues and conflicts.
- Allowing for stakeholder interaction without the conflict and tension associated in reality.
- Ability to test various scenarios and plans to understand probability outcomes and consequences of actions.
- Enables stakeholders to not only see, but understand, the implications of their actions on the environment and how such actions can affect their livelihoods.

The facilitator firstly presented findings of each study, which pinpointed the challenges face by the smallholder irrigation farmers. The findings were relating to the status of their capitals (natural, physical, social and financial), general challenges relating to gender, access to land and water. And lastly the presentation also shared the suggested entrepreneurial development pathways for smallholder irrigation farmers.

6.1.1 Developing the RPG for the current object

The RPG is a general game that needs to be tailor made for the subject in question. Therefore, for this project our Game specialist studied the content of the review report identified different role players and responsibilities which need to be undertaken in order to make transform the smallholder irrigation farmers.

6.1.2 Role players

The different roles players to be used throughout the project were identified as follows:

- **Small scale farmers** – e.g. households, cooperatives, individual farmers
- **Private sector** – e.g. public-private partnerships
- **Provincial Government** – e.g. extension support, municipalities
- **National Government** – e.g. policy and programmes

- **Financial organisations** – e.g. World Bank, agribusiness development agencies
- **NGOs** – e.g. Institute of Natural Resources, LIMA Development Foundation
- **Research and development practitioners** – e.g. IWMI, University of Limpopo, Tshwane University of Technology (TUT), University of KwaZulu-Natal
- **Traditional leadership**

6.1.3 Roles and Responsibilities

The above role players were asked to identify the following roles and responsibilities and explain how they would contribute to them.

- **Financing** – this refers to the provision of capital, loans/credit, funding, savings or grants
- **Mentorship and Knowledge** – this refers the technical skills needed by farmers – record keeping, profit predictions, production plans, farming at scale skills
- **Skills and training** – agricultural production and efficiency, water management; business and entrepreneurial skills
- **Labour** (man power, human health)
- **Technologies and infrastructure** – new technologies (implements, research (roads, storage facilities, irrigation equipment) – physical capital?
- **Market networks and Access** – building relationship, networks, providing access to markets
- **Policy, licencing, legislation** – include supportive policy instruments by government (phased approach – wean over time)

After giving the presentation, print outs of the roles and responsibilities were laid out on the floor. The role players were printed on to hats. The participants were asked to pick a hat of a role player they would want to be. They were then asked to identify a role they would want to play and say how they would play that role and it would contribute to transforming the smallholder irrigation farmers as shown in Figure 5 .

Figure 5: The workshop participants engaging in a RPG in Limpopo

7 RESULTS AND DISCUSSION

7.1 Limpopo province

After sharing the research findings, there was a general appreciation of the project findings. It was nothing new to the stakeholders; however, they were mainly interested in what can be done to improve. The stakeholders were interested in piloting some of these pathways through practical actions and learning from those experiences. The stakeholders felt that there has been enough research done and what is needed now is action.

To recap on the proposed entrepreneurial development pathways in Limpopo, **Figure 6** shows a "framework of pathways" developed by Denison and colleagues in 2016. In this framework, there are 12 possible pathways/trajectories from a household while there are three destinations, i.e. irrigated home garden, scheme plot and independently irrigated plot.

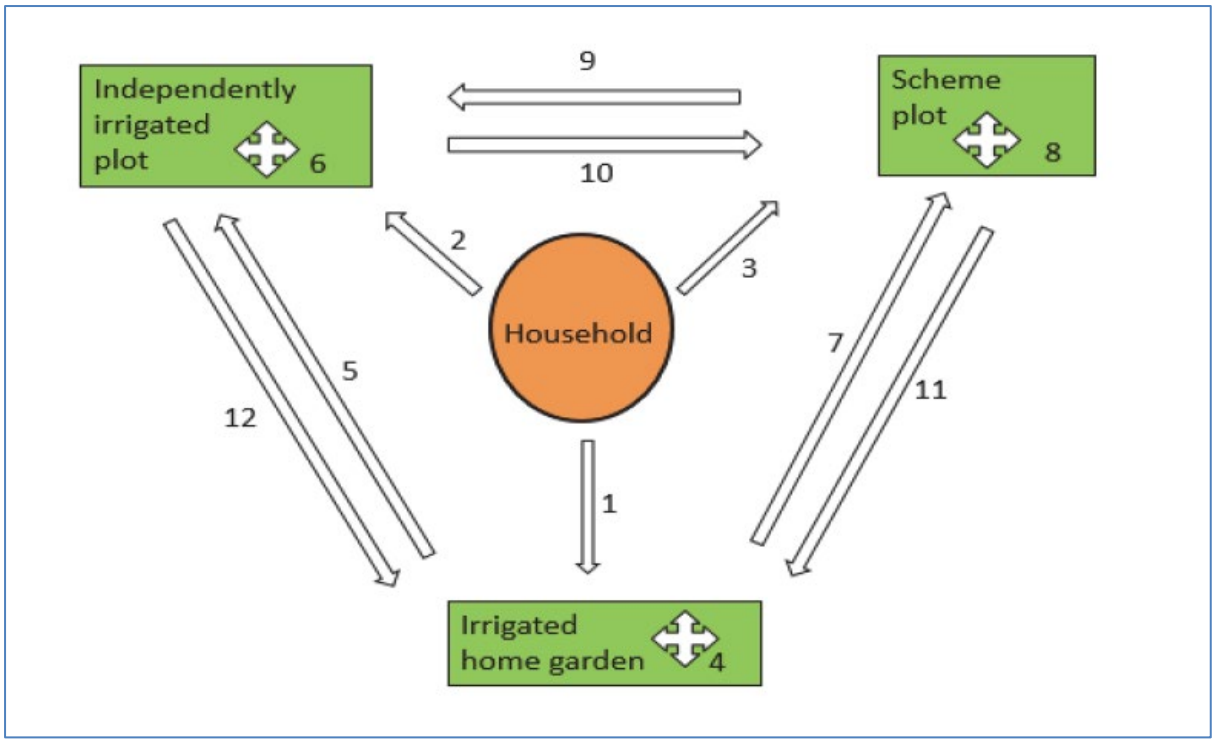

Figure 6: Development pathways frame in Limpopo (Denison et al., 2016)

The pathways defined by Denison et al. (2016) were:

- Pathway 1 – Start with home gardening
- **Pathway 2 – Homestead to independent irrigated plot**
- Pathway 3 – From homestead to scheme plot
- Pathway 4 – Intensifying and expanding the home garden
- **Pathway 5 – From irrigated home garden to independent irrigated plot**
- **Pathway 6 – Expanding and intensifying the irrigated independent plot**
- Pathway 7 – Irrigated home garden to scheme plot
- **Pathway 8 – Expanding and intensifying the scheme plot**

- **Pathway 9 – Scheme plot to independent irrigated plot**
- Pathway 10 – Independent irrigated plot to scheme plot
- Pathway 11 – Scheme plot to home gardening
- Pathway 12 – Independent irrigated plot to home gardening

More details on the description of each pathway are articulated in review chapter. The following sub-section shows results of the role playing game. Each role player describes how they would make a contribution under a specific responsibility.

Table 1: Role Playing Game summarised in to a table in Limpopo

RESPONSIBILITY	ROLE PLAYERS	CONTRIBUTION
Skills and Training	Private sector	Private sector believes they have a significant role to play on the skills and training. We have the skills and we have the resources, through partnerships we could assist the smallholder farmers with the necessary skills and provide training required.
	Financial institutions	Financial institutions identified themselves as cross-cutting role players. In order to take the smallholder farmers through the proposed pathways; the financial support is needed in almost all the roles and responsibilities. However, it was noted that the financial resources are limited; they are not enough to contribute to each and every role and responsibility. Therefore, the financial institutions needed to prioritize the most important role that can play.
	National Government	National government wanted to create policies and regulations in favour of developing farmers in to entrepreneurs. The national government said they will develop clear monitoring and evaluation frameworks that will ensure that the policies effective and if not investigate why and improve. The M&E will also look closely to the grant beneficiaries to monitor their progress. The national government needs to know why the farmers are not progressing while they receive the government support.
		The national government also wanted to support the piloting of the proposed entrepreneurial development pathways. They recognize that substantial research has been conducted over the years and now they need to implement pilot projects to see if the recommendations work. There was a general consensus among participants that government should focus its efforts on pathways 2, 5, 6, 8 and 9. These pathways make business sense and can allow farmers to become entrepreneurs.
Mentorship and knowledge	NGOs	NGOs believe they a role to play in mentorship and knowledge, the NGOs recognize that although this work is looking to promote entrepreneurship; the home gardeners still need to be supported so that they can produce food for home consumption. Some of these

RESPONSIBILITY	ROLE PLAYERS	CONTRIBUTION
		farmers lack knowledge and NGOs can reach out to them and provide farming knowledge necessary skills. The NGOs can be able to identify the farmers with potential to becoming entrepreneurs.
	Private sector	Private sector has the capacity to provide knowledge and mentorship. The provincial government needs to approach the private sector and form Memorandum of Agreements for the provision of mentorship and knowledge for smallholder farmers. Department of Agriculture in Limpopo already have MoUs with companies like Sub-trop, Potato SA and Citrus Growers, they provide training to farmers and the extension workers.
	Smallholder farmers	The smallholder farmers have a role to play in mentorship and knowledge with regards to the younger generation. The smallholder farmers need to make it their mandate to involve their kids in their farming operations to show them the value of farming. In this way the knowledge can be imbedded in the youth from a young age, this is how the white commercial farmers ensure succession in their businesses. The parents need to be transparent about the income obtained from farming and involve the youth in the negotiation and sales processes that place.
		Farmers also need to contribute in knowledge and mentorship but sharing knowledge and mentoring each other. Within communities, farmers get exposed to different opportunities and they need to share these with their fellow farmers.
	Traditional leaders	The traditional leaders have a big role to play in making sure that fallow land is made available to other people. The current land tenure system allows households to own land in irrigation schemes even when they are not utilising it. These households may not be planning to use land
Market and access	National government	The participants recognized that the farmers are vulnerable when it comes to the issue of market access. Most framers do not have the direct link to the markets; they use the intermediaries who greatly exploit them. The transaction costs incurred through intermediaries discourage farmers from engaging in formal markets. The National government has a role to play in regulating the intermediaries. The policy should favour the smallholder farmers and allow easier access to markets. The government has done a lot in terms of providing the infrastructure, inputs, training, etc. but the main challenge is to get farmers to sell their produce in formal markets. The importance of Agri parks was discussed as having a great potential in assisting farmers with storage facilities, processing and value addition.

RESPONSIBILITY	ROLE PLAYERS	CONTRIBUTION
	Farmers Associations (AFASA)	The farmers should be mobilised in to commodity groups. The farmers associations such AFASA can assist farmers with forming these commodities. AFASA has already formed RED meat, sugar cane, maize commodity groups and they could do the same with smallholder vegetable farmers. AFASA has the farmer's interest at heart; therefore, they need to help farmers through different marketing channels because they have the know-how.
	Traditional leadership	The traditional leadership played a significant role in one of the villages of Limpopo where they offered local farmers a piece of land for building a loading zone. Because most the farmers are deep rural areas, they have to travel long distances to the market, but this loading zone allowed the farmers to bring their produce and meeting the buyers halfway.
Access to land/land tenure	Traditional leadership and Municipalities	The stakeholders suggested that the traditional leadership and municipalities need to work together to standardise the fees charged in order to obtain a Permission to Occupy (PTO). The fees charged are not standard and can be very high which hinders smallholders from expanding.
Financing	Financial organisations	The financial organisations thought their role was cross-cutting across all the responsibilities. They perceive themselves as the integral part of developing the smallholder farmers. However, the responsibilities need to be prioritised according to what is needed the most to improve the smallholder farmers.
Technology and infrastructure	Financial organisations	Play a role of funding the development of new technologies and research. The financial organisations can also assist the government with funding required to improve the infrastructure.
Policy, licencing and legislation	National government	The national government said they would be responsible for setting out policies and programmes that are aimed at transforming the smallholder farmers into sustainable entrepreneurs. The policies and strategies have to have functional Monitoring and Evaluation frameworks in order to monitor the policies.
	Provincial government	The provincial government is responsible for awarding grants to beneficiaries. The provincial government will make sure that these processes are regulated. They regulations need to be clear on who receives these grants and how many times can they get them.
	Research and development practitioner	The researchers would play a role in making sure that their research informs policy. Policy making need to be well informed and therefore proper research and consultation is key and the researchers would be responsible for that aspect.

Side notes

Because of the nature of the facilitation method, the participants were very engaging and were able to think out of the box and really expressed what they thought needed to be done in order to improve the smallholder irrigation farmers. Most of the participants consider home gardeners as people who take farming as a hobby and felt that these types of farmers not interested in entrepreneurship. Pathway number 9 was suggested for consideration for support because they have been farming in scheme plots and have already been operating as farmers.

The Cooperatives model has failed in many of the schemes because there is no sense of ownership of the infrastructure. Cooperatives are have been found to be over dependant on government aid. However, within the participants, there were farmers coming from successful cooperatives. They are run their farming as a business; they buy their own fuel, pay for water and other inputs. Government subsidy is always a nice thing to have but they emphasised that it is important to know why you form a cooperative. It is about having a collective action in everything you do not to receive government aid.

On the aspect of mentorship, it was emphasized that mentorship should be provided in a strategic manner. Farmers need to be mentored on areas of concern. Most of the smallholder farmers have the experience and farming knowledge, therefore, the mentorship should be directed to certain area where they are lacking and should add value to what they already know.

There are a lot of discussions about the farmers without the farmers. The development pathways might there but if we don't know what the farmers need, the pathways might fail. Therefore it is important to conduct proper consultation to find out exactly the farmers need and how the pathways can play a role.

7.2 KwaZulu-Natal

In KwaZulu-Natal, after sharing findings, again the participants were not surprised and shared what they thought contributed to the current challenges. For example, the issue of market access; it was mentioned by agricultural advisors based in Jozini that the current marketing systems are not accommodating to smallholder irrigation farmers. The smallholder farmers or previously disadvantaged farmers will remain so because it is imbedded in their minds that they need to remain so. The stakeholders mentioned that some of the irrigation schemes have been revamped with state of the art irrigation equipment but they are underutilized. Formation of public private partnerships was perceived as a non-viable solution by government officials. The extension workers reported that such partnerships have not worked because very few farmers have significantly improved after engaging in such partnerships. Lima Development Foundation as an NGO which has been working in this field for quite some time and have tried many things, believes that these partnerships can still work. However, there should be a transparent contractual agreement between the two parties which will ensure that both parties benefit from the agreement made.

LIMA mentioned that in their experience with working in irrigation schemes. They have identified that the smallholder irrigation farmers are planting very common crops such the cabbage and spinach which are not highly demanded by the market. They have found that the chain stores like Spar, Pick n Pay, etc. are interested in exotic vegetables and herbs and the smallholder farmers have not

realized this opportunity. As an intervention, whoever is supporting the farmers need to link them with the correct market for the correct crops.

Access to land was also discussed quite significantly and it tied in with the fact that research found the youth to shy away from agriculture. A bunch of young farmers were present from Jozini and Tugela Ferry. The biggest challenge they face as young people is that they do not own land. They are currently renting land and there are no contractual agreements to honour their arrangements. Often the times; once the land owners see that they are making profit they just increase the rent. The youth pleaded to the Department of Rural Development and Land Reform to relook at the land reform processes because most of the times the farms fall into wrong hands.

To recap on the proposed development pathways in KwaZulu-Natal

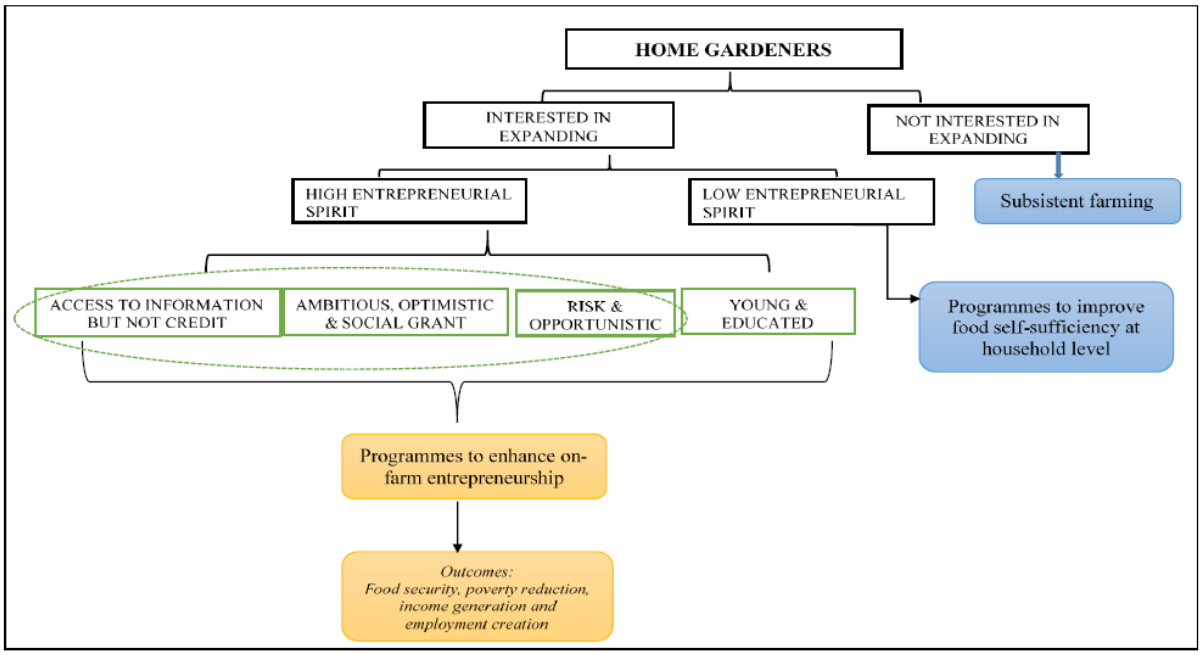

Figure 7: Development pathways for homestead food gardeners to transform to successful farm entrepreneurs (Wale and Chipfupo, 2018)

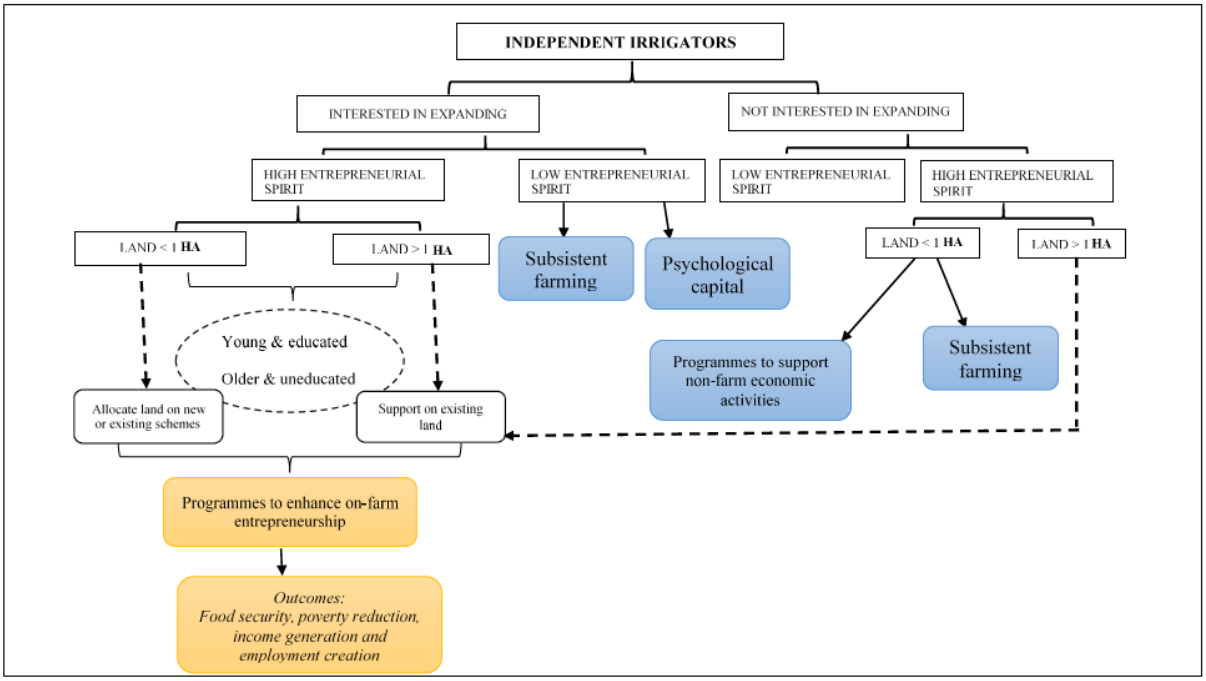

Figure 8: Independent irrigators with higher probability of developing into farm entrepreneurs

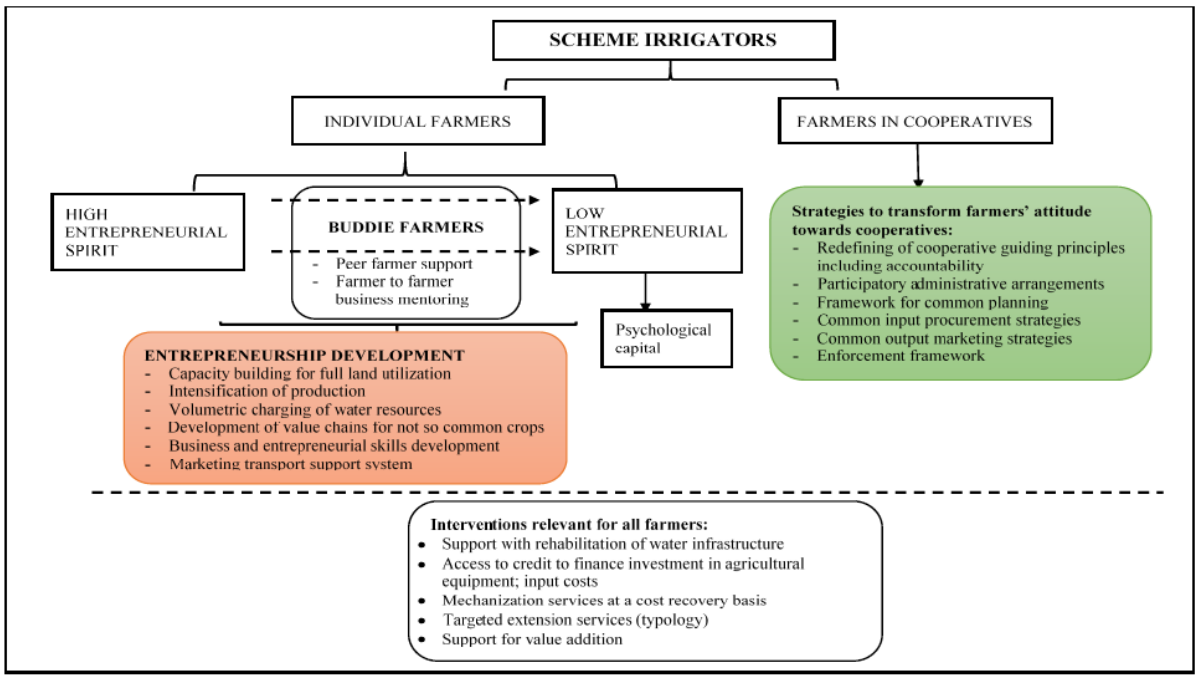

Figure 9: Entrepreneurship transformation programme for scheme irrigators

There was great interest in development pathways designed for scheme irrigators and independent irrigators. The stakeholders thought efforts need to put in to farmers who are already farming for business at a reasonable scale. The participants appreciated the distinction of development pathways and agreed with Prof Wale's conclusion that farmers are heterogeneous and require different sets to programmes. The agricultural advisors appreciated that the home gardeners were not left behind all together but appropriate development paths were suggested for them.

Table 2: Role Playing Game summarised in to a table in KwaZulu-Natal

RESPONSIBILITY	ROLE PLAYER S	CONTRIBUTION
Skills and Training	Smallholder	Amongst the smallholder farmers, there are lead farmers who have the skills and knowledge. These farmers need to actively transfer skills to other farmers within the schemes. The farmers recognize that they need to be equipped with business skills so that they can treat their agricultural activities as a business.
Market and access	NGOs	The NGOs want to support primary production to ensure that the farmers are able to produce in required volumes and quality. They believe that the markets are there but farmers are excluded because they fail to meet the demand required by the market. Once the farmers master the primary production, it will be easy to access the markets and the NGOs can help facilitate the linkages.
	Partnership between government and private sector	The farmers need to understand that the market wants at a particular and be able to deliver. The farmers need to
Access to land/land tenure security	Provincial government	The department of Rural Development and Land reform through its land reform programme in partnership with Department of Agriculture could identify farmers with entrepreneurial spirit, who are limited by land and place them on government farms and provide necessary mentorship and knowledge of operating at a farm scale.
Financing	Financial institutions	The financial institutions saw themselves as sources of capital for farmers aspiring to become business. Financial institutions felt that the smallholder farmers did not have knowledge of what they have to offer. Therefore in order to contribute to empowering farmers, they would make they services more visible and accessible.
	Local government	It was suggested that the local government change its financing model from being grant into loans. It is believed that since farmers receive government funding as grants, they do not work hard enough to become independent. The comfort of knowing that the government grant will always offer capital, makes the farmers to not even determine if they making profit or a loss. The loans would make farmers harder and keep an eye on profit as it would allow them to pay back the loan. Lima is already lending money to farmers as revolving loans and they find that these farmers work much better than those receiving government grants.

RESPONSIBILITY	ROLE PLAYER S	CONTRIBUTION
	NGOs	The NGOs can act as financial organisations. If the government can channel the funding through NGOs and the NGOs make it available to farmers as revolving loans with very low interest rates. The NGOs are already landing farmers money and they see these farmers improving because of the additional support they obtain such relationships.
	National government	With the financing responsibility, it was also recognized that the smallholder irrigation farmers do not have collateral when approaching financial institutions. Therefore government should come into play; government has a good understanding of how communal land works. The best thing would be to partner with these financial institutions, and channel some of the grant money to them and create a system where farmers can access the funding without having to provide collateral.
		The Land Bank in South Africa is not easily accessible by smallholder farmers. However, government allocates money to land bank to assist smallholder farmers. The requirements for acquiring these funds are so steep hence very few people qualify. Smallholder farmers are considered risky in nature but this can be changed if the government could take this risk.
Policy, licencing and legislation	NGOs	The NGOs thought they have a role to play in the policy making and licensing. They saw themselves advocating for smallholders by communicating the farmers needs during policy developments. The NGOs have a very good understanding of the challenging faced by smallholder farmers and are in a good position to communicate these challenges to policy makers.
	Traditional leadership	The traditional leadership would play a role in policy making especially in policies that relate to communal land.
	National government	National government need to develop programmes that are carefully designed not to create dependency syndrome
	Private sector	The private sector wants to be part of policy making so that they can provide their perspective in terms of supporting smallholder irrigation farmers.
	Research and development practitioners	To contribute to the policy making by conducting research that informs policy.

Some of the responsibilities were not spoken to because the marketing, financing and land issues dominated the discussion. It was apparent that the government financing models has created a lot of dependency and often the times it is landed by wrong people. There are “farmers” who have mastered the art of applying for government grants and they apply for every funding opportunity they come across. The formation of public-private partnerships with the aim of addressing the lack of markets was discussed. Some participants think the PPP do not work while other stakeholders think it works if the partnership is transparent and created with an intention to exploit. For example RCL foods signed agreements with smallholder farmers. RCL foods supplies vegetables they obtain from smallholder farmers to their clients. However, the challenge is always the inconsistent supply.

7.3 Eastern Cape

This section discusses what came up during the stakeholder workshop in Eastern Cape. The smallholder farmers who were present agreed that they have the potential to create local employment opportunities; however, they lack financial and marketing support. It was mentioned again in Eastern Cape, that smallholder farmers are producing common vegetable crops such as the cabbage, spinach and beetroot which are flooding the markets.

The provincial government need to also fund individuals; the individuals struggle to access to government funding. Often they have to form cooperatives and these are not sustainable because they are not formed on a common vision and goal. The cooperative model needs to be reviewed and improved.

There are many challenges hindering small scale irrigation farmers; however interventions should seek to prioritise the most impactful and not aim to solve everything at once. For example, training, infrastructure has been provided, however, the biggest challenge is marketing. Therefore marketing should be on top of the list. The farmers are discouraged by the middleman and the inability to determine prices for their goods. The example given was the blueberry industry where farmers are exploited by the middleman because they don’t have the proper certification such as Global Gap which would allow them to sell directly to the market. Therefore, it is difficult to negotiate the prices; they often have to accept what the middleman offers. The national government at policy level should regulate how marketing support is given to the smallholder farmers.

Farmers need to be better equipped with critical thinking and planning skills. They should be able to sit down and look at the trends, the weather forecast and have a good understanding of the market they are targeting, so that they can plan exactly what will be mostly needed by the market in that season. One example which was given was that of the current drought in Eastern Cape, the farmers operating in irrigation schemes have an upper hand because of access to irrigating water. Therefore they could plant yellow maize because it going to be in demand for livestock feed.

The social dynamics are very important in these irrigation schemes. Farmers fight over many things and these should also be resolved. It is not easy to provide the necessary support to the farmers because of such dynamics.

The farmers agreed that they receive government support in form of farming inputs, e.g. fertiliser, seeds and seedlings. But the biggest challenge is that the timing. The timing is always off. The farmers feel it is important for government to consult them before providing support. For example the

Department of Agriculture would supply them with cabbage seedlings or maize seed at a wrong time when the planting dates have passed. The farmers feel the Department sometimes sends out support only tick the box. The government departments work in silos and end up implementing similar programmes. There needs to be a coordination of government programmes to ensure a meaningful and significant impact.

The issue of limited land is not entirely true; the land on irrigation schemes is highly underutilised. In some irrigation schemes, the infrastructure is fully installed and yet not fully utilised. Therefore this issue of land needs to be clearly unpacked to find the real reason why it is underutilised while they are people struggling to access it. The traditional leaders need to speak to land owners who are not using the land. Not everyone is a farmer and therefore people who are not farming the land should make it available to those who want to use it for farming. The traditional leaders should facilitate contractual agreements between land owners and tenants, the contracts should protect the tenants from exploitation. Traditional leaders should regulate and give direction of how fallow within schemes is handed over to people who need to use it. The policy makers need to work with traditional leadership and standardise how communal land is leased.

The stakeholders thought private sector has a significant role to play in providing skills and training because they have the capacity and the resources.

Partnerships between the public and the private sector can help with providing mentorship and knowledge support. However, other participants were warning against these Public-Private Partnerships as they have a potential for exploitation. There needs to be a constant monitoring of PPPs. The farmers often get into such partnerships without proper understanding of the contractual agreements. It is the responsibility of the farmers to seek legal advice before signing on these partnerships. In other instances such partnerships sometimes also create a dependency. For example, a buyer and farmer would sign an off-take agreement, and the farmers would not actively look for other market avenues. And should it happen that the buyer for some reason stops buying, the farmer collapses.

The municipalities need to improve road infrastructure. The farmers are failing to send their produce to formal markets because road infrastructure is not in a good condition.

8 SUGGESTED PRACTICAL MECHANISMS FOR INCLUDING SMALLHOLDER FARMERS IN COMMERCIALLY ORIENTED VALUE CHAINS

The ultimate goal of this review and stakeholder engagement was to identify practical mechanisms required for the inclusion of smallholder farmers in commercially oriented food value chains. The main issues that came out strongly during the engagements clearly indicated that the interventions cannot create impact over-night. Therefore, the suggested interventions were categorised into two parts, i.e. short term interventions and long term interventions.

8.1 Short term interventions

8.1.1 Marketing and access

Both the literature review and the stakeholder consultation revealed that the biggest challenge that the farmers are facing is marketing of produce. In most irrigation schemes, functional infrastructure exists, land and water are not limiting. However farmers lack marketing skills. The first intervention should be around capacitating the farmers with marketing skills. It was reported a couple of times that farmers do not plant what is required by the markets. Therefore farmers need to be equipped with business and marketing skills that can help them conduct market research which will inform what they need to produce. Farmers should become better negotiators for prices; they should not just take what they are given. The collective action between government, NGOs and the private sector should facilitate the access to markets. The government should not aim to develop something new, instead identify what is already done by none-government institutions and add value.

For some commodities such as high value crops, marketing of produce involves a middleman responsible for connecting the primary producer to the export market. Smallholder farmers are exploited by the middleman as they sell the produce on farmer's behalf without giving farmers honest information about the price. As a short term intervention, the farmers need to be linked directly to the market. For example those farming blue berry, need to be trained and certified to sell their blue berry directly to the export market.

We cannot shy away from the fact that farmers struggle to meet the market demands and end up sticking to local markets. A short term intervention would be to mobilise farmers to form clusters or commodity groups. In this way the farmers could aggregate their produce to ensure that they supply the required quantities at a desired quality standard. Formation of commodity groups provides other advantages such as collective buying of inputs which reduces the production costs. The farmers also adopt similar production practices which could improve the quality of their produce.

8.1.2 Financing

The government needs to work with NGOs that already have the presence in the irrigation schemes. These NGOs can be used to create a "one stop shop" for farmers, where they can get support relating to primary production, financing, processing and value-add and lastly marketing. Providing revolving loans at a low interest rate will reduce the dependence on government grants. Such NGOs are

currently providing support to farmers on a voluntary bases and their support is not infinite because they depend on project funding.

8.1.3 Skills development and training

What came out strongly during the engagements was that skills development and training is not only needed by farmers. The extension workers or agricultural advisors also need to be trained about entrepreneurship. The agricultural advisors are very knowledgeable about agronomic aspects of farming. However, they also struggle to give support relating business development because they are not trained in that subject. Therefore, training should start with them so that they can be able to transfer the knowledge.

8.1.4 Support to youth

Young farmers that are already engaging in agricultural production or support services along the value chain should be identified. Those who are interested in primary production should be fast-tracked into the entrepreneurial farmers' pathway. For those who wish to participate in other parts of the agricultural value chain, specific programmes should be developed, based on aptitudes and interest. Broadly these can consider the following:

- Supply of inputs and information (e.g. fertilizer, soil testing, pest control and pesticides)
- Financing
- Processing
- Transport
- Marketing.

In all of the above cases, there would be specific criteria for participation in the various schemes, for example all participants should be actively farming or actively involved in agricultural value chain, but there would need to be subsets of criteria for each pilot initiative.

8.2 Long term interventions

8.2.1 Policy

Interventions relating to policy are long term, policy development and amendment takes time. The national government need to review its policies and programmes to determine their effectiveness and contribution to developing smallholder irrigation farmers. It is well understood that it is government's mandate to provide government aid in form of grants and inputs. However, this has created a lot dependency to government. It is hard to create a society of entrepreneurs through giving handouts.

Land reform programmes need to support smallholder entrepreneurs. Farmers with high entrepreneurial spirit but limited by land should be identified and be prioritised for land reform farms. There is a big outcry from farmers about the land reform farms given to inexperienced people who end up using the land for none agricultural activities. The youth is highly impacted by the lack of land; policies should create a favourable environment for the youth. In Eastern Cape and KwaZulu-Natal we came across very passionate young farmers who understood the concept of entrepreneurship but are experiencing challenges with accessing land for expansion.

The issue of land tenure systems in communal areas is complicated and has a negative impact on the ability to expand. The land tenure issue is a policy issue which requires the government, municipalities, traditional and farmers to sit together and come up with a way forward.

The national government in the long term should look into their procurement processes. There is a lot of wasteful expenditure caused by late/delayed purchases of inputs for farmers. The procurement systems should efficient in order to ensure that the inputs reach the farmers at the right time.

8.2.2 Infrastructure

This is an important long term intervention; the local government has to make sure that the access roads are in an acceptable condition to transport agricultural produce. The local government, at a municipal level should invest in building local pack houses and cold storages with functioning processing facilities. This is regarded as long term intervention because; development is often slowed down by politics. For example in KwaZulu-Natal, the Radical Agrarian Socio-Economic Transformation Programmage has supplied municipalities with mobile cold storage trucks. However, due to political dynamics the farmers have not been able to start using these trucks. The development of AgriParks has been ongoing for years, and they have not started functioning to their full potential. However, these are government programmes which need to be improved constantly studying.

8.2.3 Mentorship and knowledge

This should be an ongoing activity. Knowledge is constantly generated through research and development. The responsibility of knowledge sharing and dissemination lies with the research and development practitioners. The universities, research institution and private companies should make it their mandate to share the most updated information with the smallholder farmers. The smallholder farmers are far behind when it comes to new knowledge and technologies and this contributes to their slow progress in farming.

Mentorship in the context of white commercial farmers mentoring smallholder farmers is still tricky. There is still an element of mistrust between the two parties due to the South African history. However, such mentorship relationships are successful in some instances while sometimes not. The mentorship framework and guidelines should be clear and should create a win-win situation for both parties.

9 CONCLUSIONS

Conclusions drawn from reviewing literature indicated that water tenure security, land tenure security and access to markets are critical limiting factors that impede expansion, both within schemes and for those moving onto schemes, as well for independent irrigators.

Although some irrigation schemes have been revamped, Irrigation infrastructure remains underdeveloped in most irrigation schemes, making it difficult for the producers to grow the high-value crops which usually have high water demands (Wale and Chipfupa, 2018). Obi et al. (2016) concluded that irrigation technology had a positive contribution to smallholder transformation by boosting farm output which can lead to expanded market sales within an environment that features supportive infrastructure and conducive socio-economic and demographic, including institutional, conditions. Despite huge investments, irrigation schemes still underperform or collapse. "Institutional/government/market failures have made smallholders in South Africa the way they are" (Wale and Chipfupa, 2018). Obi (2016) found that the farmers grow a wide range of crops but cabbage, green maize and beans are the most important. They are able to sell these crops to local markets although they could earn more if they can sell in high value markets. Farmers struggle to access markets that will provide them with favourable prices for their produce and others sometimes do not even have a market to sell to, which often leads to substantial post-harvest losses.

Smallholder agriculture is dominated by opportunistic farmers who engage in farming because it is the only option available. If better opportunity arises in the future, they are eager to move out of farming. This is one of the factors contributing to low entrepreneurial spirit and aspiration within the irrigation sector.

Wale and Chipfuta (2018) reckon that transformation and successful on-farm entrepreneurial development paths depend mainly on transformation of farmers' mindsets. However, they acknowledge that changing mindsets is complicated as the behaviour has been embedded over a long period of time and it is a process that requires collective effort from all stakeholders, particularly those in education, extension and public transfers. The potential to transform homestead food gardening and smallholder farming would depend on the attributes of farmers (resource endowments, objectives in farming, constraints, opportunities and mindsets). Obi (2016) concluded that there are important differences in behaviour regarding the transition from homestead gardening to irrigated farming. There was also evidence that involvement in alternative economic activities influenced the choices made by the households which have implications for transforming to more commercialized farming.

The stakeholder consultation revealed that there has been enough research conducted to determine the challenges faced by smallholder farmers in irrigation schemes. The challenges are quite similar across different provinces. The stakeholders were not surprised by the findings presented but were rather eager to hear what will be done in order to address the challenges. Therefore next step now is to conduct pilot projects based on these recommendations. Access to markets and funding are the most limiting factors hindering farmers from transforming into entrepreneurs. Land is identified as limiting in some cases; however, the stakeholder consultation revealed that land is rather underutilised. There are other community dynamics which make land to be inaccessible.

Taking smallholder irrigators through the proposed development pathways is not going to be easy, it requires a formulation of programmes that will not be a blanket approach but that will rather identify the different farmer typologies. The work done by the three authors clearly show that entrepreneurship is not a concept you can enforce but rather identify people with entrepreneurial qualities and develop them accordingly. The farmers showing entrepreneurial qualities need to be trained with specific agribusiness skills and constant monitoring and evaluation need to be in place to monitor adoption.

10 RECOMMENDATIONS

Based on all the information gathered through the WRC research, implementation plans for pilot projects should be developed and rolled out.

Training and mentoring scheme irrigators on collective management of common-pool resources (like irrigation water) will play an important role to improve the operations of the institutions and assist with development of internal control and reporting systems to enhance accountability. Furthermore, government should also focus on institutional mechanisms of transferring ownership and responsibility of collective management of the schemes. Farmers should not only be beneficiaries of the irrigation scheme but also owners of the scheme with collective responsibility to manage and maintain the infrastructure. With this said, the project recognises that people fight within schemes and instilling the culture of collective management would be a challenge.

Existing financing mechanisms, such as farmer support provided through the Land Bank and Micro Agricultural Financial Institutions of South Africa (MAFISA), need to be explored to understand how they can be leveraged to effectively support smallholder irrigation farmers. There is need for government to evaluate the input support programme in terms of its impact on agricultural production and productivity. Government should consult more with farmers so that appropriate support is provided.

In terms of training and rural extension support, farmers should be empowered with a range of skills. The skills development programme should focus on:

- Agricultural production/farming – technical skills in production of different types of high value crops.
- Water management – involving the development of irrigation management training manual adapted to suit the literacy levels, language and context of the target farmers. For rainfed farmers this will entail training in water harvesting strategies.
- Business and entrepreneurial skills (record keeping, importance and ways of distinguishing farm operations from family operations, simple planning techniques including budgeting).
- Marketing and selling including negotiation, pricing of produce, time management, post-harvest handling, labour management and networking).

It is also important to note that training is not only needed by farmers, but the extension workers need to be well equipped to facilitate an effective information sharing and transfer.

In closing, it is worth emphasizing that development pathways for smallholder farmers can be achieved through collaborative efforts between local and national government entities, NGOs, the private sector, new and existing financial organisations, traditional leaders, and research and development role players. To address smallholder challenges, there is a need for collective action by all the relevant role players. The various role player activities and processes need to be coordinated and integrated and engage all relevant role players/stakeholders, along the value chain of developing and implementing the interventions.

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12 APPENDICES

12.1 Attendance register: Limpopo workshop

WATER RESEARCH COMMISSION

Institute of Natural Resources

STAKEHOLDER WORKSHOP FOR DEVELOPMENT OF ENTREPRENEURIAL DEVELOPMENT PATHS FOR ESTABLISHING SMALLHOLDER IRRIGATION FARMING BUSINESSES IN SOUTH AFRICA

Date: 10 October 2019

Time: 09:00 – 13:00

Venue: Polokwane Protea Hotel (Next to Shell Ultra City

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WATER RESEARCH COMMISSION

Institute of Natural Resources

STAKEHOLDER WORKSHOP FOR DEVELOPMENT OF ENTREPRENEURIAL DEVELOPMENT PATHS FOR ESTABLISHING SMALLHOLDER IRRIGATION FARMING BUSINESSES IN SOUTH AFRICA

Date: 10 October 2019

Time: 09:00 – 13:00

Venue: Polokwane Protea Hotel (Next to Shell Ultra City

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12.2 Attendance register: KwaZulu-Natal workshop

WATER RESEARCH COMMISSION

Institute of Natural Resources

STAKEHOLDER WORKSHOP FOR DEVELOPMENT OF ENTREPRENEURIAL DEVELOPMENT PATHS FOR ESTABLISHING SMALLHOLDER IRRIGATION FARMING BUSINESSES IN SOUTH AFRICA

Date: 15 October 2019

Time: 09:00 – 13:00

Venue: Institute of Natural Resources, 67 St Patricks Road, Scottsville 3201

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12.3 Attendance register: Eastern Cape workshop

WATER RESEARCH COMMISSION

Institute of Natural Resources

STAKEHOLDER WORKSHOP FOR DEVELOPMENT OF ENTREPRENEURIAL DEVELOPMENT PATHS FOR ESTABLISHING SMALLHOLDER IRRIGATION FARMING BUSINESSES IN SOUTH AFRICA

Date: 6 November 2019

Time: 09:00 – 13:00

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