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Setting up an Innovation Platform for Agribusiness Opportunities in South Africa

A Systems Analysis of the Preconditions for Setting up an Innovation Platform to Stimulate Sustainable Economic Growth in Giyani, South Africa

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“Real innovation is in finding ways to include everyone”
– Jon Gosier

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Abstract

This research focuses on the development and implementation of agricultural innovations that will ensure food security of small scale farmers in rural areas in South Africa. Its overall goal is to develop a strategy how to set up an innovation platform (IP) in Giyani, South Africa that also stimulates sustainable economic growth. The innovation platform is a new way of arranging and managing relationships of relevant stakeholders within the local agricultural innovation system in Giyani which depicts an innovative business model in the region. It enables the stakeholders to collaborate on new business opportunities and find solutions for the increasing food demand of the growing population and the threats of the unpredictable climate on the regional farming grounds.

For this innovation platform to be an economically stimulating part of the agricultural innovation system its opportunities and barriers and how to overcome these need to be analyzed. However, there is little theoretical background to which to refer on this matter in general, let alone the north-east region of South Africa. Therefore this research applied a comparable case study approach that considered three case studies describing how to set up an innovation platform in South Africa and Rwanda. The case studies are analyzed from an agricultural innovation systems perspective taking structural, dynamic, and external components into account. A further cross-case analysis between the three studied cases established the key aspects for setting up an innovation platform which are the facilitation of the innovation platform and the cooperation of its relevant stakeholders.

Based on these results a four-step strategy to set up an innovation platform is defined that includes (1) the analysis of the environment, (2) the set-up of the innovation platform, (3) the implementation of the innovations and (4) the monitoring and evaluation of the entire process.

Based on this strategy the well-functioning innovation platform in Giyani can be established and will stimulate the development of agricultural innovations and therewith sustainable economic growth.

Abbreviations

AGRI South Africa	South African Agricultural Union
AIS	Agricultural Innovation Systems
Alterra WUR	Alterra Wageningen University and Research center
ANC	African National Congress
ARC	Agricultural Research Council
ARC-GCI	Agricultural Research Council Grain Crops Institute
ATM	Automated Teller Machine
BASED	Broadening Agricultural Services and Extension Delivery
CDI	Center for Development Innovation
CIMMYT	International Maize and Wheat Improvement Center
CIP	Crop Intensification Program
CGIAR	Consultative Group on International Agricultural Research
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMO	Genetically Modified Organisms
INNO Giyani	Innovations in Giyani
IP	Innovation Platform
IS	Innovation System
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organization
NYAMIG	Nyagatare Maize Investment Group Ltd
PAFO	Pan African Farmers Organization
PICOTEAM	The Institute for People, Innovation and Change in Organisations (PICO)
RDO	Rwanda Development Organization
RIU	Research Into Use
SADC	Southern African Development Community
SANSOR	South African National Seed Organization
SGA	Seed Grower Association
SWOT	Strengths Weaknesses Opportunities Threats
WTO	World Trade Organization
ZAR	Zuid-Afrikaanse Rand

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1. Introduction

An estimated 805 million people in the world are suffering from malnutrition and hunger, whereby African countries show the highest rate of underweight people compared to other countries (FAO, IFAD, WFP, 2014). Food insecurity and the lack of access to trade markets are accused to be the main reasons causing not just hunger, but overall monetary poverty in the world (Wiggins & Keats, 2013).

Thus it comes as no surprise that three of the main novel Sustainable Development Goals[1] are poverty reduction, ensuring food security and promoting sustainable agriculture (United Nations, 2015). The UN's Food and Agriculture Organization seconds this by stressing that only an effectively managed food security will ensure a true sustainable development (FAO et al, 2014), which is "to meet the needs of the present without compromising the ability of future generations to meet their own needs" by definition (Brundtland Commission, 1987, p.8). Carlo et al (2009) added the importance of agricultural innovations that could enable sustainable economic growth, social welfare, and job creation to the list. Convincingly all 193 countries of the world agreed upon the implementation of this action plan until 2030 to achieve the Sustainable Development Goals (United Nations, 2015).

For South Africa this specifically translates into building sustainable communities in rural areas to preserve their ecosystems, use natural resources in a responsible manner, and achieve food security and economic growth that is sustainable and creates jobs (Environmental Affairs and Tourism, 2008). To do so, major investments into research and development activities, as well as in institutions fostering agricultural innovations need to be rendered (National Planning Commission, 2010).

The South African government has analyzed that especially small scale farmers who make up for 40% of all poor citizens suffer socio-economically from the currently inefficient national and local agricultural system of the country (Alterra, 2012), as they depend on self- grown agricultural products for food and income (FAO et al, 2014; Kumo, Omilola, Minsat, 2015; UNEC for Africa, 2007). So clearly, the agricultural sector holds an essential strategic position in putting forward the economic development.

The Limpopo Province in the north-east is one of South Africa's poorest provinces and therefore attracted special attention from the government with regard to achieving the Sustainable Development Goals, as it also happens to have very fertile soil and an advantageous climate for agricultural production (Alterra, 2012).

Section 1.1 specifies the research questions of this study.

[1] An action plan for people, environment and wealth formed in September 2015 by the member states of the UN General Assembly (United Nations, 2015).

1.1 Research Objective and Research Questions

This research aims to ensure food security of small scale farmers in rural areas in South Africa through the development and implementation of agricultural innovations. One way to achieve this is to create an innovation space within the South African agricultural system that promotes knowledge gathering and exchange, community, cooperation, and innovation (Prefontaine, 2013; Swaans et al, 2014).

Such space is also called an innovation platform (IP): "putting an inclusive innovation system approach into practice by bringing different types of stakeholders together to address issues of mutual concern and interest with a specific focus on the marginalized poor" (Swaans et al, 2014, p.1). It integrates the requirements of the poor in the development of innovations, addressing their local challenges and important joint solutions that can overcome these (Nederlof et al, 2011). In other words, the innovations should be discovered and developed by the same actors that will make use of the innovative solutions afterwards (Hall et al, 2006).

This research was undertaken in Giyani a town in Limpopo that suffers highly from poverty and food insecurity that yet has a great potential for developing and implementing agricultural innovations. The focus of the study is on the establishment of an innovation platform in Giyani. Researchers believe that especially in this province the development and implementation of innovations would improve agricultural production and food security to assure sustainable economic growth (Alterra, 2012; Ramaru & Hagmann, 2009).

In order to achieve the aforementioned goals the following main research question has been defined:

How to establish and facilitate an innovation platform in the agricultural sector in Giyani, in order to stimulate agricultural innovations and therewith sustainable economic growth in South Africa?

To make sure that all aspects of this comprehensive question will be discussed, the following sub-questions have been derived:

- What are the main opportunities and challenges for the development of innovations in the Agricultural Innovation System (AIS) in Giyani?
- How can the establishment of an Innovation Platform overcome the challenges of the AIS?
- What are the benefits of the innovation platform for the different stakeholder groups involved in the AIS?

Based on the answers to these questions the conditions will be identified that are needed to develop a suitable strategy to set up an innovation platform which will then help the AIS to achieve the goals of food security and sustainable economic development.

1.2 Scientific Relevance

Since 1990, scientific research on the topic of poverty reduction through agricultural development is driven by the aim to reach the United Nations Sustainable Development Goals (United Nations, 2010) which is reflected in the scientific literature on agricultural development that ever since pays special attention on strengthening the creation and implementation of innovations as an important driver for reducing poverty and enhancing economic growth (Swaans et al, 2014). Over the years, a shift from a mainly linear innovation approach towards a more inclusive and systemic co-innovation approach can be seen (Nederlof et al, 2011).

That means that instead of imposing technology onto the farmers, they are now already involved in the creation process of the technology which turned out to be crucial to establish an actual efficient innovation system (Nederlof et al, 2011). This implies acquiring the knowledge of local farmers (Heemskerk & Wennink, 2004). Earlier work has also shown that innovation platforms constitute a foundation for innovations in agricultural systems in developing countries, as they provide a space for stakeholders to collaborate to enhance livelihoods of poor people (Kilelu, Klerkx, & Leeuwis, 2013; Nederlof et al, 2011).

Accordingly, the current constraints and opportunities for setting up an innovation platform can be identified by analyzing the structural elements and dynamics of an agricultural innovation system in South Africa. That leads to a better understanding of the functioning of innovation systems in the agricultural sector in developing countries and highlights which preconditions are necessary to successfully launch the innovation platform.

A study by Ngwenya and Hagmann (2011), that evaluated innovation system approaches, showed that creating an innovation platform requires the involvement and cooperation of all significant stakeholders, namely: farmers, private partners, politicians and researchers. These stakeholders should be involved at the right time, taking over the right tasks, a process that needs facilitation (Nederlof et al, 2011; Ngwenya & Hagmann, 2011).

In this regard, the Agricultural Innovation Systems (AIS) approach[2] is applied to this research study, to detect constraints as well as opportunities for innovations to enhance the livelihoods of small scale farmers (Hounkonnou et al, 2012; Spielman, Ekboir, & Davis, 2009; Ayele et al, 2012).

Although theoretical studies have been conducted in the field of the implementation of innovation systems and platforms in the agricultural sector of developing countries (Abate et al, 2011; Agwu et al, 2008; Hall et al, 2006; Hounkonnou et al, 2012; Larsen et al, 2009), there is a lack of research studies regarding the establishment and functioning of innovation platforms in practice, where day to day challenges have been taken into account (Nederlof et al, 2011).

This exploratory research aims to fill this gap of a practical approach in previous studies concerning the formation of an innovation platform in a developing country. This research wants to create new insights into the major cultural, political, economic and institutional barriers when implementing agricultural innovations. These challenges include, amongst others, poor infrastructure, the lack of distribution channels in rural areas, illiteracy and therewith the lack of skilled labor, unemployment, weak legal frameworks and therefore corruption and the lack of institutional capacity (Anderson & Billou, 2007; Ganda & Ngwakwe, 2014). In order to elucidate the factors which constrain or support the development of agricultural innovations in developing countries an innovation system perspective needs to be applied. This can be used as a role model for other research projects in regions with similar conditions. Since the concept of an innovation system remains mostly unexplored in the agricultural sector of a specific region (Hall et al, 2006), this study also contributes to the scientific literature on agricultural innovation systems in developing countries.

1.3 Societal Relevance

This research is also societally relevant as it incorporates the development of strategies how to involve relevant stakeholders and how to interconnect them within the innovation platform, in order to develop agricultural innovations, exchange knowledge and receive trainings. The vast majority of agricultural producers in South Africa are small scale farmers, which call for a platform with a strong community approach that solve local challenges with innovative solutions (Ramaru & Hagmann, 2009).

[2] AIS approach: „Innovation occurs through the collective interplay among many actors [...] and is influenced by factors such as technology, infrastructure, markets, policies, rules and regulations, and cultural practices (actors´values and norms). [...] Innovations are not just about technology but also include social and institutional change, and have a systemic and co-evolutionary nature.“ (Kilelu et al, 2013, p. 65).

This research could support current and future innovation platforms to adopt an advanced strategy to develop innovations, which tackle local challenges, small scale farmers face every day. The study is beneficial for governments, researchers and development assistants who are involved in rural sustainable economic development in Sub-Saharan Africa to reduce poverty. Establishing innovation platforms in the agricultural sector is an innovative way to overcome the current cultural and institutional barriers which are hindering small scale farmers to achieve sustainable economic growth based on their own capacities and means. A well-functioning innovation platform can increase the agricultural production performance of small scale farmers, the marketing of their products as well as the strengthening of their collaboration with the stakeholder network. That leads to sustainable economic growth, increased incomes and therewith an advanced livelihood for local small scale farmers in developing countries. In addition, an IP addresses food security and the reduction of poverty, both crucial aspects of the global sustainable development policy and the enhancement of the global society (United Nations, 2010). Two examples of establishing an innovation platform in a developing country to improve the livelihoods of small scale farmers are exposed in the findings part of this study, which reassure this statement.

1.4 Outline

Chapter 2 describes the underlying concepts of scientific theories on agricultural innovation systems in developing countries, factors influencing the AIS, as well as innovation platforms and its functions. This will lead to an integrated conceptual framework, in order to answer the research questions. The operationalization of this conceptual framework is explained in the method Chapter 3, also including research design, data collection, data analysis and quality of the research method. Chapter 4 presents the findings from the field research, supplemented with the output from the desk research and its analysis. This will be discussed in Chapter 5 in relation to the given literature propositions and limitations of the research. The conclusion Chapter 6 entails the answers to the research questions, policy recommendations and ends with future research possibilities.

2. Theory

This chapter comprises the theoretical background to the research that was undertaken. It covers three main parts: the theory about agricultural innovation systems with a special focus on developing countries in section 2.1 and 2.2, the theory about innovation platforms in chapter 2.3 and 2.4, and an integrated conceptual framework, chapter 2.5, which will be applied to the empirical research.

2.1 Agricultural Innovation Systems in Developing Countries

According to Amankwah et al. an innovation system (IS) is a "set of all individual and organizational actors that are relevant to innovation in a particular sector or issue, their interactions and governing institutions" (Amankwah et al, 2012, p. 38). The goal of an innovation system is to develop, diffuse and implement innovations (Hekkert et al, 2007), which occur in a collaborative process and are essential for economic development (Swaans et al, 2014). An important part of its creation process is the collaboration of stakeholders with different expertise and their open knowledge exchange. These stakeholder groups contain, amongst others, research institutions, universities, companies, buyers, suppliers as well as certain political actors. The influence of already existing formal and informal institutions such as rules, regulations, norms and behavioral attitudes based on local and cultural imprints in combination with social structures can trigger, or hinder the innovation process (Hekkert et al, 2007). It is therefore necessary that innovation systems are able to constantly evolve and adjust within and towards their changing environment (Spielman, Ekboir, & Davis, 2009).

Ernst (2000) asserted that innovation systems in developing countries incorporate special characteristics which are not represented in the traditional innovation systems approach. These countries have usually heterogeneous economies, weak and volatile economic institutions, limited domestic knowledge and an unstable global currency and financial market (Ernst, 2000). They are therefore more dependent on foreign knowledge transfer to develop local capabilities and learning mechanisms to create a well-functioning innovation system. That requires adequate international interactions between public and private partners to absorb this foreign knowledge and to apply it to the local circumstances. This can be achieved by creating efficient national policies which favor innovations, and to account for unpredictable market dynamics (Ernst, 2000).

To analyze the potential of the development of innovations in the agricultural sector of developing countries, the Agricultural Innovation Systems (AIS) approach (Agwu et al, 2008) has evolved based on the National Innovation Systems approach (Edquist, 1997; Freeman, 1995). Agricultural problems can be detected and analyzed based on the AIS framework and suitable innovations can be developed in order to solve agricultural problems (Schut, Klerkx, et al, 2015). Overall, this agricultural innovation system represents a guidance to map its actors, their interactions, and their roles within the agricultural innovation system. In developing countries the AIS is inadequately aligned with the needs of local small scale farmers. This is reflected in their policies, governmental services and education capabilities which are rather directed to commercial farmers than to small scale farmers in rural areas (Aerni et al, 2015). Within the AIS, innovations are defined as "the result of a process of networking and interactive learning among a heterogeneous set of actors, such as farmers, input industries, processors, traders, researchers, extensionists, government official, and civil society organizations" (Klerkx et al, 2010, p.1). Besides new technologies, institutional innovations are also emphasized by the AIS (Klerkx et al, 2010) which require a holistic understanding and analysis of the structure, the different dimensions and the various stakeholders of the AIS (Hounkonnou et al, 2012). Figure 1 illustrates a national agricultural innovation System (Spielman & Birner, 2008):

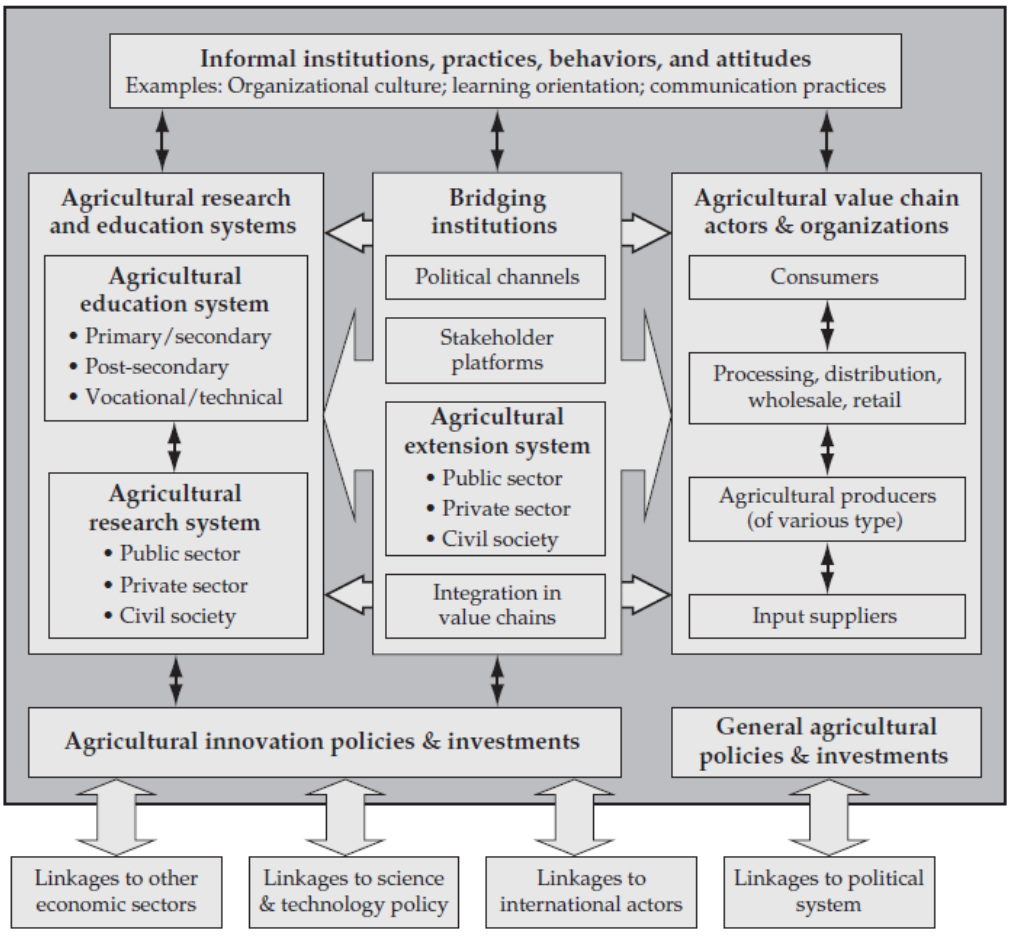

Figure 1 A National Agricultural Innovation System (Spielman & Birner, 2008, p.6)

This study examines how the AIS of a developing country can contribute to sustainable economic and agricultural development by strengthening the innovative capacity through creating an innovation platform. The innovation capacity describes the ability of the stakeholders of the AIS to develop new skills to create innovations within the agricultural system (Schut, Klerkx, et al, 2015). To analyze under which conditions an innovation platform can be established, the socio-technical context it is embedded in - the AIS - needs to be investigated first (Kilelu et al, 2013).
Which internal and external factors influence an agricultural innovation system in its well-functioning is described in the next section 2.2.

2.2 Factors influencing AIS in Developing Countries

To determine whether the previously described agricultural innovation system functions well it is recommended to analyze whether its structural elements are rather hampering or enhancing the development and diffusion of innovations (Lundvall et al, 2009; Schut, Klerkx, et al, 2015). The structural elements include:

- Infrastructure and assets;
- Institutions;
- Interaction and collaboration and;
- Capabilities and resources (Schut, Klerkx, et al, 2015, p.3).

It is presumed that innovations emerge “from a broad network of dynamically linked actors within a particular institutional context” (Swaans et al, 2014, p.2). To identify the network with its actors Hall et al (2006) suggest to apply the following checklist:

- Actors, roles they play, and activities in which they are involved;
- Attitudes and practices of the main actors;
- Patterns of interaction
- Enabling environment (policies and infrastructure) (Hall et al, 2006, pp. 28-29).

The interactions between the actors and institutions, and its external environment need to be examined to achieve a holistic overview of the AIS. This can include multi-stakeholder partnerships, a sharing knowledge culture, the establishment and facilitation of networks with public and private partners, power dynamics and the degree of trust which occur amongst them (Schut et al, 2015; Lundvall et al, 2009).

In the context of this research, facilitation incorporates the stimulation, support and improvement of the collaboration processes of involved actors (Nederlof et al, 2011).

There are political, economic and environmental aspects, here referred to as external factors that can influence the development and diffusion of innovations. These are in particular “competition, openness to international trade and capital flows, labor market dynamics, social welfare systems and ‘social capital’” (Lundvall et al, 2009, p. 5). They determine whether the AIS is able to actually strengthen the local market economy and provide capacity building by improving institutions within the innovation system.

Barriers for an efficient market economy are, amongst others, high transaction costs and information asymmetry (Wiggins & Keats, 2014).

Transaction costs are defined as “the costs of searching for a partner with whom to exchange, screening potential trading partners to ascertain their trustworthiness, bargaining with potential trading partners (and officials) to reach an agreement, transferring the product, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement” (Holloway, Nicholson, & Delgado, 1999, p.7). They are much more pronounced in an agricultural innovation system in a developing country, especially in rural areas amongst poor smallholders, due to long distances to the market and the nescience of the farmers about market prices and quality standards (Wiggins et al, 2013).

Information asymmetry also impedes the successful functioning of the local market economy. In literature this is referred to in principal agent theory (Laffont & Martimort, 2001). The agent is specialized in a certain area of expertise and is consulted by the principal who lacks that information. The principal has no control over the integrity or accuracy of the received information, or over the objectives of the agent, which leads to an asymmetry of power (Laffont & Martimort, 2001). This asymmetry creates unwanted dependencies as well as mistrust between the principal and agent. Moreover, it also leads to high transaction costs to access the market and limits any market participation by the principal (Greenwald & Stiglitz, 1986).

Both, transaction costs and information asymmetry are causing the failure of rural markets as they block the access to affordable inputs, credit and market information. Such hidden costs make it complicated for small scale farmers from rural areas to participate in market transactions to create an income from their harvest to overcome the poverty trap (Wiggins & Keats, 2014).

2.3 Strategy for Setting up an Innovation Platform in a Developing Country

Key to overcome the barriers in the AIS is to set up a platform, an innovation platform, which can be understood as a space where individuals can have a facilitated learning experience, to mutually identify solutions for their problems (Homann-Kee Tui et al, 2013).

The concept of establishing innovation platforms is widespread in research and development projects (Homann-Kee Tui et al, 2013).

A well established and functioning AIS constitutes the precondition for the formation of an innovation platform. The possible constraints existent in the aforementioned agricultural innovation system can be overcome by creating a platform with a multi-stakeholder network and therewith interactive learning and innovation mechanisms (Hall et al, 2006). Agricultural innovation platforms can simplify the profitable participation at trade markets for its members by reducing transaction costs through the multi-stakeholder network (Delgado, 1999). The network will provide cultivation skills and a secure sales market which is an incentive for the participating farmers to grow over their own consumption limit and to comply with market quality standards (Holloway et al, 1999). An IP in the agricultural sector can be especially of advantage in rural areas in developing countries. Through the distinctive stakeholder network and the supply of agricultural services, small scale farmers will be connected to the market via a communication and transportation infrastructure and they will be aided with access to knowledge, facilitation and farm equipment (Sanchez & Ricart, 2010).

Building a multi-stakeholder network is a key success factor for the operation of an IP (Sanchez & Ricart, 2010). Such collaborative approach can be regarded as an institutional innovation in rural areas in developing countries to stimulate sustainable business and economic growth (Bocken et al, 2014). An institutional innovation is necessary to overcome the barriers for an efficient innovation system (Kilelu et al, 2013).

Numerous authors have condensed key steps towards the development of a functioning innovation platform (Abate et al, 2011; Kilelu et al, 2011; Ngwenya & Hagmann, 2011; Swaans et al, 2014), which are shown in Table 1.

Table 1 Key Steps of Setting up an Innovation Platform (Based on Boogaard et al, 2013, p.6)

Authors	Key Steps of Setting Up an Innovation Platform
Varma et al. 2009	**6 steps:** Identify stakeholders; Establish learning alliance; Assessment, knowledge sharing and consensus building; Visioning and prioritizing; Planning and implementation; Monitoring and evaluation
Adekunle et al. 2010	**10 steps:** Location of sites; Identification of commodity or system; Identification of stakeholders; Engagement of researchers; Development of governance and management guidelines; Facilitation of interaction of stakeholders; Development of business plan; Implementation of business plan; Establishment of participatory M&E measures; Review of implementation and lessons learnt
Tenywa et al. 2011	**6 steps:** Identification of research and developmental challenges; Site selection; Consultative and scoping study; Visioning and stakeholder analysis; Development of action plans; Implementation of action plans
Abate et al. 2011	**5 steps:** Identify a problem or challenge; Formalize focus and scope; Identify functions; Identify actions; Identify expectations and formulate actions
Nederlof and Pyburn 2012	**4 steps:** Scoping and preparation; Process management; Learning and restructuring; Renegotiating
Coraf/Wedard 2012	**3 steps:** Establish situation, capacity building and engagement with stakeholders; Action planning and understanding priorities – participatory learning and action research – monitoring and evaluation; Adapting and re-planning (starting next cycle)
Homann-Kee Tui et al. 2013	**7 steps:** Initiate; Decided on focus; Identify options; Test and refine solutions; Develop capacitiy; Implement and scale up; Analyse and learn
Makini et al. 2013	**6 steps:** Initiation; Establishment; Management; Sustainability; Innovation; Learning and knowledge

This previous researches create an extensive pool of knowledge that allows to derive a case specific list of steps suitable for the installation of an agriculture information platform. Three main aspects are consistently listed which are the need for a physical space, distribution of responsibilities based on skills and resources, and the appointment of leadership positions.

According to Kilelu et al (2013) the initiation of an innovation platform is based on a partnership of actors of the agricultural system. To do so all stakeholders must be able to come together at a physical meeting place. This place has to be central and easy to reach for the prospective platform members. The initiators usually already have a broad vision of the platform and will be able to identify relevant stakeholders based on this vision. Together with the objectives and common interests of the stakeholders, the scope and subject of the platform can be determined to set up a clear focus for the platform. The roles and responsibilities can be distributed based on the skills and capabilities of the stakeholders. The appropriate integration and governance of the individual stakeholders is essential, as in who will be in a leading position (Kilelu et al, 2013; Abate et al, 2011).

The facilitation of this process is critical, wherefore an innovation intermediary with appropriate skills and attitudes will be appointed (Abate et al, 2011). It is essential that all this is done on a voluntary basis to ensure a sustained commitment of the members throughout the innovation process (Kilelu et al, 2013). When these steps are fulfilled, the members can start working on the development of innovations to find solutions for the present challenges. The necessary technology and capacity needs to be created through workshops, consultancy and trainings so that the innovation can be implemented in the field (Homann-Kee Tui et al, 2013; Nederlof et al, 2011).

Last but not least it is suggested by Makini et al (2013) and Nederlof et al (2011) to set up the innovation platform based on a sustained strategy, focused on a continous development of innovations, being flexible and adapting to a changing economic, political and social environment, having a dynamic network and clarifying benefits for its members.

2.4 Functions of an Innovation Platform in Developing Countries

The innovation platform needs to operate on a horizontal, vertical and complementary coordination level between the involved stakeholders so that it can remove potential barriers for the development of innovations, and strengthen the interactions of the stakeholders to improve the performance of the AIS (Kilelu, 2013). A multilayered structure and an extensive interconnectedness of the innovation platform is crucial for its well-functioning. According to Kilelu (2013) the functions illustrated in Figure 2 need to be fulfilled, in order to efficiently perform the aforementioned coordination:

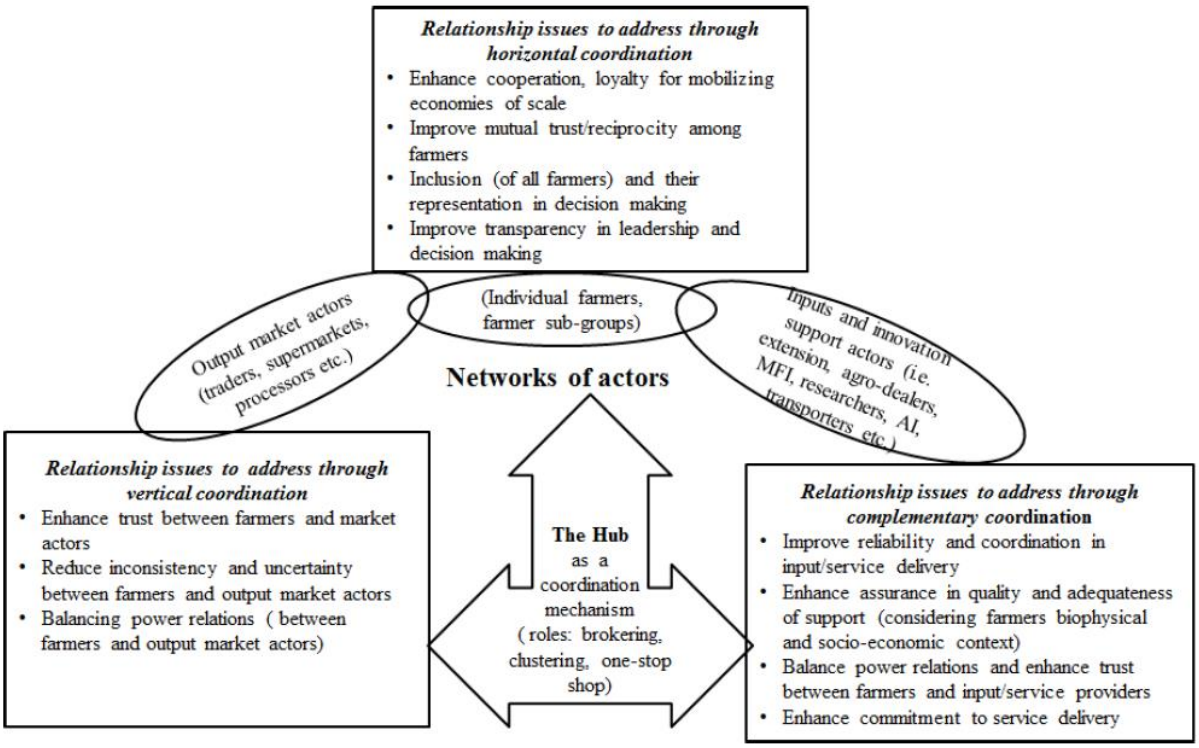

Figure 2 Functions of an Innovation Platform (Kilelu, 2013, p. 88)

In order to be able to answer the research questions based on the explained theoretical background all the single elements need to be combined, structured and efficiently connected. This is done with the so called ’Integrated Conceptual Framework` which is explained in the following chapter.

2.5 Integrated Conceptual Framework

The integrated framework draws the above mentioned theoretical approaches into one scheme and will be used to analyze the constraints and opportunities of the implementation of an innovation platform in the AIS in South Africa. The framework describes the process in three parts (Figure 3).

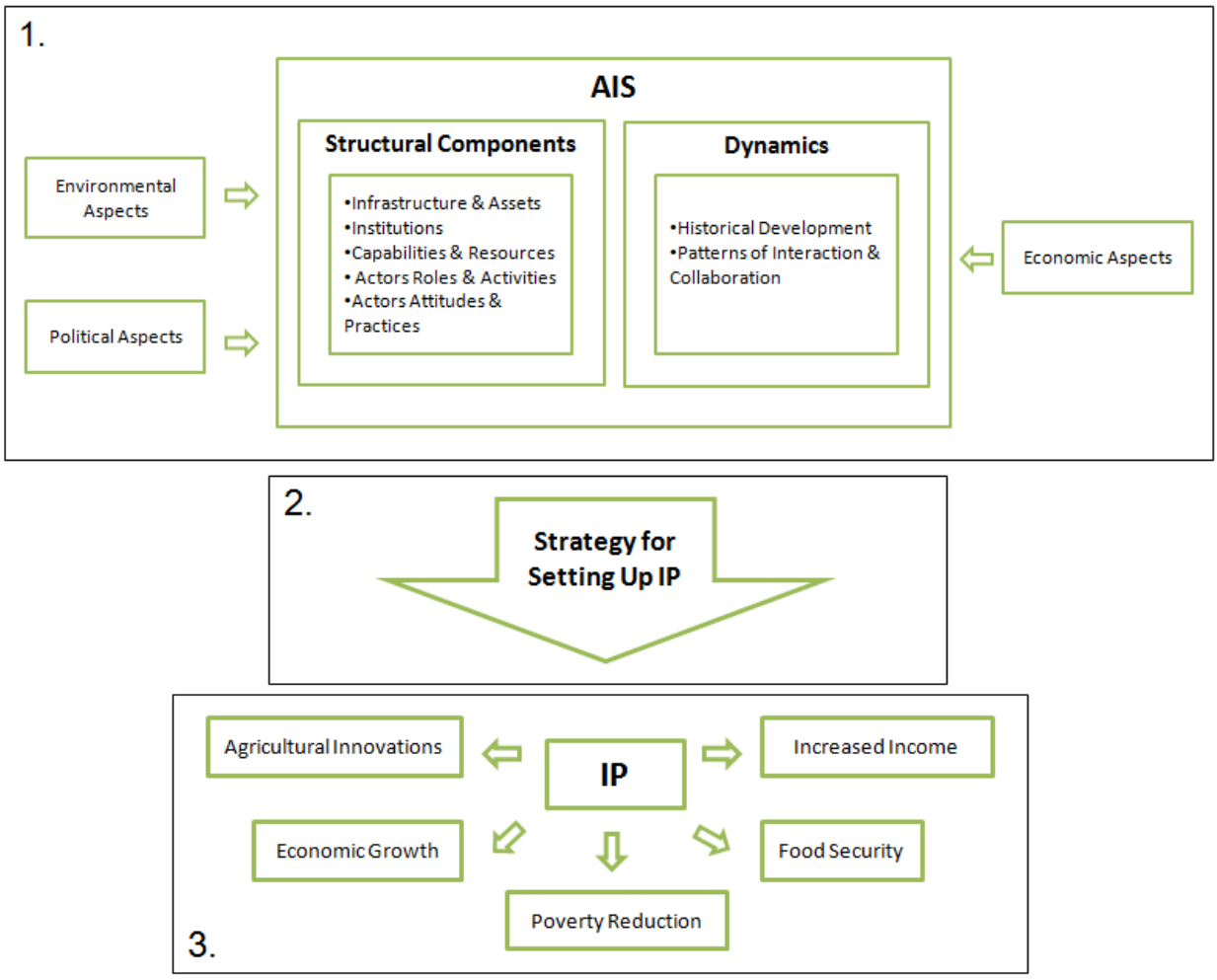

Figure 3 Integrated Conceptual Framework (Own Illustration)

The first part (1.) comprises the list of structural components compiled by Schut et al (2015) complemented with the checklist to identify actors and their interaction within the AIS suggested by Hall et al (2006). It analyses the current structure of the agricultural innovation system, its characteristics and interactions as well as external aspects, in order to understand if the components are hampering or enhancing the development of innovations (Hekkert et al, 2007). The historical development of the agricultural sector in South Africa zooms in on the dynamics and interactions part of the AIS which is important to get a background understanding about the development and relationships of the current AIS.

This analysis constitutes the basis for the alignment of the strategy (2.) how to set up the innovation platform. The strategy for the formation of an innovation platform will be derived from several approaches of setting up an IP illustrated in Table 1 aligned to site specific circumstances in Giyani, South Africa. The strategy makes use of the opportunities and attempts to eliminate the constraints in the AIS. The third part (3.) of the integrated framework depicts the functions of an innovation platform based on the research of Kilelu (2013). These functions need to be fulfilled by the IP in order to develop innovations which address the challenges of the AIS and its individuals. This represents an institutional innovation which will be capable to develop agricultural innovations. This will lead to an improvement of the yield, an increased income of the farmers and stimulating sustainable economic growth. Therewith it ensures food security in the region and reduces poverty.

The next section describes how this integrated conceptual framework will be operationalized in order to gather and analyze data, necessary to find answers to the research questions.

3. Methods

The goal of the study is to identify current constraints and opportunities to develop innovations within the AIS as perceived by the stakeholders involved in the agricultural sector in South Africa. In order to answer the research questions interviews were conducted in South Africa to get a real insight of the circumstances for the formation of an IP on-site. The interviews were conducted to better understand the challenges regarding the farming business small scale farmers in Giyani are confronted with. These insights were used as the base for formulating a strategy for setting up the IP.

3.1 Research Design

The research is an **exploratory** study of the agricultural innovation system in Giyani, South Africa. This method was chosen because the research aims to get an overview of the main opportunities and challenges for the development of innovations in the AIS and to get new insights into trends and latest developments of the AIS (Robson, 2002). This exploratory research is based on multiple sources of information involving documents, stakeholder observations, expert interviews as well as stakeholder group interviews.

This study has a **multiple case study design**, whereby one main case was analyzed in detail and on-site. The case study approach is a qualitative method, "which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" (Robson, 2002, p. 178). It was chosen to get an in-depth contemporary comprehension about the case specific real-life context (Yin, 2013). The main case study of this research receives financial support from the Dutch Ministry of Foreign Affairs in the course of the INNO[3] Giyani project, managed by Alterra WUR. The unit of analysis of this case is the agricultural innovation system in Giyani, South Africa, its structural and dynamic components as well as involved actors. This case was selected because Giyani is an illustrative example with a great potential for agricultural production, especially maize as the main aliment in Giyani, and the need of an external impulse for the region to develop in a sustainable way. The main challenges small scale farmers in Giyani are confronted with are the lack of food security and access to trade markets. Therefore the establishment of an IP in Giyani is an appropriate way to address these challenges and improve the situation of the small scale farmers.

[3] INNO - Innovation

A snapshot that is a less extensive analysis of two comparable case studies of two already existing innovation platforms, i.e. the Maize Innovation Platform in Rwanda, and the Seed Innovation Platform in South Africa was done based on a literature review and reports. These cases of innovation platforms were deemed qualified because they fulfill the criteria of being located in a developing country, of being based in the agricultural sector, and of dealing with maize as the main agricultural product, just as the planned IP in Giyani. They were chosen based on recommendations from J. Ramaru, an expert in the field of innovation platforms in Sub-Saharan Africa. These case studies highlight the role which innovation platforms can fulfill in enabling the development of innovations and connecting the various actors of an AIS. From the cross-case analysis recommendations for the main case and future projects were developed.

3.2 Operationalization

In this part the key concepts that were distilled from theoretical literature are defined based on measurable indicators. These indicators again are defined and suitable instruments are selected on how to observe them.

The developed integral conceptual framework explained in chapter 2.5 is used as a template for the operationalization. Thereby case specific circumstances, such as the physical infrastructure, the capabilities of the stakeholders and climatic conditions, are taken into account with the aim to make the model more precise and practical applicable on site (Verschuren & Doorewaard, 2010).

Operationalization of the AIS

The structural components of the AIS are defined based on the conceptual framework (Figure 3). The indicators provide an operational definition for each component and the instruments present the way how the data was collected (Table 2).

Table 2 Operationalization of Structural Components and Interactions of AIS (Based on Schut, Klerkx, et al, 2015; Schut, Rodenburg, et al, 2015)

Structural Components	Indicators	Instruments
Infrastructure and Assets	- Knowledge, research and development infrastructure - Physical infrastructure including roads, irrigation schemes and agricultural inputs distribution - Communication and financial infrastructure	- Stakeholder interviews - On-site observation - Physical artefacts
Institutions	- Formal institutions including agricultural policies - Laws - Regulations - (Food) quality standards - Agricultural subsidies - M&E structures - Organizational mandates - Market (access) and trade agreements - Informal institutions such as social-cultural norms and values	- Stakeholder interviews - On-site observation - Local newspapers - Documents
Capabilities and Resources	- Agricultural entrepreneurship - Labor qualifications - Human resources (quality and quantity) - Education and literacy rates - Financial resources - Legal frameworks to facilitate the application of new knowledge	- Stakeholder interviews
Actors´ Roles & Activities	- A sufficiently diverse set of organizations from the public and private sector actively engaged in a the agricultural sector - Appropriate range of actors to the nature of the sector, the stage of development of the market, and the institutional setting of the particular country	- Stakeholder interviews - On-site observations
Actors´ Attitudes & Practices	- Ineffective or conservative behavior - Attitudes enable or restrict collaboration between organizations - Existence of patterns of trust and reciprocity - Existence of a culture of innovation - Demand for research in the private sector - Emphasis on capacity building for future eventualities - Common use of collaborative arrangements for knowledge-based activities - Emphasis on both technological learning (mastering new technology) and institutional learning (accessing and using knowledge more effectively) - Secretiveness - Top-down culture - Lack of confidence - Openness - Transparency	- Stakeholder interviews - On-site observations
Patterns of Interaction and Collaboration	- Networks and partnerships between private companies, farmer organizations, NGOs, and research and policy organizations - Integration of concerns of the poor in the activities of the innovations system, and mechanisms to promote their agenda - Effective sector-coordinating bodies present - Present stakeholder bodies, such as farmer and industry associations - Power-dynamics - Trust - Mutual respect - Proactive networking - Reflection and learning from successes and failures	- Stakeholder interviews - On-site observations - Documents

This operationalization gave the underlying structure for a semi-structured guideline for the interviews, here referred to as questionnaire. The detailed questionnaires can be found in the Appendix B and C. The interviewees were asked about the presence and characteristics of the individual components. Moreover, it was examined whether the indicators were mentioned in a positive or negative context regarding the condition of the components, or whether indicators such as the physical infrastructure were present or missing and how their state of development is based on the perception of the interviewees. From this analysis the current situation of the AIS could be identified and whether its components are rather constraining or enabling the development of innovations.

Data for the historical development of the agricultural sector was collected through literature research. The chosen timespan ranges from the year 1913 until 2015. The starting date was chosen based on the commencement point of the Apartheid era. The political situation during the Apartheid regime can be seen as the opposite to the current political system in South Africa and is therefore a suitable reference point to identify the influence of different political systems on the agricultural sector. The collated timeline of historical political events in the agricultural sector will be supported by statements of the interviewees.

Operationalization of External Aspects

The external economic-, environmental- and political aspects were identified through desk research, covering local and national news over the period April 2015 – September 2015; on-site observations, interviews and physical artefacts. These aspects were identified as particularly influential to the AIS when they were also mentioned by the interviewees.

3.3 Data Collection

The data collection used multiple sources of evidence, to get an overview and a broad understanding of the research topic. A profound desk research was carried out before the site visit at Giyani about the following subjects: agricultural innovation systems and factors influencing these, innovation platforms, and the formation and governance of IPs, all against the background of developing countries. In preparation for the research site visit an extensive research about the case studies was made based on scientific literature and documentation, such as project proposals, progress and final reports and formal studies of the cases (Yin, 2013). Regarding the two comparative case studies, Maize Innovation Platform in Rwanda and the Seed Innovation Platform in South Africa, no site visits have been performed, written sources were the only sources of evidence.

Based on the recommendations of the initiators of the project in Giyani, the people or groups which needed to be interviewed were identified. During the data collection and first analysis it was determined who the envisioned stakeholders for the innovation platform were and which kind of people or groups were lacking in the current system. The interviews with these stakeholders were conducted during a three months (May – July 2015) research site visit to Giyani, South Africa.

Data Collection in South Africa

At the beginning, two exploratory expert interviews were conducted with Joe Ramaru from PICOTEAM[4] and Paul Plantinga from the Innovation HUB[5] in South Africa. These experts were chosen because they already have successfully implemented innovation platforms in South Africa within the agricultural sector. As a result, insights on the roles of participants of the IP, the efficient governance of the IP, an innovation enabling environment of the IP as well as the barriers and opportunities within the AIS were discovered. The experiences and information from these interviews were integrated into the questionnaire for the interviews with the local people and project partners in Giyani.

This questionnaire included: general questions about the interviewees and the current situation in Giyani regarding agricultural production, questions about the interviewees´ knowledge and attitude towards innovations and, questions about the interviewees´ requirements and expectations of an innovation platform. In the next research stage qualitative data through 13 semi-structured in-depth interviews (using the developed questionnaire, see Appendix B and C) and several informal conversations, covering all involved stakeholder groups, were conducted to analyze the structural components of the AIS (Schut et al, 2015). These included local farmers of Giyani, the manager of the local SPAR supermarket, scientists of the Limpopo and Stellenbosch University, farm managers, soil scientists and relevant contact persons of the Limpopo Department of Agriculture (Table 3). Due to confidentiality reasons anonymity of the individual farmers is taken into account in this research.

[4] PICOTEAM: The Institute for People, Innovation and Change in Organisations (PICO) is “a network of organisations in Africa, Latin America and Europe which supports people and organisations in their efforts to bring about change and innovations for sustainable development.”(PICOTEAM, n.d.)

[5] The Innovation Hub is a science and technology park whose main aim is to increase the wealth of its community, by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions (The Innovation HUB, 2011).

Table 3 List of Interviewees

Name	Stakeholder Group
Farmer A	Small scale farmer (represents a group of 2 farmers)
Farmer B	Small scale farmer (represents a group of 10 farmers)
Farmer C	Small scale farmer (represents a group of 5 farmers)
Farmer D	Small scale farmer (represents a group of 8 farmers)
Farmer E	Small scale farmer (represents a group of 5 farmers)
Farmer F	Small scale farmer (represents a group of 13 farmers)
Joe Ramaru	Picoteam
Paul Plantinga	Innovation HUB, Gauteng province
Peet Snyman	SPAR supermarket Giyani
Peet	SPAR farm manager Giyani
Dr Willem de Clercq	Stellenbosch University
Theo Kleynhans	Stellenbosch University
Freddy Madiba	Limpopo University
Several People	Limpopo Department of Agriculture (LDA)
Arnold Botha	Soil scientist/trainer of farmers
Coe Pienaar	Soil scientist
Dr. Jochen Fröbrich	Alterra WUR
Arjen Spijkerman	Alterra WUR

Based on the questionnaire, important interactions between the different stakeholder groups could be identified. Furthermore, insights were obtained about requirements, perspectives and resources of the various stakeholder groups regarding the set-up of an innovation platform, as well as about the local political and cultural circumstances which are influential to the implementation of the innovation platform. Additional insights could be gained about the effects of the political changes on local people working in the agricultural sector in Giyani, South Africa, especially on how it influenced their possibilities of sustainable economic development through small scale farming.

The dynamic description of the AIS in Giyani, South Africa was done based on documents and scientific literature, from which a timeline of important events in the agricultural sector in South Africa related to agricultural innovation and economic development was drawn. This timeline was supplemented with information from the interviews, which highlighted the importance of several events for the interviewees.

The gathered data through the interviews was supplemented by ongoing observations of the interviewees´ behavior during and besides the interviews in Giyani. This provided more information about the informal institutions, such as norms, attitudes, trust and decision behavior of the local people, which is one component of the AIS. This is relevant information about the characteristics of the stakeholders which cannot be found in scientific literature and is therefore important to support other sources of evidence (Bell, 2014). The observations were retained through photographs, which are also presented in this research.

Additional sources of information were physical and cultural artefacts that were found during the field visits and informal conversations with the local people (Yin, 2013). A special focus was put on agricultural technology and tools the farmers were using as well as their personal devices, such as mobile phones, cars and computers.

3.4 Data Analysis

The first part of the data analysis consists of the in-depth description of three case studies and their contexts (Creswell, 2007). In a next step a within-case theme analysis is done in which the collected data is organized and categorized to identify a correspondence of main opportunities and barriers of the AIS. To analyze the actors, their patterns of interactions and collaborations within the AIS of each case study, an actor interaction matrix (Table 3) and a stakeholder network could be set up respectively. Based on these tools the current situation of the stakeholder network, and its strengths and weaknesses can be elucidated (Hall et al, 2006).

Table 3 Template Actor Interaction Matrix

	Farmers	Researcher	Extension Officers	Traders	Service Providers	Processors	Development Organizations
Farmers							
Researcher							
Extension Officers							
Traders							
Service Providers							
Processors							
Development Organizations							

For the main case study INNO Giyani, a SWOT[6] analysis will be performed to identify the strengths, weaknesses, opportunities and threats of the AIS in Giyani, in order to establish an appropriate strategy for setting up an innovation platform. Strengths and weaknesses represent the internal attributes of the AIS and opportunities and threats represent the external attributes and effects of the AIS (Hay & Castilla, 2006).

Based on the findings from the comparable case studies, patterns are established to identify similarities or differences to the main case of INNO Giyani (see Figure 4) (Yin, 2013).

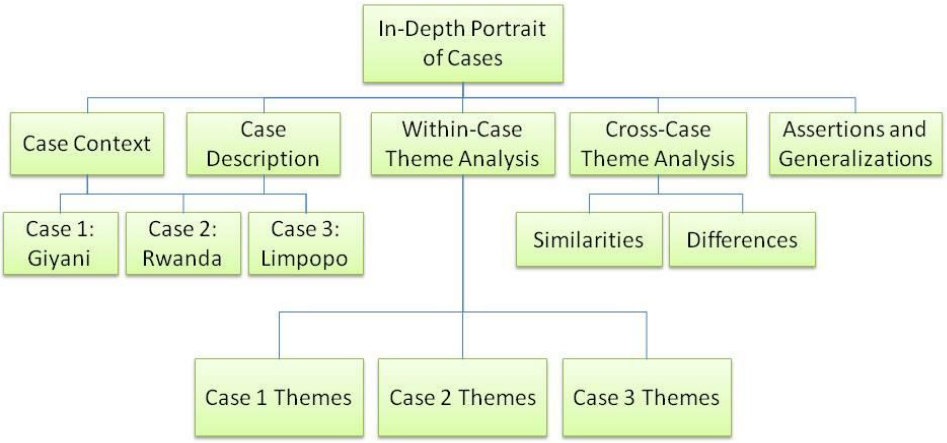

Figure 4 Template for Analyzing Multiple Case Studies (according to Creswell, 2007, p.172)

The findings from this cross-case analysis are linked to the literature to identify concordant and new themes (Burnard, 1991). Through the cross-case theme analysis and the comparison to literature, generalizations can be developed which could be applied to similar projects (Yin, 2013). After analytical generalization, key parameters for a successful innovation platform in the agricultural sector are compiled with regard to the case specific conditions in Giyani, South Africa.

3.5 Research Quality and Limitations

The four quality tests of a case study research include construct validity, internal validity, external validity, and reliability (Yin, 2013).

To ensure **construct validity** in this research, the collected data is gathered from multiple sources, such as scientific literature, policy documents, attendance of events, observations at site visits, and various interviews.

[6] SWOT – Strengths, Weaknesses, Opportunities, Threats

Besides that, the operationalization of the theoretical framework ensures that the questionnaire matches the research questions and provides information necessary to answer these questions. Not all interviews could be recorded and transcribed which decreased the traceability of the used information. Another limitation can be the accessibility of the necessary interviewees, related to the availability and the willingness of the interviewees and time constraints.

The **internal validity** is increased through the semi-structured character of the interviews which limits steering by predetermined questions to lower interviewer bias (Bryman, 2004).

The **external validity** of the research is limited because the stakeholder compilation and the environmental circumstances are unique (Yin, 2013). Thus, the studied case is mainly representative for Giyani/South Africa. However, main findings can provide a template for analytical generalization for studying the development and implementation of IPs in other similar regions in developing countries (Yin, 2013). Even though generalization of the findings of this one specific case is not entirely possible, the theoretical framework and the recommendations can be used as a starting point or analytical tool for future projects, as it involves the most up to date literature research and insights based on real case studies (Bell, 2014). Even though just one researcher was interpreting the findings, two scientists from Alterra WUR reviewed these outcomes, so that a triangulation of the different data sources could be achieved to increase the validity of this research study (Yin, 2013).

The **reliability** is given to the extent, that the data could be reproduced. Nevertheless, the studied case is embedded in an environment where unexpected changes could occur, such as the fluctuation of the involved stakeholders, which means that it is likely that the obtained information could not be exactly replicated at a later point of time.

4. Findings

This part presents the description of the case studies, the empirical data of the research, the analysis of the data and the interpretation of the findings. As mentioned earlier, the first step is giving an in-depth description of the case study INNO Giyani. Second, the collected data of the field research is presented structured by the components of the agricultural innovation system: infrastructure and assets, institutions, capabilities and resources actor´s roles and activities, actor´s attitudes and practices, patterns of interaction and collaboration, historical development and external aspects. These findings are then analyzed in an iterative way. In the next step a snapshot of the case study of the Nyagatare Maize IP in Rwanda as well as the case study Limpopo Seed Production IP in South Africa is given, also based on the components of the agricultural innovation system at the point of time when the innovation platforms in the respective locations were already established. The circumstances of the AIS and primary challenges for setting up an innovation platform in Rwanda and South Africa are explained and elaborated in section 4.2 and 4.3.

Finally, chapter 4.4 gives the cross-case analysis, in which similarities and differences, regarding the challenges of the AIS and solutions of the three investigated case studies are determined which will lead to the part ‘5’ of the thesis - the discussion.

4.1 Case Study: INNO Giyani – South Africa

This research was part of the project 'INNO Giyani - Boosting Agribusiness Opportunities in Giyani' (illustrated in Figure 5), a project initiated by the Dutch research organization Alterra WUR[7].

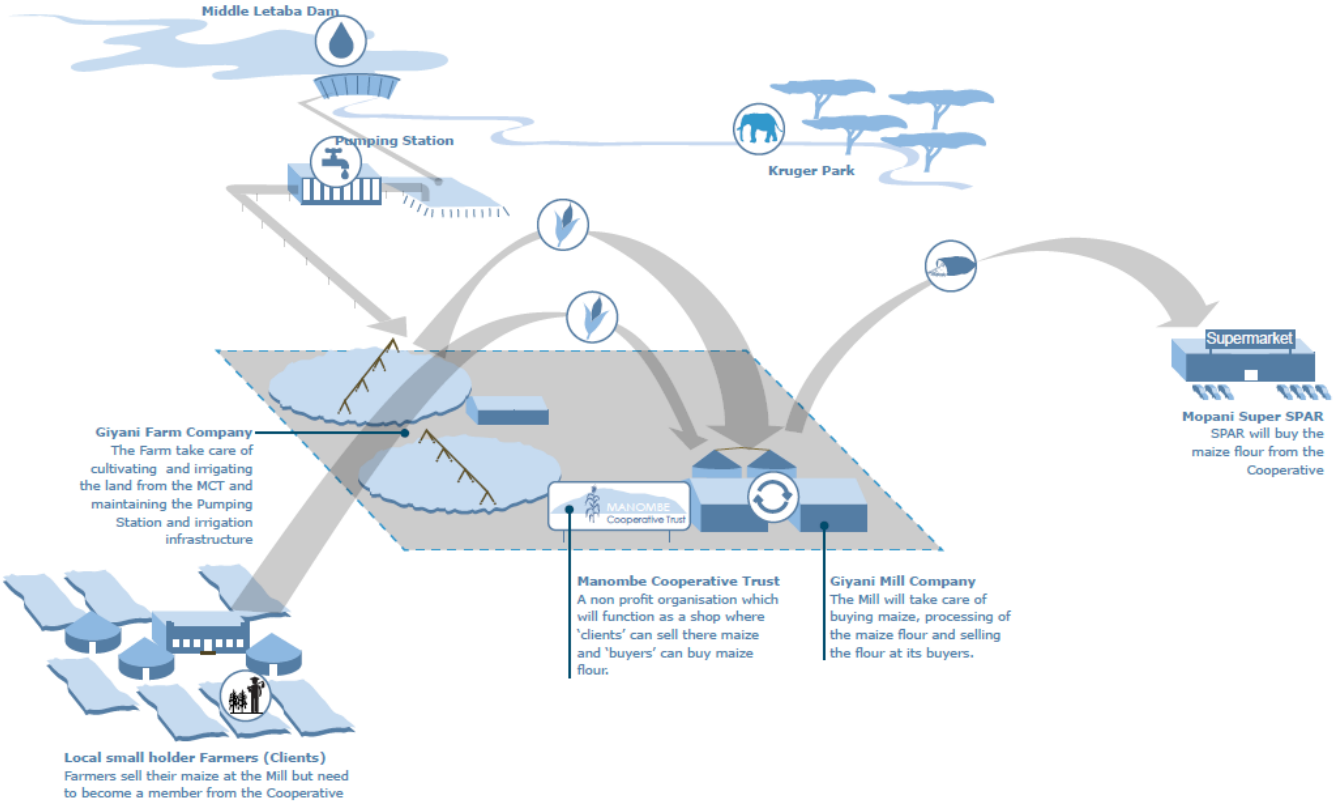

Figure 5 Illustration INNO Giyani Project (Spijkerman, 2012)

The Dutch Ministry of Foreign Affairs is granting the project, with 5.99 Mio Euro over five years (2013-2018), covering costs of the project management, technical assistance and training as well as consultancy services. The main focus lies on innovations within irrigated agriculture, crop cultivation and food production chains in Giyani, a village located north-east in the rural area of the Limpopo province in South Africa (Figure 6) (Alterra, 2012). The majority of the population in the Limpopo province lives in rural areas and is involved in farming (Ramaru & Hagmann, 2009). Giyani is a small village with a population of around 26,000 people (Frith, 2011) and is located in a region characterized by very fertile soils and a semi-arid climate (Alterra, 2012). Subsistence farming on small farms is the main income of the people living in this area (Southafrica.info, 2012). Despite these circumstances, the governmental support services are targeted towards commercial farming, because it is seen more profitable and effective than small scale farming (Ramaru & Hagmann, 2009).

[7] Alterra Wageningen University and Research center.

Figure 6 Location Giyani, South Africa (own illustration)

The 'INNO Giyani' project is a public-private partnership between partners from South Africa (SPAR supermarket; ZZ2[8]; Dacom B.V.[9]; Limpopo Department of Agriculture; Stellenbosch University) and the Netherlands (Alterra WUR, Dutch Ministry of Foreign Affairs). They will combine their different disciplines and knowledge to innovate in the areas of production, processing and marketing of agricultural products (Alterra, 2012). This partnership aims to develop a Cooperative, which is defined by the International Co-operative Alliance as "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically-controlled enterprise." (ICA, 2015). The Cooperative will accompany the process of determining sustainable production thresholds whereas the impact on the environment will be considered (Alterra, 2012). One of the main goals of the INNO Giyani project is to supply the local maize demand in Giyani by producing and selling maize on-site at a competitive price. The local market will therewith become self-sufficient and food security in Giyani will be achieved.

An innovation platform will be established for the Cooperative to accomplish a diversification of agribusiness opportunities in Giyani, such as finding new niche products and producing high quality products in addition to the maize production. The implementation of the innovation platform, which is the main research object of this study, aims to strengthen the innovation capacity of the region.

The project itself has not been started and the Cooperative was not established yet, during the time of reserach in Giyani (May – July 2015) due to the complexity of the project and therewith an unexpected long preparation phase for technical plannings and its implementation (Fröbrich, 2015). Next, the current situation of the AIS in Giyani is described according to the classification of its structural components that enable or constrain innovations in the agricultural innovation system in Giyani.

[8] ZZ2 – Agricultural business in South Africa, producing vegetables and cattle (ZZ2, 2015).

[9] Dacom B.V. – High-tech company based in the Netherlands, develops hardware, software and consultancy services for agricultural enterprises worldwide (Dacom B. V., n.d.).

4.1.1 Structural Components of the AIS in Giyani

Infrastructure and Assets in Giyani

During the Apartheid regime in South Africa (1913 - 1994), the area of Giyani was flourishing, with mango and banana plantations run by commercial farmers. Homelands[10] were constructed in Giyani, where less successful small scale farmers were resident (Snyman, 2015). The commercial farmers established an irrigation system, with pump houses, underground pipes and various bore holes throughout Giyani, to be able to cultivate fruits and vegetables at every time the year (de Clercq, 2015).

Since the end of the Apartheid regime (1994) until today (2015), this situation changed drastically. There are no commercial farms in Giyani anymore. The area is marked by abandoned fields (Photo 1), scrubland and overgrazed grounds. Most of the small scale farmers practice agriculture on 1-4 hectare sized farmland, mainly for their own consumption. During the exploration of the area it could be determined that the old irrigation system is run down and most of its parts were stolen (Photo 2).

Due to the lack of maintenance and utilization the pump and operator houses are now dysfunctional (Photo 3) and the network of underground water pipelines is for the most part disconnected (de Clercq, 2015).

The old maize mill in Giyani (Photo 4) is still present, though run down and not functional anymore. This is why maize products are currently imported from markets 600 kilometer away from the Giyani region (Snyman, 2015).

Photo 1 Abandoned field in Giyani (own photo)

Photo 2 Disconnected irrigation pipe in Giyani (Fröbrich, 2014)

Photo 3 Broken water pump house in Giyani (own photo)

Photo 4 Old maize mill in Giyani (Fröbrich, 2014)

[10] Homelands are „areas to which the majority of the Blacks population was moved to prevent them from living in the urban areas of South Africa" (South African History Online, 2014).

After 1994, the agricultural land was redistributed to black citizens with the intention to empower them, at which more and more land was dispossessed from white commercial farmers by the government. However, the majority of the black population was incapable to return to farming activities and to maintain the operation of the fields by themselves, due to the lack of cultivation skills and an appropriate agricultural education (UNEC for Africa, 2007). This is the main reason why successful farming business in Giyani came to an end after 1994, leaving mainly abandoned fields and a desolated irrigation infrastructure behind.

Another infrastructural challenge in Giyani is the lack of security, such as fences around the fields or safeguard. The smallholders are confronted with free-range cattle destroying their crops and theft of valuable farming tools and machines if not fenced off or locked away.

"I really need money to buy a fence for my field. During the day I am the security guard here, but if I am not here the cows from the neighbors walk through my field and eat my plants." (Farmer F, 2015)

The road system in and around Giyani is rather developed and well connected. Based on the statements of the farmers and own observations it became clear that the main difficulties to successfully turn their farming into a business are the long distances from the farms to the market. That constraints the farmers to go there frequently to get agricultural inputs, such as seedlings, pesticides and fertilizer, as well as to get up-to-date information about market prices, demand and quality requirements, which constraints them to sell their harvest for a fair price. The lack of access to trade markets is one of the main problems in Giyani (Erasmus, 2015; Farmer A – F, 2015).

All of the interviewed farmers owned a cell phone and the majority had a car. Even though the very basics of a communication infrastructure are established, they have hardly been used for networking amongst the farmers, or with the market respectively.

At the commercial center in Giyani several banks and ATM´s[11] are available, however the majority of the small scale farmers do not has a bank account. This implies that especially the low-income smallholders do not participate in the financial system which explains why they are not able to profit from governmental grants, loans or fixed contracts with money transaction assurances. Even though there are financial support mechanisms available in the region, their accessibility and/or affordability is not always secured.

[11] Automated Teller Machine

A provincial government office of the Limpopo Department of Agriculture is located in Giyani, but the performance of the extension officers cannot live up to its potential (Farmer A-F, 2015). This service almost exclusively reaches privileged farmers, who are member of cooperatives or associations or who have a stake or good relations to the employees of the department (LDA, 2015; Farmer A, 2015). The majority of the interviewees mentioned nepotism in this context, when asking about the reason for the different handling. Another reason for the failure of the extension service is the lack of trained extension officers, inadequate facilities and a weak knowledge infrastructure. Hence, the extension officers do not have the possibility to regularly visit and train the farmers nor provide them with required up-to-date cultivation knowledge (LDA, 2015). This often results in wrong advices due to the lack of cultivation experiences which is not solving the problems of the small scale farmers (Kleynhans, 2012). The shortcoming of agricultural service delivery to rural areas, particularly knowledge provision, training supplies, as well as farming input materials, represents one of the most serious challenge of the South African government related to agricultural development (Kumo et al., 2015).

Institutions in Giyani

The Limpopo Department of Agriculture provides grants for development projects which mostly apply to farmer cooperatives (LDA, 2015). For individual farmers it is difficult to build up successful cooperatives on their own in order to fulfill the requirements to receive these grants (Farmer A, 2015). In addition, long distances between the different farms, illiteracy, lack of information and cultural barriers, such as the lack of trust between the farmers make it complicated for the smallholders to benefit from this specific governmental support (Ramaru, 2015). Given that most of the farmers do not have a bank account complicates the possibility of financial transactions moreover.

There are several non-governmental organizations and projects which support small scale farmers and their activities on a local or national level respectively. One example is the Agricultural Research Council, a research institute in South Africa, which provides capacity development and trainings for smallholders (ARC, 2014). Another institution where farmers can get educational support is the international organization Technoserve which is a “nonprofit organization that develops business solutions to poverty by linking people to information, capital and markets” (Technoserve, 2015). A more extensive list with residential organizations and their support mechanisms can be found in the Appendix A.

It can be determined that there are several small projects with the aim to improve the participation of small scale farmers in agricultural development in South Africa (Siambi, 2010).

Yet only one of the interviewed farmers did profit from such a project in the past, and the majority of the respondents received inputs from these organizations, such as seedlings, fertilizer, or pesticides (Farmer A, 2015). All interviewed smallholders agreed that the support and advise from the private companies is more effective and valuable than the one from the governmental extension service (Kleynhans, 2012; Farmer A-F, 2015). This is due to the fact that the private consultants are trained and skilled workers and therefore more qualified and motivated to provide agricultural extension service. In addition, the governmental extension officers are partly appointed into their positions on the basis of relations to the government rather than on the basis of their skills and experiences (Pienaar, 2015).

Because the farmers have limited access to markets and to market information, trade agreements never led to the formation of reliable written contracts between small scale farmers and the sales market (Farmer A – F, 2015; Snyman, 2015). This hierarchical structure is restraining the farmers to reach a successful farming business and fosters the creation of a non-cooperative culture amongst the actors in the agricultural system (Farmer C, 2015).

According to the corruption index[12], existing laws in South Africa are often inadequately enforced and public services are not working very efficient. This results from overregulation and high bureaucracy which can hinder action or decision-making regarding sustainable economic development (GAN Integrity Solutions, 2014; Transparency International, 2014).

Capabilities and Resources of Residents in Giyani

Agricultural entrepreneurship amongst the educated farmers is quite present. One of the interviewees started his own small business, offering his cultivation knowledge as an advisory service to other farmers, to support them in achieving a better harvest (Farmer A, 2015). A second farmer officially registered his farm as a company to be able to negotiate at the market with private partners. He runs his one hectare farm very successfully, cultivating vegetables like cabbage, okra and tomatoes, and is nominated for the "young farmers award", an event which rewards young farmers from the Limpopo province for their achievements in the agricultural sector (Farmer C, 2015; LDA, 2015).

These examples show the potential of the region´s young people, who are able to create an efficient agricultural innovation system and to transform farming into a beneficial business. The biggest challenge is that most of the young and educated people are leaving the region towards cities (de Clercq, 2015; Snyman, 2015).

[12] A country ranking based on the level of corruption, determined by experts (Transparency International, 2014).

This is due to the fact that they either cannot find a job in the rural areas, or they re-educate to a non-farming related subject, as confirmed by Farmer B:

"I actually bought this land for my son, because he wanted to farm. But after a while he found a better job in Polokwane and now I have to do everything by myself without any knowledge about farming." (Farmer B, 2015).

From a human resource perspective, there is a high amount (47%) of unemployed people in Giyani and the surrounding villages (Kleynhans, 2012; Statistics South Africa, 2011). If these people, often illiterate, would be trained with basic cultivation skills, there is an extensive pool of potential farm-workers for new or expanding farms.

One respondent from the Limpopo Department of Agriculture declared that as soon as a project started, involving public and private partners with a reasonable management and project plan, the department is willing to support the project financially (LDA, 2015). From a former socio-economic study of small scale farmers in Giyani, it became apparent that the farmers hold very small financial reserves, which restricted them to obtain more farm land, or new farm technologies in order to expand their farming business (Kleynhans, 2012).

Actors´ Roles and Activities

To give an overview of the actors present in the agricultural innovation system in Giyani, a matrix with actors involved and their interactions is presented in Table 4.

Table 4 Actor Interaction Matrix Agricultural Sector Giyani

	Farmer	Knowledge Institutions	Buyer	Broker	Governmental Extension Services
Farmer		Agricultural studies	Buying seeds, fertilizer, pesticides and equipment at high price	Selling produce Additional costs for transport and packaging	Irregular trainings Arbitrary supply of (poor quality) seeds, fertilizer, pestizides
Knowledge Institution					Training
Buyer				Transport to market Selling produce	
Broker					
Governmental Extension Services					

The network between the actors in Giyani is not very well established and cross-linked, which can be seen in the ‚actor interaction matrix' (Table 5). The farmers do not exchange information amongst each other or unite, due to mistrust and long distances between their farms. This leads to a disadvantageous position of the farmers in the AIS, because they individually buy seeds, fertilizer and pesticides in small quantities at high market prices and they lack bargaining power opposite to sales agents. In addition, the farmers have no direct connection to the local or even national fruits and vegetable markets of Giyani or other regions, respectively, to get up-to-date information about market prices, quality requirements and product demands (Snyman, 2015; Farmers A-F, 2015). The smallholders therefore mainly sell their harvest to sales agents or hawkers, who buy their products in bulk, rarely directly to the supermarkets (Farmers A – F, 2015). This leads to undervalued prices the farmers get from the sales agents and high costs for transport and packaging they have to pay in return, which in the end creates almost no profit for the farmers. This financing structure represents a major barrier for the small scale farmers to improve their agricultural business and the economic system to develop in a sustainable way. Moreover, the majority of the interviewed farmers did not have an educational background in agriculture and depend highly on external knowledge input. Besides one project of the Limpopo University, no connections or projects between the local farmers and knowledge institutions could be found. The *‚Rural and Innovation Development HUB'*, a project established at the University of Limpopo, which aims to engage local communities in their research and education system, was established in 2011 (Robbins et al, 2012). It intends to address social needs in the local communities of the Limpopo province based on research projects involving academics as well as local farmers. However, none of the respondents mentioned this project.

The interviewed farmers receive irregular or no agricultural training by the extension officers from the government, because there are not enough extension officers available to cover the amount of farmers who need the support (Erasmus, 2015; Farmer D, 2015). At times they got farming input material from the government which comes mostly in poor quality and without instructions on how to apply it (Farmer F, 2015). Thus, it can be seen that the connection between the local government and the smallholders is not very strong and reliable.

From the actor interaction matrix it became apparent that the AIS in Giyani lacks important stakeholders and interactions, such as agricultural experts and scientists who team up with local small scale farmers, sufficient extension trainers and intermediates who connect the farmers with the other stakeholders (Farmer A, 2015; de Clercq, 2015).

Actors´ Attitudes and Practices regarding Agriculture and Innovation

The culture amongst the local farmers is very competitive and characterized by distrust (Farmer A, E, F, 2015). This limits the collaboration amongst the farmers and constrains the advancement of the local agricultural economy. There is no transparency or agreement amongst the farmers as they are afraid of opportunistic behavior from their combatants. The smallholders do not share their intentions about upcoming cultivation plans, with the aim to have the monopoly when they sell their products to the market (Farmer A-F, 2015). That was confirmed by Farmer A, stating:

"The last time I wanted to sell my cabbage to the supermarket, they send me away, because they just got a big delivery of cabbage from another farmer yesterday." (Farmer A, 2015).

This leads to an unregulated cultivation scheme in the area, resulting in an overproduction or a shortfall of the supply of the local market with local products (Wiggins & Keats, 2013).

Against this background, there are several rather unsuccessful small farmer cooperatives and associations in the region of Giyani (de Clercq, 2015). Yet none of the interviewed farmers was member of these institutions. This results from past negative experiences with cooperatives due to mismanagement, lack of motivation and failures of their members and initiators, which creates distrust against joining traditional cooperatives, or farmer organizations (Farmer A, C, 2015). However, all respondents are open for new organizational institutions and partnerships, facilitated by experts or international partners from the private sector.

The interviewed smallholders in Giyani have a very modern and amenable attitude towards agricultural innovations. This could be determined during the field visits, where all the farmers showed their drip irrigation systems. One interviewee stated:

"I saw that the neighboring farm uses solar panels to generate energy for their water pumps. I also want to have this for my pumps, it would be better and cheaper than the diesel generator I am using now." (Farmer B, 2015)

Therefrom it can be seen that the smallholders in Giyani are open for applying new technologies on their farms and that they perceive innovations as something advanced and profitable.

The region is managed by the traditional chiefs who decide over land rights and the distribution of land (Alterra, 2012). These hierarchical power dynamics make it difficult for the small scale farmers to expand their land, or for new entrants to obtain territory to cultivate (Farmer F, 2015).

Younger citizens of Giyani perceive farming not as a beneficial business but rather as a subsistence occupation of poor people (Snyman, 2015). As a matter of fact, 35,8% of people living in Giyani who are working in the agricultural sector cannot obtain an income from their farming activity (Statistics South Africa, 2011). This reality in conjunction with the negative perception of farming amongst young people constrains the development of the agricultural sector and therewith the emergence of agricultural innovations in the region.

Concluding it can be said that the structural components of the agricultural innovation system in Giyani incorporate components which hamper innovations, such as weak governmental institutions and underdeveloped capabilities and training services, but also components which foster innovations, such as a basic structures of a transport and communication infrastructure, and the willingness of local farmers to create a business out of their farming. If the potential of the fostering components is applied well, it can overcome the barriers created by the hampering components.

4.1.2 Dynamics of the AIS in Giyani

Historical Development of the AIS in South Africa

To illustrate the dynamics of the current agricultural innovation system in Giyani over time an overview about historical events and policy decisions is given. The following Table 5 illustrates the significance of these events for the agricultural sector in South Africa. The starting date, 1913, in the table also depicts the beginning of the Apartheid regime in South Africa which then continues in a chronological order until the current year, 2015.

Table 5 Historical Development of the AIS in South Africa (based on Harmelen, 2015; Kirsten, Stander, & Haankuku, 2010; New Partnership for African's Development (NEPAD), 2013; OECD, 2006; Tibane & Vermeulen, 2014; WIPO, 2002; Khoza, 2015; West, 2015)
(The red line in the table highlights the end of the Apartheid regime 1994)

Year	Political Event	Significance for the agricultural sector
1913	Native Lands Act	▪ Limited black Africans to get farming ground ▪ Land was in reserves under communal tenure ▪ Restricted land transactions ▪ Prohibited sharecropping and cash rentals for black Africans ▪ No traditional farming anymore
1966	Agricultural Credit Act	▪ Assistance of farmers (favoring white farmers)
1971	Establishment of the CGIAR[13]	▪ Essential for sustainability in agricultural research ▪ Improved high-yielding crops
1992	Establishment of the ARC[14] Establishment of the SADC[15]	▪ Major public agricultural research ▪ Established trade arrangements; access to foreign markets; greater exposure to external competition

[13] Consultative Group on International Agricultural Research

[14] Agricultural Research Council

[15] Southern African Development Community

1994	First democratic elections - End of the Apartheid regime Land restitution	▪ Deregulated marketing of agricultural products ▪ Most agricultural cooperatives transformed to private companies ▪ Liberalized agricultural trade ▪ Enacted land reform policies and programs ▪ Eradicated certain tax concessions and reduced direct subsidies ▪ Introduced minimum wage for farm workers ▪ Attracted FDI[16] from several multinationals; built international and national partnerships ▪ Land redistribution ▪ "willing-buyer/willing-seller" approach (voluntary market transactions) ▪ Black farmers got land back but struggled to get resources and skills to develop it; 90% of the land was not functional
1997	GMO[17] Act	▪ Responsible development, production, use and application of GMOs ▪ Limited possible harmful consequences to the environment
1999	Decreasing import tariff	▪ Since 1994 the import tariff was lowered by 1/3
2002	Launch of African Union	▪ Fostered socio-economic development ▪ Supported liberation of Africa
2005	Introduction of development programs	▪ Supported the development of market-oriented family farms with investment grants; micro credits; retail finance services in rural areas
2010	Establishment of the PAFO[18]	▪ Enhanced economic institutions (finances and insurances)
2011	National Development Plan	▪ Increased agricultural exports ▪ Enabled food-trade surplus by small-scale farmers ▪ Channeled public investment into research and new agricultural technologies for commercial farming ▪ Developed adaptation strategies and support services for small-scale and rural farmers
2014	Plant Breeders' Rights Amendment Bill Plant Improvement Amendment Bill	▪ Protected Intellectual Property rights of plant varieties – contributed to economic growth & competitiveness of agricultural sector ▪ Supported sustainable production ▪ Participation in global market due to adapted quality standards
2015	Agri-parks Youth programme in agriculture	▪ Development of Agri-parks, controlled by farmers, financially supported by the government ▪ Created a stakeholder network between small scale farmers, markets and processors ▪ Development of agricultural skills amongst young farmers in rural areas ▪ Job creation in the agricultural sector for young farmers

[16] Foreign Direct Investment

[17] Genetically Modified Organisms

[18] Pan African Farmers Organization

During the Apartheid era, black people were suppressed and relocated to Homelands. They were not allowed to farm for themselves or to acquire farmland anymore (South African History Online, 2014). They were forced to work for white people in the industry, especially the mining sector (Tibane & Vermeulen, 2014). Through this shift of labor possibilities, the black people lost their cultivation skills and perceived the industrial sector as a promising labor opportunity. After the Apartheid regime (highlighted through the red line in the table) the currently ruling party ANC[19] started the 'Black Economic Empowerment' movement, to redistribute assets and to create employment possibilities for the disadvantaged people (Ponte, Roberts, & van Sittert, 2007). The biggest problem was at first the fair and fast redistribution of farmland to the black citizens, and with that the skills and access to farming equipment. This transition in combination with a continuing population growth stimulated the agricultural production (Liebenberg & Pardey, 2010). However, the percentage of agricultural output did not increase in equal measure. In 2008, the growth rate of agricultural output in South Africa was 0.19%, whereas the population growth was 0.82% in the same year (Liebenberg & Pardey, 2010; Statistics South Africa, 2008). The development of agricultural output over the period 1947 – 2008 can be seen in Figure 7.

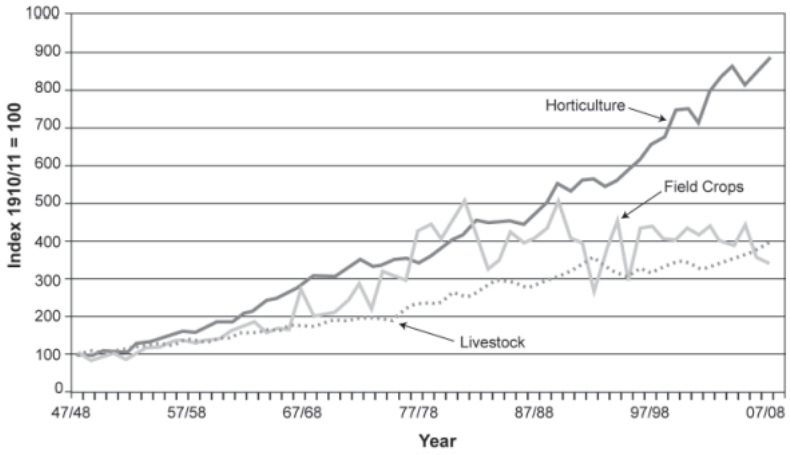

Figure 7 Quantity of Agricultural Output by Sector, 1911-2008 (Liebenberg & Pardey, 2010, p.391)

This condition of unimproved agricultural output and the growing population indicates the necessity of innovations and education in the agricultural sector to improve the production of agricultural products to achieve food security in rural areas like Giyani in South Africa. The planned innovation platform in Giyani can improve this situation through the stimulation of agricultural innovations and cooperation amongst the smallholders.

[19] African National Congress

Patterns of Interaction and Collaboration amongst the Stakeholders

Currently, there are no public-private partnerships or similar multi-stakeholder interactions regarding agricultural innovations or development in Giyani (Fröbrich, 2015). One respondent reported that he participated in an agribusiness workshop provided by Technoserve, where he learned how to write a business plan and how to improve his marketing skills (Farmer A, 2015). Representative bodies at a national or regional level like the National African Farmers Union, an organization with the attempt to create equality amongst the South African population through lobbying for land access, financial resources and access to information for black farmers, and AGRI South Africa, a farmers federation working on land reform, farmer development and infrastructure amongst others, are existent (Agri SA, 2015; NAFU-Agri Business, 2012). Though, none of the interviewed farmers were in any way connected to these associations, due to the lack of information about these possibilities (Farmer A-F, 2015).

From this, it can be seen that there is a need to create a sharing knowledge culture and information network in Giyani. Additionally, the remoteness of the farms and the infrequent contact amongst the farmers limited the sharing of such information further.

Another challenge is the relationship between the farmers and the market actors, such as hawkers, traders or supermarkets, in Giyani. The poorly used communication infrastructure and remoteness of the farmers make it difficult to directly interact with the market actors and to get up-to-date information about prices and demand for their vegetable products (Farmer B, E, 2015). In addition, small scale farmers act and sell their harvest mainly individually which leads to an imbalance of bargaining power between them and the market actors. The lack of written and binding contracts makes it almost impossible to negotiate profitable prices and does not provide the security of the disposal of their products. The interviewed farmers resort to hawkers in most cases, because they do not always reach the quality requirements of local supermarkets, where they could get a higher price for their products. Also the collaboration with sales agents is common in the area. The sales agents buy the yield from the farmers and distribute it to other provinces with a higher demand like Gauteng. According to the statements of the farmers, these arrangements are always based on verbal agreements:

"I never had a written contract with the traders, I never meet them, we clarify everything on the phone." (Farmer D, 2015)

"I have a trade agent in Gauteng, but he is not very reliable. Every time I get less money for my products, than we agreed on." (Farmer A, 2015)

Ultimately, these verbal contracts are not profitable for the small scale farmers, since the sales agents charge for unexpected transport and packaging costs afterwards. However, there are already a few collaborations occurring between the farmers and the SPAR supermarket in Giyani, which are highly depending on the quality and quantity of the products (Farmer D, 2015). Given that the manager of the two SPAR supermarkets in Giyani is also the initiator of the INNO Giyani project, he assured that if the local small scale farmers can achieve the required quality standards and quantity of their agricultural products, the supermarket will buy and market their products under the SPAR house brand (Snyman, 2015). This will stimulate the local trade of agricultural products from local smallholders in Giyani.

4.1.3 External Aspects Influencing the AIS in Giyani

Environmental Aspects Influencing the AIS in Giyani

The biggest environmental problem in semi-arid South Africa is the low amount and limited access to fresh water which is a critical resource in the agricultural sector (WWF global, 2007). Especially farmers without water bore holes have difficulties to cultivate in the dry winter months, due to the lack of water. The very poor smallholders in Giyani do not have an irrigation infrastructure which permanently provides them with fresh water, and therefore they are relying on rainfall and groundwater (Erasmus, 2015). In addition, the predictability of the climate in Sub-Saharan Africa is decreasing which hinders the development of responsive adaptation mechanisms (Thornton et al, 2011). Consequently, food security and a secure income through agriculture is endangered in rural areas in developing countries (Griffin, 2012).

Economic Aspects Influencing the AIS in Giyani

After the termination of the Apartheid regime 1994, South Africa acceded to the WTO[20] which exposed the national market to international competition. This decision created various challenges for the national agricultural sector (Kalaba, 2015). Despite the failing redistribution of land to the disadvantaged people after the Apartheid regime, small scale farmers in rural areas did not always get appropriate support and tools from governmental extension services to develop and compete on a global level (Alterra, 2012). On top of that, commercial farms struggled, because their products were replaced by cheaper imported products from overseas (Kalaba, 2015). This development is also reflected in the decrease of the agricultural exports over the last decades, which is illustrated in Figure 8 (National Planning Commission, 2010).

[20] World Trade Organization

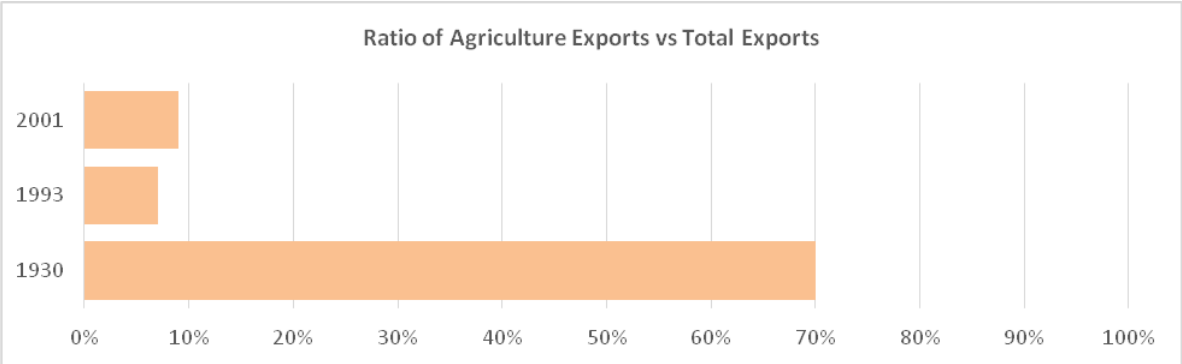

Figure 8 Development of Agricultural Exports in South Africa (Kirsten et al., 2010)

South Africa is currently dedicated to strengthen its economic trade relations with China to increase the export of high-value products, and labor-intensive commodities, as an emerging business opportunity (SAnews.gov, 2015). In addition, China invested in South Africa´s economy to support its development and to transfer knowledge to get a stake in its industry (SAnews.gov, 2015). This economic relationship can help to increase the demand for the South African export market and simultaneously enables an international transfer of knowledge and skills which can help South Africa´s agricultural sector to develop. For the intended innovation platform in Giyani, these international relationships can be beneficial too, especially regarding the possible export opportunities of high-value agricultural products from Giyani, which can lead to a stimulation of local agricultural development through an increased demand. Besides, the involved stakeholders of the innovation platform can profit from the international knowledge transfer, adapt it to local circumstances and implement it in Giyani to improve local cultivation practices.

According to the report of the African Development Bank Group, South Africa has adequate policies in place to enable a fast and efficient start of new businesses which is in return stimulating economic growth and job creation (Kumo et al, 2015). This policies could help to overcome main barriers for doing business in South Africa, which were represented in this report as “i) restrictive labor regulations; ii) an inadequately educated labor force; iii) inefficient government bureaucracy; iv) corruption; v) inadequate supply of infrastructure and vi) policy instability” (Kumo et al, 2015, p.9).

The currency of South Africa, ZAR[21], dropped in value over the period 2014-2015 and has a rather volatile growth, which can be seen in Figure 9 (OANDA, 2015). This can be an advantage for exporters but not for the national economy itself. If this development will continue and interest rates increase even more, the negative impacts on the national sustainable economic growth will lower investment rates due to higher interest rates (Kumo et al, 2015).

[21] Zuid-Afrikaanse Rand

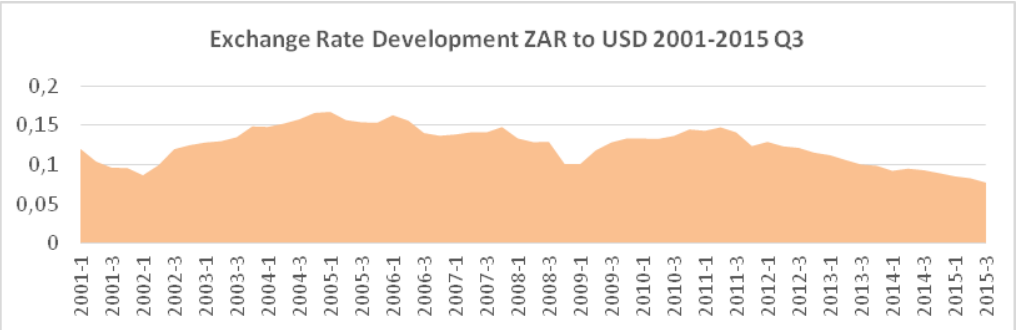

Figure 9 History of South African Rand to US Dollar (based on OANDA, 2015)

Political Aspects Influencing the AIS in Giyani

In March 2015 South Africa´s Minister for Small Business Development announced at the Global Entrepreneurship Congress that "As government, we remain open and receptive to new policy ideas that will help accelerate the formation of new businesses and sustainability of existing ones." (SAnews.gov.za, 2015). Furthermore, the South African government plans to improve policies and guidelines to simplify the bureaucratic processes for the registration and development of small businesses to create an enabling environment (Zulu, 2015). These statements illustrate that the government plans to support innovation and entrepreneurship to achieve sustainable economic growth by means of encouraging policies. This can also have positive effects on future entrepreneurs in the agricultural sector in Giyani, regarding simplified bureaucracy processes when starting up small businesses. However, these policies focus mainly on increasing the amount of small scale farmers in rural areas rather than on improving the financial and knowledge support of the existing ones (Erasmus, 2015).

Figure 10 integrates the findings with regard to the structural components of the AIS in Giyani.

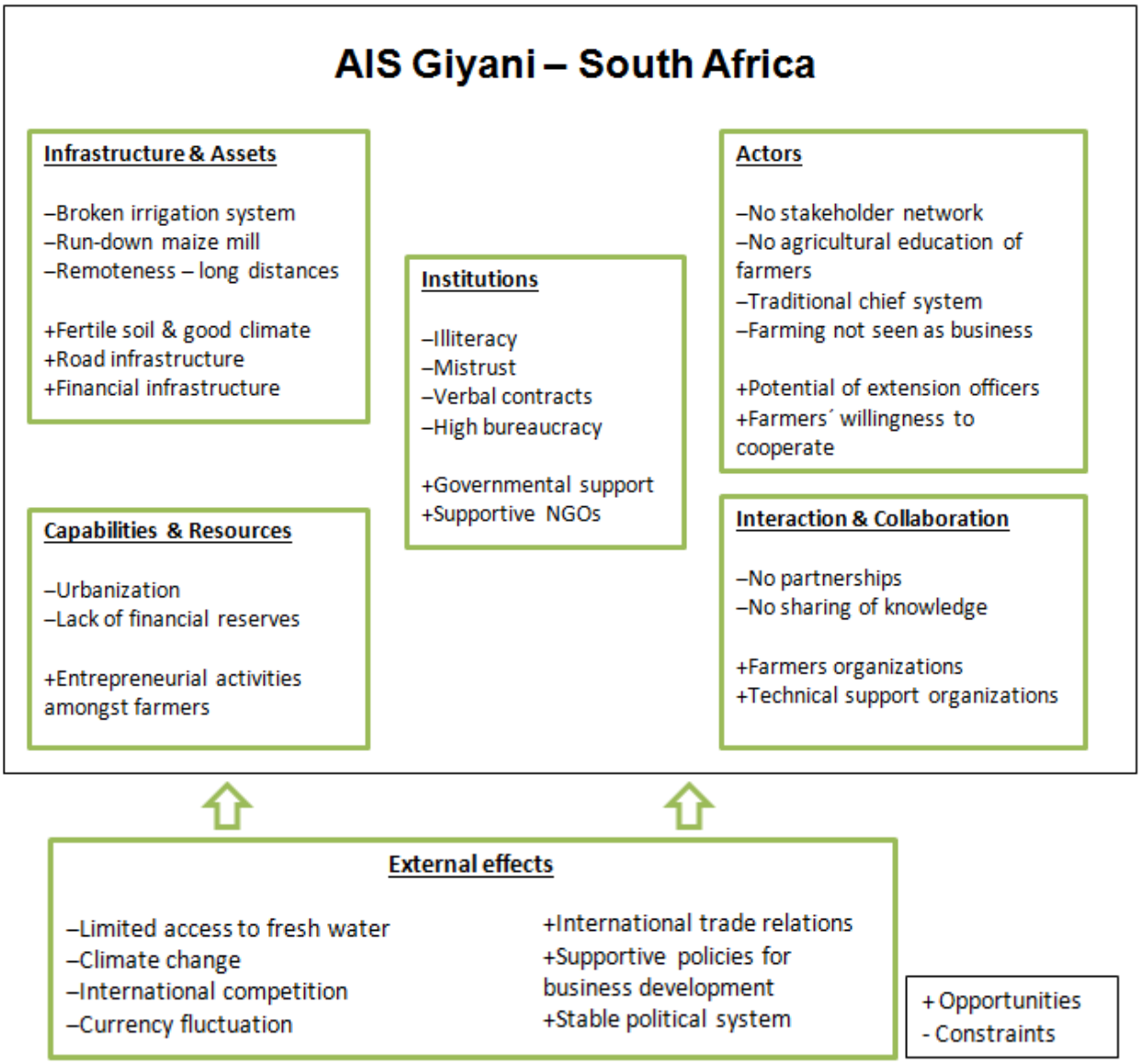

Figure 10 AIS Giyani – South Africa (+ Opportunities; - Constraints)

4.1.4. Analysis of Findings from the INNO Giyani Case

This section analyzes the findings from an agricultural innovation systems perspective. Figure 10 shows that the AIS in Giyani is an undeveloped agricultural innovation system with various barriers for innovations to develop, but also promising opportunities to overcome these barriers and to establish a well-functioning AIS.

The physical **infrastructure**, primarily the run-down irrigation system and the maize mill, needs a financial investment to be revived. Generally it represents a positive potential to have a constant fresh water supply for farming activities. Considering the high demand for locally produced agricultural products, mainly for maize, this investment depicts an economic opportunity in the AIS.

In addition, the availability of financial grants provided by the government and other national organizations, like Alterra WUR within the INNO Giyani project, are encouraging this intention. With regard to the limited financial capital of the smallholders, the focus on an optimization of their cultivation methods is required. This includes an efficient application of agricultural inputs and the amelioration of the soil and irrigation system, which can be achieved through agricultural knowledge transfer as well as training in the field (Kleynhans, 2012).

The knowledge **infrastructure**, which enables innovations in AIS, is currently underdeveloped in Giyani. The intended innovation platform can create a space to connect farmers, traders, scientists and students to exchange and create agricultural knowledge amongst them. Within this cooperation, which requires a qualified facilitator, cultivation and irrigation schemes can be developed and therefore necessary agricultural inputs can be distributed, which will lead to an organized cultivation scheme in Giyani. Given that the communication and financial **infrastructure** in Giyani is existent but under-utilized, it is necessary that the appointed facilitators of the innovation platform establish a communication system amongst the farmers and enable them to participate in the financial system through opening-up bank accounts.

Part of Giyani´s **institutional** culture is that the land ownership and distribution is managed by the chiefs of the different districts. This culture needs to be considered and the chiefs need to be involved in the project from the beginning, in order to avoid restrictions to access arable land or to extend already existing fields respectively. The current political situation regarding encouraging laws and policies is rather advantageous for the development of agricultural innovations, in particular the policies which simplify the formation of new small businesses. This is coherent with the historical development in the agricultural sector in South Africa since the Apartheid regime. Given that the whole political reform after 1994 was in favour of the black population, including land redistribution and sustainable development programs focusing on rural areas, new opportunities emerged for small scale farmers. Nevertheless, such a drastic political and structural rearrangement needs time to perform efficiently, skilled facilitators to manage and direct the process of land redistribution and the provision of agricultural education towards the small scale farmers in rural areas. In the situation of Giyani, the failure of this process is recognizable. The land restitution was not working out well, since the people who had access to arable land did not always get the right education on how to cultivate their newly achieved land and market their products. It can be observed, that the agricultural sector in Giyani was not prepared for this structural change of land rights from a financial, cultural and educational perspective. Concluding, the political development and the current policy situation of South Africa is indeed stimulating the development of the agricultural sector and therewith innovations, but the execution is weak and does not reach small scale farmers in rural Giyani yet.

That is why the locals are not profiting from that development to date. The planned innovation platform also will be also engaged with the education of farming techniques and the development of necessary skills to cultivate, which represents a knowledge **institution** aimed at small scale farmers in Giyani.

The aforementioned aspects are rather constraining the main **actors** in Giyani, the local small scale farmers, to create an income through agriculture in a system whith a high potential for sustainable farming business. This leads to a negative perception of farming as a permanent and full time occupation amongst the local people in Giyani. Hence, it is very common for young educated people to leave Giyani for a better job opportunity to another town or city. However, the willingness and openness of the local farmers to get agricultural trainings and to become a member of the planned innovation platform shows the capability of the region and its citizens to become agricultural entrepreneurs. This opportunity is fortified by the ongoing entrepreneurial activities of some smallholders in Giyani, which indicates the potential of the local farmers to develop and implement agricultural innovations. Currently, the majority of the interviewed farmers in Giyani do not have an educational background in agriculture or appropriate skills to cultivate their fields in an efficient way. The focus should be on on-site trainings, especially on how and when to apply which fertilizer and pesticides, to achieve a high yield. Though, the high level of illiteracy needs to be considered when developing agricultural training programs to efficiently educate local people. Currently, the AIS in Giyani lacks important **actors** to function well, such as facilitators to manage the farmers, soil scientists and trainers to educate the farmers and extension officers, and brokers between farmers and the sales market to enable a profitable trade.

One of the main barriers in the AIS in Giyani is the weak physical connection of the small scale farmers to the market and other small scale farmers due to long distances and the lack of transportation facilities. This situation creates several negative economic, as well as individual consequences especially for the smallholders. This can be seen in the current trading system in Giyani which is based on verbal contracts that rarely lead to a profitable business for the farmers. These power dynamics are in favor of sales agents and private buyers and hamper the development of reliable business relationships between farmers and their purchaser. It is therefore necessary that the farmers unite and regularly interact with each other to strengthen their bargaining power, and to achieve fair prices for their products. The multi-stakeholder network, which will be created within the innovation platform will constitute a representative body for the farmers, and will contribute to the creation of this relationship. If the market participants of the AIS in Giyani are well connected, the limited access to market information, such as commodity prices, quality requirements and required quantities, can be overcome.

Another identified barrier in the AIS in Giyani is the lack of **interactions** between the smallholders regarding solving agricultural problems. This is a result of the culture of mistrust, which leads to opportunistic behavior. This can be noticed in Giyani, an area characterized by an unregulated cultivation scheme, which results into either an overproduction or shortcoming of the local market supply. This withholds the smallholders to reach economies of scale, constrains the local agricultural production to flourish and enables external producers to supply the market. With the establishment of an innovation platform in Giyani, smallholders will be encouraged to exchange cultivation and marketing information to grow according to the market demand, which will lead to an organized supply of the local market with agricultural products, as well as to the possibility for the farmers to purchase agricultural inputs in bulk for a lower price.

Based on the interviews, it could be identified that the **interactions** between the governmental extension officers and the farmers are characterized by nepotism, which means that the smallholders in Giyani cannot always benefit from equal opportunities. This in combination with the lack of educated extension officers, represents a major constraint for small scale farmers to get adequate skills and knowledge to develop a successful farming business. This means that currently there is a mismatch between the required extension service by the farmers and the offered trainings and tools by the governmental officers, which hampers the development of agricultural innovations in Giyani. In addition, the hierachical power of the local chiefs contributes to the challenge to achieve or extent farm land in Giyani.

A great opportunity to create a well-functioning AIS in Giyani is the possibility of the **cooperation** with the local SPAR supermarket, including a secure sales market for the local farmers to sell their quality harvest at a fair price. This collaboration represents an entry point for small scale farmers to transform their agricultural activities into a profitable business.

Looking at the **environmental influential aspects**, climate change can have a negative impact in the long term, e.g. generating droughts in the already water scarce and arid climate of South Africa. In this respect it can be regarded advantegous that South Africa opened up its market to the international trade, supposing that there will be knowledge exchange and import of advanced farming technologies, which are able to cope with the consequences of climate change, and the potential of new export markets for selling their agricultural products.

To conclude, the findings from the INNO Giyani case are illustrated in a SWOT analysis (Figure 6) in which strengths, weaknesses, opportunities and threats of the agricultural innovation system in Giyani are summarized. With this analysis the context can be investigated “in which institutional constraints have hindered farmers from taking advantage of opportunities” (Nederlof et al, 2011, p.12).

Table 6 SWOT Analysis AIS Giyani

Strengths	**Weaknesses**
Partnership with SPAR supermarket Motivated local people Developable infrastructure	Inefficient extension service Lack of financial resources Mistrust between local farmers Long distances between farmers and markets Traditional chief system
Opportunities	**Threats**
Good climatic conditions Growing demand for locally produced food Favorable laws & policies for agricultural innovations Cooperation with University professors & students	Imported agricultural products are cheaper & have a higher quality Climate change can cause more water scarcity

The analysis clarifies that the challenges are interrelated and reinforce one another. For example, the mistrust between the local farmers complicates a frequent information and knowledge exchange amongst them. This is reinforced by the long distances between the farms, which hamper a regularly direct contact between the smallholders. Moreover, the already financial resource poor farmers do not cooperate with their remote neighbors in order to get discount at the market, if buying seeds, fertilizer and pesticides in bulk. Also, they are not able to apply individually for financial grants targeted to farmer alliances and cooperation's. Another challenge is the inefficient extension service provided by the government in Giyani. On the one hand, the insufficient amount of extension workers are confronted with the many remote farms and the long distances to reach them, to regularly provide the necessary farm visits and trainings. On the other hand, the nepotism within the local agricultural extension service in Giyani reinforces the mistrust between the farmers who do not have a clear insight about the criteria on how to receive the extension service.

Based on these insights, it is crucial to apply a systems approach covering every level and stakeholder group of the interrelated challenges to create a well-functioning AIS in Giyani (Gildemacher & Mur, 2012).

4.2 Case Study: Nyagatare Maize Innovation Platform in Rwanda

The case study in Rwanda „Nyagatare Maize Innovation Platform“ was selected as a comparable case, because it addressed similar challenges within the maize production in a developing country (Rwanda) and tried to solve these challenges with the approach of setting up an innovation platform focused on small scale farmers.

The main objective of this project was about: “Building a network of actors in the maize value chain with an aim of improving the livelihoods of maize producers and other stakeholders through using new knowledge to increase production, enhance access to credit and to improve maize trade in Nyagatare District” (Gildemacher & Mur, 2012, p. 101).

The innovation platform in Rwanda was established in 2008 by the RIU[22] program, which aims to develop and implement innovations in the agricultural sector to create positive social and economic contributions in developing countries (“Research Into Use,” n.d.).

Prior to the establishment of the Nyagatare Maize IP, the local farmers were confronted with a not well-functioning agricultural innovation system, in which institutional constraints restrained them from developing a profitable farming business (Nederlof et al, 2011). The main challenge was the inadequate trading system in Nyagatare, which resulted from the poor interaction between farmers and traders. That led to the lack of market information for the farmers, a limited bargaining power of the farmers and the import of maize seeds from other regions. Moreover, the lack of capabilities amongst the local farmers regarding cultivation knowledge caused a low quality of their yield. This situation was the outcome of an insufficient agricultural extension service provided by the government and the lack of support by agronomists. On top of that, the limited access to financial resources aggravated the situation of the farmers regarding an independent improvement of their farming business (Gildemacher & Mur, 2012; Nederlof et al, 2011).

In the following section a snapshot of the AIS in Nyagatare, Rwanda will be given, illustrating the structural components involving infrastructure and assets, institutions, capabilities and resources, and actors, dynamic characteristics, such as interactions and collaboration, and supportive external aspects (Figure 11). Therefrom lessons learnt will be derived to get new insights about critical factors on how to set-up an innovation platform in an agricultural innovation system in a developing country.

[22] Research Into Use

4.2.1 Snapshot of AIS in Nyagatare, Rwanda

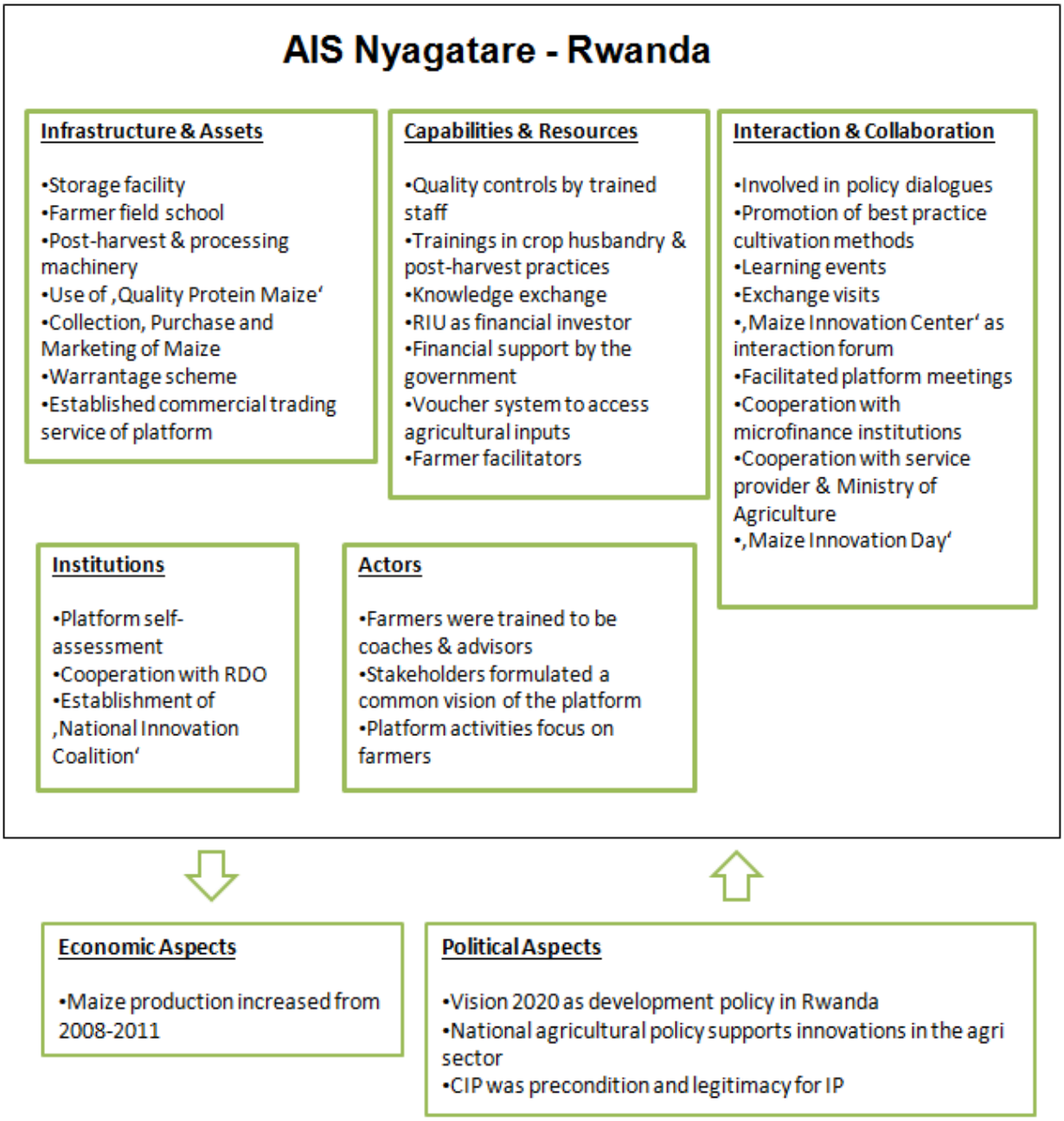

Figure 11 Snapshot of AIS Nyagatare – Rwanda (based on Gildemacher & Mur, 2012; Nederlof et al, 2011)

To get an overview of the actors involved in the Nyagatare Maize IP, Rwanda, a stakeholder network is presented (Figure 12). The platform is almost exclusively oriented towards the local farmers, alliances between other platform members are barely existent or promoted.

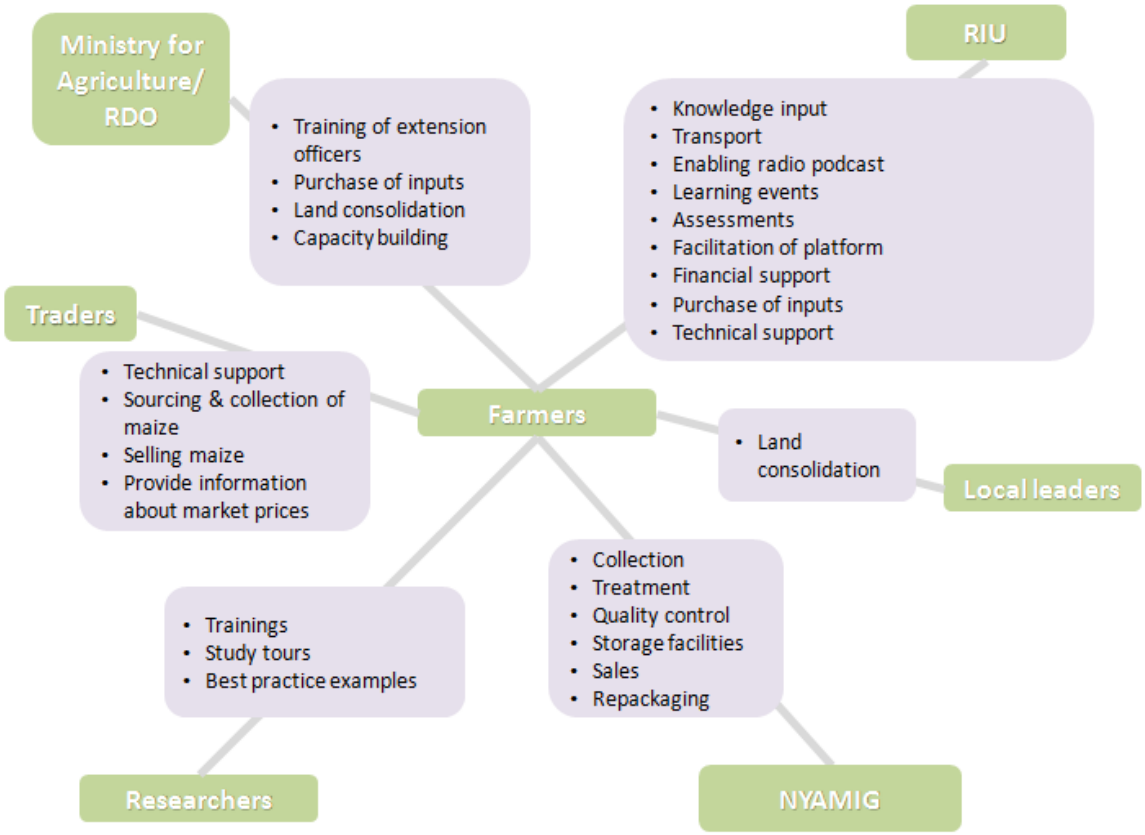

Figure 12 Stakeholder Network of Nyagatare Maize IP (based on Nederlof et al, 2011)

4.2.2 Lessons Learnt from the Nyagatare Maize Innovation Platform, Rwanda

The establishment of the Nyagatare Maize Innovation Platform in Rwanda was a new attempt to improve the livelihoods of Rwandan maize producers through ensuring fair prices for their produce, providing training and knowledge to improve cultivation practices and enabling the access to affordable financial means for the farmers. In order to measure the impact of the innovation platform on the farmers, a baseline study should have been done at the beginning of the project. Since that first evaluation was not conducted, it is hard to identify if and to what extent the Nyagatare Maize Innovation Platform was successful (Gildemacher & Mur, 2012). However, this project gives various insights on how to set up and govern an innovation platform, which can be used as input for the case study in Giyani.

One of the key learning points was that regular interaction between involved stakeholders, in this case local leaders, extension officers, scientists, NGOs and traders, is crucial in order to improve the capacity to innovate (Nederlof et al, 2011). That was achieved through the implementation of meetings, trainings and knowledge exchange at the innovation platform (Gildemacher & Mur, 2012).

Despite the multi-stakeholder involvement, the main focus was on the farmers, which lead to the negligence of the requirements and expectations of other involved actors, such as the local leaders and traders. This resulted into a discontent among a few stakeholders and to demotivation and decreasing commitment by the disregarded platform members (Nederlof et al, 2011). To achieve a systems perspective, an extensive stakeholder analysis is suggested to be able to address the demands of all groups and to develop aligned solutions which satisfies the needs of all involved actors.

The innovation platform was established and financed by the external partner Research Into Use (RIU), yet there was no plan how to gain additional financial resources after RIU´s support in order to continue with the project operation. To avoid that the activities of the innovation platform slow down or completely stop after the involvement of external funding partners, it is important to establish a predetermined sustainable financial plan for a project with limited external financial support (Nederlof et al, 2011).

Another important factor to successfully implement an innovation platform is its facilitation. Therefore, an initial support from experts is necessary to train local people to efficiently govern the platform and involve local partners such as NGOs or governmental departments (Nederlof et al, 2011). Ideally, responsibilities and management capacities will be transferred to competent local platform members in such a way that they can sustain the innovation platform without external support. This includes an organizational structure with incorporated feedback moments, transparent communication, monitoring mechanisms of the progress like self-assessments, the flexibility to adapt to altering circumstances and needs, and the ability to create knowledge and access to information (Gildemacher & Mur, 2012).

To provide the farmers with access to financial means, the Nyagatare Maize IP project introduced the warrantee system. The warrantee system enabled farmers to get a credit with an adequate interest rate which they could use before the actual harvest. When the yield matured, the smallholders had the possibility to store their harvest in the innovation platform facilities, which in turn served as a guarantor for the bank. When the price for the maize products was appropriate at the market, the harvest would be sold in order to achieve a decent profit for the farmers (“Research Into Use,” n.d.). Through this system the farmers got fair prices for their crops and had access to affordable credit in order to invest in necessary cultivation input and tools, to improve the quantity and quality of their harvest.

In summary, the main focus within the Nyagatare Maize IP was on the following topics:

- "critically assess remaining bottlenecks across the maize value chain;
- understand and agree on the roles of platform members in removing these bottlenecks;
- identify new opportunities for innovations;
- redefine membership, including identifying and recruiting new members" (Gildemacher & Mur, 2012, p. 101).

Concluding it can be said that for an external initiated project to set up an innovation platform, it is crucial to transfer the responsibilities, knowledge, skills and management tasks to local platform members, so that the IP can become self-sustaining after the first external financial and knowledge impetus. In addition, the interests of all involved stakeholders, which include at best public and private partners, need to be converged to maintain commitment and motivation (Nederlof et al, 2011).

4.3 Case Study: Limpopo Seed Production Innovation Platform in South Africa

The Limpopo Seed Production Innovation Platform in South Africa was initiated by the Limpopo Department of Agriculture in 1998 as part of the BASED[23] project (Ramaru, Mkhari, & Hagmann, 2006). The main goal was to address the problem of weak agricultural extension service for small scale farmers in the Limpopo province through providing trainings and developing capacities for the local extension workers. Thereby a participatory extension approach was used to develop and implement innovations, which could overcome the difficulties of smallholders with the support of the previously trained extension officers. This innovation platform attempted to enable successful maize seed production of smallholders in the Limpopo province.

The situation of the local small scale farmers in Limpopo prior to the set-up of the Limpopo Seed Production IP was characterized by an inadequate extension service from the government, no access to affordable agricultural inputs, such as hybrid quality seeds, no access to trade markets to sell their harvest, and no cooperative culture amongst local farmers to exchange information and knowledge regarding cultivation or seed production (Ramaru et al, 2006).

The next section gives a snapshot of the AIS of the Limpopo province (Figure 13) and a stakeholder network of the Limpopo Seed Production Innovation Platform (Figure 14).

[23] Broadening Agricultural Services and Extension Delivery

4.3.1 Snapshot of the AIS in the Limpopo Province, South Africa

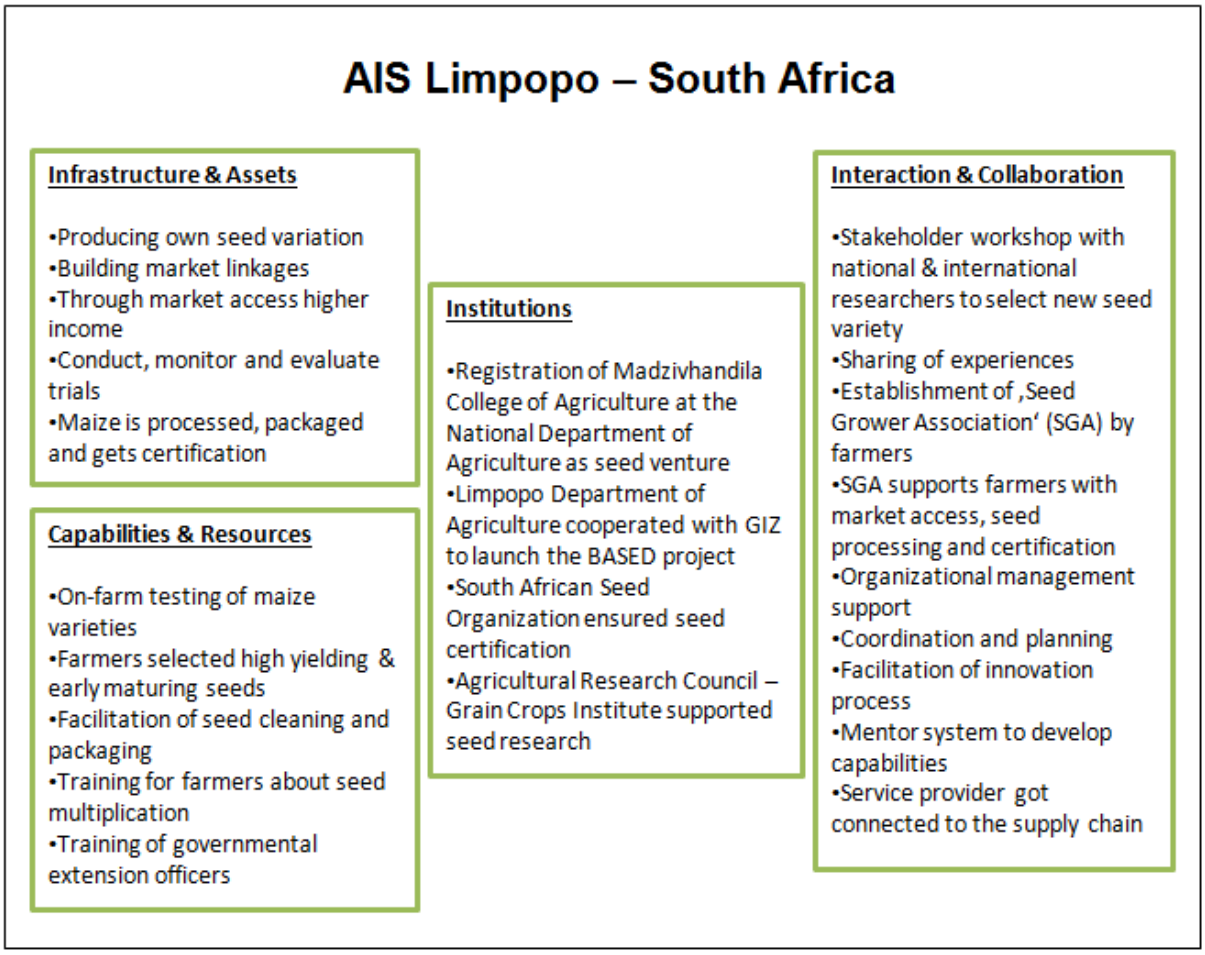

Figure 13 Snapshot of AIS Limpopo – South Africa (based on Ramaru et al, 2006; CPSI, 2007; PICOTEAM, 2008)

Figure 14 shows the involved stakeholders of the Limpopo Seed Production IP and their contribution. The stakeholder network consists of a variety of actors, with different professional backgrounds and incentives to participate in the innovation platform. The incentive of the private partners, such as CIMMYT and Capston, to participate at the IP was the opportunity to become producer and distributer of the newly developed maize seeds in the regional market (Ramaru et al, 2006). The farmers´ motivation to become a member of the IP was primarily the possibility to get access to affordable maize seeds and the skills to produce maize seeds by themselves. The project initiators considered it as crucial to provide extensive facilitation of the platform members in order to maintain and develop the platform and to sustain the different motivations of the stakeholders (Ramaru et al, 2006). Within this innovation platform it can be seen that the stakeholder group of the farmers played a central role and the focus was mainly targeted towards them.

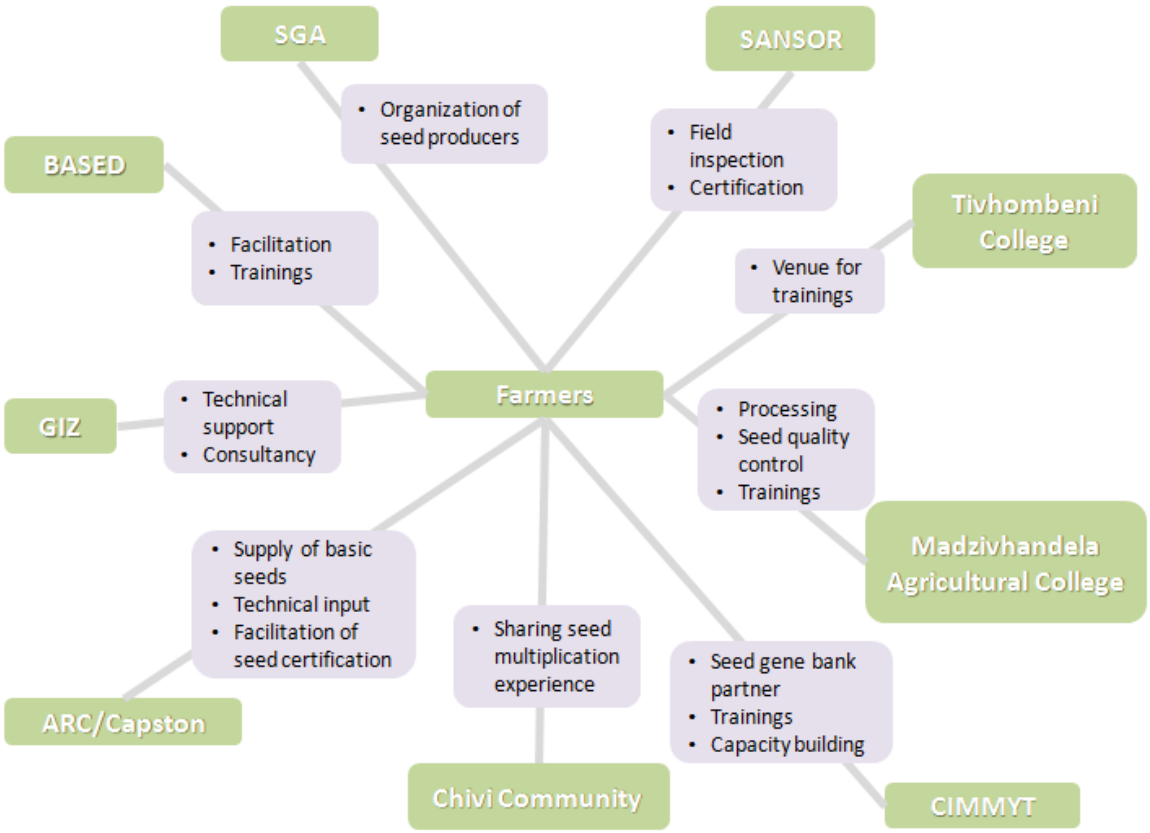

Figure 14 Stakeholder Network Limpopo Seed Production IP (based on Ramaru et al, 2006)

4.3.2 Lessons Learnt from the Limpopo Seed Production Innovation Platform in South Africa

A key challenge for setting up the Limpopo Seed Production Innovation Platform in South Africa was to create and sustain a stakeholder network and stimulate interactions within this platform (Ramaru et al, 2006). The following ten steps were used as a guidance to set up the Limpopo Seed Production IP:

1. „Define a problem or opportunity with a high potential for impact.[...]
2. Formulate an innovation challenge which defines clearly the scope and focus of the platform.[...]
3. Identify the functions required to make the system work as a system.[...]
4. Identify the actors who can best deliver these functions effectively and efficiently.[...]
5. Invite the promising actors for a first meeting and analyse systemic blockages and first actions. [...]
6. Development of a compelling business model creating the incentives of the system to work.[...]
7. An assessment of systemic capacity and each individual actor's capacity[...].
8. A first workplan is drawn up to start operating as a platform towards delivery.[...]
9. Review action, performance and analysis at regular intervals.[...]
10. Coaching support" (Ramaru et al, 2006, pp. 3-4).

This list is compiled based on the know-how of the initiating organization PICOTEAM, which facilitated various projects, dealing with setting up innovation platforms in developing countries. Based on the experiences from the Limpopo Seed Production IP, the following aspects are suggested to take into consideration when establishing an innovation platform:

- Facilitation of the network is crucial;
- Knowledge generation should involve all actors as information sources;
- Creative solution-oriented thinking;
- Capacity building through regular learning supply;
- Achive self-sustaining status to be financial independent from a single funding source (Ramaru et al, 2006).

The main challenges which emerged during this project were the different expectations and interests of the platform members. Therefore it was even more important to align these needs through an extensive facilitation to create a synergy in their collaboration and which points out the individual benefits (Ramaru et al, 2006). The farmers involved in the project had limited resources and anticipated that through the participation in the project they would receive free services and inputs for their farming activities. But because this was financially not feasible on a long term, they were asked to pay a small amount for their seeds, which created disaffirmation and disappointment amongst the farmers.

Applying the participatory extension approach to the management of the innovation platform, proved to be successful in the case of the Limpopo Seed Production IP. It encouraged the community to independently organize themselves and the extension service from the government got aligned to the demands of the farmers (Ramaru & Hagmann, 2009). In comparison to previous individual and isolated attempts to provide extension services to farmers, this project was engaged in various levels of the system, from the local level in the villages to the provincial level of the government, and focused on the involvement of diverse stakeholders to improve the functioning of the agricultural innovation system in Limpopo, South Africa. Concluding it can be said that it is essential to create a well-functioning system as a precondition for setting up an innovation platform and therewith the development and diffusion of innovations (Ramaru et al, 2006).

4.4 Cross-Case Analysis between the Case Studies

In this part the findings from the three case studies are aggregated to identify similarities and differences between them regarding their initial barriers in the particular AIS, their approaches to set up an innovation platform and lessons learnt from the implementation of the Nyagatare Maize IP and Limpopo Seed Production IP. From this cross-case analysis an implication can be made for the INNO Giyani case, identifying which steps are necessary in order to set up an innovation platform. This will give relevant information to answer the second sub-question: *How can the establishment of an Innovation Platform overcome the challenges of the AIS?*

4.4.1 Similarities between the Case Studies

Based on the analysis of the three case studies it can be reasoned that they were all confronted with similar initial challenges regarding a well-functioning agricultural innovation system and with that the development of agricultural innovations (Table 7).

Table 7 Overview of Main Challenges of the Case Studies

Main Challenges INNO Giyani	Main Challenges Nyagatare	Main Challenges Limpopo
Limited access to markets	Inadequate trading system	Lack of access to inputs & markets
No cooperative culture	Lack of access to financial assets	No cooperative culture
Lack of capabilities	Lack of capabilities	Inadequate extension service

All three cases were initiated in cooperation with international organizations which provided financial and knowledge resources. The respective governmental departments were incorporated in the process, which was beneficial for the assertiveness and the legitimacy of the projects on a political level. Both, the Nyagatare Maize IP and the Limpopo Seed Production IP put special emphasis on the facilitation of the innovation platform, performed by external experts. Moreover, they all put the main focus on the small scale farmers and oriented the trainings towards them. Against this background, the approach of establishing an IP is the most effective in regard to build a cooperative culture and an adequate knowledge base amongst the farmers.

4.4.2 Differences between the Case Studies

The main difference between the three case studies is that the innovation platform in Giyani is still in its planning phase, whereas the other two projects were already completed. Therefore the main comparison between the three cases is made based on the primary challenges of the small scale farmers in the particular region.

The comparison regarding the applied strategies of setting up an innovation platform was solely made between the Nyagatare Maize IP and the Limpopo Seed Production IP.

The primary focus of the tasks the innovation platforms addressed, slightly differs amongst the case studies. Whereas the Nyagatare Maize Innovation Platform in Rwanda improved the maize production and emphasized an adequate financial system, the Limpopo Seed Production IP in South Afirca was specialized on maize seed production. The innovation platform in Giyani at first intends to establish an efficient irrigation system combined with an optimal use of fertilizer and pesticides to achieve an improved maize production. Another difference between the case studies is that the INNO Giyani project was initiated by, amongst others, the manager of the local SPAR supermarket which is a valuable partner and entry point to market activities. This cooperation had to be established first by the other two innovation platforms, in order to have access to markets and to a reliable buyer. The Nyagatare Maize IP had a great focus on the education of farmers, implementing different methods such as the farmer field school, exchange visits or the 'Maize Innovation Day' which all emphasized cooperation amongst the stakeholders. In addition, the innovation platform developed a warrantage scheme that enabled small scale farmers to get access to financial resources and agricultural inputs. In contrast, the Limpopo Seed Production IP was more active on an institutional level, cooperating with several public and private partners, which led to the development of an own maize seed variation and the official registration as a seed venture at the National Department of Agriculture in South Africa.

4.4.3 Conclusion of the Cross-Case Analysis

After studying the three different case studies it became apparent that the focus of the different innovation platforms was predominantly set on network building and creating a cooperative culture between farmers, traders, government officials, researchers and private companies. Additional functions of the IP were the education of the extension officers and the training of the farmers. It is observed that the platform initiators or the international organizations respectively were responsible for the management and organization of the innovation platform.

Therefrom it can be concluded that an efficient facilitation needs experienced experts and is key for setting up and sustaining an innovation platform, in order to respect different requirements of the diverse stakeholders. Even though the projects were initially financed by external partners, the innovation platforms did not generate income independently. That makes clear that a self-sustaining financial plan is necessary for the viability of the innovation platform. In addition, the particular benefits need to be highlighted and clarified for the different stakeholders in order to meet their expectations and therewith keep their motivation. Therefore a comprehensive stakeholder analysis is suggested so that the needs and challenges of the stakeholders can be identified. In summary, it can be said that it is essential to create a well-functioning agricultural innovation system, including efficient institutions, a well-developed communication and physical infrastructure, cooperative stakeholders and necessary resources, which constitutes the precondition for setting up an innovation platform.

5. Discussion

The findings illustrate that the agricultural innovation system in Giyani is confronted with extensive challenges, ranging from institutional, political to cultural barriers. The resource poor local small scale farmers, therefore, call for an external impetus to overcome these constraints. That includes capability trainings, financial support as well as an adequate facilitation of the entire process of establishing and implementing the IP. As elucidated before, an innovation platform represents an appropriate approach to provide the appropriate support aligned to the needs of small scale farmers. Thus, implementing a platform to develop agricultural innovations that are both indulgent with the local circumstances and affordable, is key to increase local food production to achieve sustainable economic growth, food security and poverty reduction.

The next section 5.1 reflects the findings from the empirical research study in Giyani with literature, followed by the limitations which emerged during the field research in section 5.2.

5.1 Reflections on the Findings

It has been observed, that in order to establish an innovation platform in Giyani a well-functioning AIS is a precondition, which is also brought forward by corresponding scholars (Hall et al, 2006; Nederlof et al, 2011). We found that the agricultural innovation system is underdeveloped and the required stakeholder network is not existent in Giyani. Thus, the seven innovation system functions, which are suggested by Hekkert & Negro (2009) to be applied to determine the functioning of an emerging innovation system, could not be used in this research study. Instead, the basic structure of the AIS, consisting of the structural components and its dynamics, was used as a framework for analysis. The choice of applying the AIS as an analytical framework for the case studies proved to be adequate, given that an agricultural innovation systems approach elaborates the systems´ characteristics, the institutional context it is embedded in, as well as the interactions between those two elements, as their well-functioning is essential for the development of agricultural innovations (Bakhuijs, 2013). Empirical research showed that it was essential to conduct an on-site pre-study, analyzing the opportunities and constraints of the agricultural innovation system. This analysis needs to examine especially site specific circumstances, demands, cultural conditions, attitudes towards innovations and an investigation why the AIS is currently not well-functioning, since these projects are highly context specific. Interestingly this step is rarely mentioned in relevant literature.

This is one reason why several development projects in the past were not successful in the long term, as experienced with previous projects in the Limpopo region, which could not be investigated anymore. Hence, the case study design for this research was appropriate in order to achieve insight into specific circumstances through interviews with local people and on-site observations in order to provide suitable policy recommendations.

In addition, developing economies in remote areas are more vulnerable to political and environmental influences than their counterparts, which needs to be considered when conducting research in these areas. These special circumstances were addressed by just a few authors (Aerni et al, 2015; Ernst, 2000), which relates to the fact that little research has been done on that precise subject of setting up an innovation platform in a rural area in South Africa.

Previous studies show that setting up an innovation platform is a suitable mechanism to improve agricultural production performance and marketing of the produce, which leads to the enhancement of rural livelihoods, food security and therewith poverty reduction (Kilelu et al, 2013; Nederlof & Pyburn, 2012; Nederlof et al, 2011), which confirms the choice of establishing an innovation platform in Giayni to address these challenges.

Overall it can be stated that the main barriers for the development of innovations in the AIS in Giyani are very similar to the ones discovered in the two comparative cases Nyagatare Maize IP and Limpopo Seed Production IP. Likewise, these barriers were identified in related literature, namely: the lack of access to markets, lack of capabilities and the lack of cooperation amongst the actors (Totin et al, 2012; Nederlof et al, 2011). One of the important solutions suggested by literature and practitioning experts is the creation of a cooperative culture within the AIS (Ramaru et al, 2006; Ngwenya & Hagmann, 2011; Nederlof et al, 2011). However, that turned out to be rather difficult in practice considering the mistrust amongst the farmers and the opportunistic culture in this region. Furthermore, the social-historical background of South Africa hinders the collaboration between different ethnic groups. Thus, it is recommended to follow a participatory approach (Amankwah et al, 2012; Ramaru et al, 2006) when establishing the innovation system, which would also limit the transaction costs between the stakeholders (Holloway et al, 1999; Wiggins & Keats, 2014). A further elaboration on the effect of transaction costs to the development of economies in developing countries can be reviewed in the scholars by Holloway et al (1999), explaining how cooperative organizations can help farmers to overcome high transaction costs at the example of the East-African dairy sector, and Delgado (1999), elaborating possibilities to overcome high transaction costs for small scale farmers to get integrated into market activities in Sub-Saharan Africa.

This research has demonstrated that in order to develop a culture of confidence in an agricultural innovation system, the stakeholders need to be aware of their social and economic benefits when cooperating in order to keep the platform working (Nederlof et al, 2011). Another important mechanism to overcome the problem of mistrust is the facilitation of the process of establishing and implementing the IP by an experienced broker (Kilelu et al, 2013). Also other scholars (Klerkx, Hall, & Leeuwis, 2009; Batterink et al, 2010; Kilelu, 2013) emphasize the role and impact of such a facilitator, and the importance of broker mechanisms in agricultural innovation.
Cullen et al (2013) highlights the role of prevailing power relations within an innovation platform and clarifies how to overcome these power differences.

On the basis of this empirical research it became apparent that there is not ‚one' perfect guideline, or strategy how to set up an innovation platform for agricultural innovations in developing countries, such as South Africa. This was confirmed by the literature reviewed, in which several authors compiled different lists of key steps how to establish an innovation platform (Abate et al, 2011; Adekunle, Fatunbi, & Jones, 2010; Coraf/Wedard, 2012; Homann-Kee Tui et al, 2013; Makini et al, 2013; Nederlof & Pyburn, 2012; Tenywa et al, 2011; Varma et al, 2009). These lists should therefore be used as suggestions rather than as a set of rules.

The new insights based on the literature review, the analysis of the INNO Giyani case study and the lessons learnt from comparative case studies, expose a practical approach how to establish an innovation platform. Therefore, the developed integrated conceptual framework is a valuable tool to perform a study in which the required preconditions are analyzed and identified, and fills the research gap of a practical approach which takes day-to-day problems into account.

5.2 Limitations of the Research

During the field research several limitations were encountered. While drafting the research goal and preparing the interviews to receive the necessary data, it was assumed that the INNO Giyani project and with it the set-up of an innovation platform already started. Due to inherent challenges related to the complexity of the planned project, the start of the INNO Giyani project got postponed. That meant that during my research trip not many people were actually involved or informed about the intended innovation platform. That made it difficult to apply the prepared questionnaire and to obtain enough data about the planned research topic. For that reason the focus of the research was slightly adapted to rather study the preconditions of the intended innovation platform, instead of asking about the functioning and the impact of it.

To guarantee construct validity it was necessary to use as much as secondary data as possible to support the findings from the interviews.

A further limitation on the construct validity of this research concerns the accessibility of the interviewees due to the lack of support regarding transportation in Giyani and the remoteness of the farmers´ fields. Public transport was poorly developed and not always available for the locations to visit, which was not clear from the beginning. Hence, it was not possible to reach the farmers independently. It was necessary to be accompanied by a local, who on the one hand knew where the local farmers have their fields, and on the other hand knew when to encounter them there. The total sample of interviewed stakeholders is therefore rather small. In addition, the openness of the farmers to talk about sensitive topics, like the governmental support, might be limited, because of their fear that their information will be misused and could have negative consequences for them.

Moreover, the plan to visit and interview stakeholders at similar ongoing, or completed projects in the region was not possible. Even though these projects were recommended by local experts in the field of agricultural innovations, it was difficult to find the responsible contact persons or involved farmers within the time of the field research in South Africa. Besides, most of the approached people were no longer involved, because the projects were not active anymore, or failed. Thus, the comparable case studies were exclusively based on secondary data. This also limits the construct validity of the conducted research.

The total number of studied cases is limited to three samples, namely: INNO Giyani project, Nyagatare Maize IP and Limpopo Seed Production IP, which were all based in rural areas in Sub-Saharan Africa, which provides a poor basis for generalizations beyond these locations. The findings, especially from the main case study INNO Giyani are very context and place specific, representing in particular the needs of the local farmers in Giyani, which limits the possibility of generalizations about these specific findings. However, the external validity of the main research case INNO Giyani could be strengthened through the randomized sample of interviewed farmers in Giyani.

Nevertheless, the developed integrated conceptual framework (Figure 3) can be applied as an analytical tool for studying agricultural innovation systems and to develop a strategy for setting up an IP at different locations. That represents an added value for future innovation platforms.

6. Conclusion

A major reason for poverty is food insecurity and the lack of access to trade markets in developing countries (Wiggins et al, 2013). The aim of this thesis was to establish a strategy for setting up an innovation platform in the rural area of South Africa, to address the underlying causes of poverty, to increase food security and to stimulate sustainable economic growth through improved agricultural production by small scale farmers. This research study made two contributions to literature. First, an integrated conceptual framework was developed based on a profound literature review combining the theories about agricultural innovation systems and the establishment of innovation platforms in developing countries. That led to the next contribution, a suitable strategy on how to set up an innovation platform in the agricultural sector in Giyani, South Africa, derived from this framework and adjusted to site-specific circumstances in Giyani.

This research has demonstrated that cooperation between small scale farmers, researchers and market actors, and its facilitation is key for establishing a well-functioning innovation platform. To get a better understanding about developing a strategy for the establishment of an innovation platform, various sub questions were formulated, whose elaboration will lead to the answer of the main research question: *How to establish and facilitate an innovation platform in the agricultural sector in Giyani, in order to stimulate agricultural innovations and therewith sustainable economic growth in South Africa?*

6.1 Answering the Research Questions

The first sub-question was about identifying the current structure of the agricultural innovation system in Giyani, and whether its structural components and dynamics are rather enabling or constraining the development of innovations:

What are the main opportunities and challenges for the development of innovations in the AIS in Giyani?

From the interviews and field research arose three main challenges in the AIS in Giyani, namely 1) the lack of access to markets, 2) no cooperative culture amongst the local people, and 3) the lack of agricultural capabilities. These challenges constrain the development and implementation of innovations, because they partly constitute the preconditions of the functioning of an innovation platform. Moreover, there are opportunities which provide an entry point for the development of innovations and the possibility to overcome the challenges.

These include i) a local demand for agricultural products in combination with the local supermarket SPAR as a reliable partner and buyer of the products, ii) financial support mechanisms by the government, iii) and the potential of the region for successful agricultural production aligned with local farmers willing to learn and cooperate to improve their agricultural production. Therefrom it can be seen that there is a great potential to develop innovations, provided that support mechanisms are implemented.

The second sub-question of the research applies the insights from the first sub question and illustrates a practical approach how to overcome these barriers and exploiting the potential, by asking the question:
How can the establishment of an innovation platform overcome the challenges of the AIS?
Based on the literature review it became apparent that an innovation platform is addressing such challenges in an innovation system and therefore represents a suitable institutional solution. As elaborated in the theory section, the main tasks of an innovation platform are the organization of the farmers into groups and the facilitation of the network development, which stimulates a collaborative culture amongst the farmers and ensures their demand articulation in front of researchers and agricultural experts. Through the multi-stakeholder network the small scale farmers get access to knowledge, input and output markets, new technologies, and credit. Therefore it is crucial to select exclusively committed farmers to assure motivated and long term participants of the innovation platform, who will at its best distribute their acquired knowledge and collaborative attitude amongst their communities. Initially the facilitation of this process requires an external experienced manager, who will transfer the knowledge and management skills to the local people, so that they are capable to take over that task in the long term. Within the innovation platform local small scale farmers can place their daily farming difficulties and profit from a collective solution finding process and can develop innovations aligned to the local circumstances. Concluding, an innovation platform can help to overcome the aforementioned barriers in an agricultural innovation system, since the development of agricultural innovations improves inefficient cultivation methods. That leads to an increased income of the farmers, which then have a higher purchase power and stimulate the local and national economy.

Following up, the next sub-question elaborates in more detail the social relevance of setting up an innovation platform in Giyani:
What are the benefits of the innovation platform for the different stakeholder groups involved in the AIS?

The innovation platform is a new way of arranging and managing relationships of the relevant stakeholders within the local AIS in Giyani to collaborate on new business opportunities, which depicts an innovative business model in the region. This should increase the emergence of entrepreneurs, which are able to realize their innovations with the support of the network and resources of the innovation platform. From the interviews and the literature research it can be concluded that the farmers will be the main beneficiaries of the innovation platform because they are confronted most with difficulties in the agricultural innovation system. The most relevant benefits for the small scale farmers would be the possibility to increase their income through the improvement of their agricultural production based on trainings and a secured market. Through the involvement in the stakeholder network, it will be possible for the members to buy their inputs collectively and get a fair price for high quality products. In addition, farmers will get access to agricultural equipment and a possibility to store their harvest against an affordable fee. The social benefit for the farmers is related to their economic benefits – with the increase of their income, they can also purchase more prestige goods to improve their personal esteem in the community.

The advantages for the local supermarket will be a steady inflow of local agricultural products, especially maize products, due to a coordinated cultivation schedule of the region. Therewith transportation costs and product quality loss can be reduced through shorter distances from the field to the market.

The government will benefit from this innovation platform on several levels. On a local level, the extension officers of the Limpopo Department of Agriculture will be involved in the trainings and receive the necessary skills to achieve the competences to fulfill their tasks satisfying and to reach the targets of the Sustainable Development Goals. This in turn leads in the long term to a qualitative as well as quantitative improvement of the agricultural production in the region which, implies sustainable economic growth and enhanced food security. If the establishment of the innovation platform in Giyani will be a success, it will provide a nationwide role model, which can be imitated at other locations with similar conditions.

Researchers and knowledge institutions, like the nearby Limpopo University, will benefit from the IP through the opportunity to apply their theoretical knowledge into practice and investigate in new technologies and farming methods adjusted to their local environment. This provides a practical learning environment for students and researchers within the region.

Now the main research question can be elaborated, which is a rather practical guidance for implementing the innovation platform:

How to establish and facilitate an innovation platform in the agricultural sector in Giyani, in order to stimulate agricultural innovations and therewith sustainable economic growth in South Africa?

1) To formulate a strategy for setting up an innovation platform in Giyani the first important step is to analyze the current situation of the small scale farmers in Giyani to identify their challenges and the circumstances of the environment they are working and living in. This has been done by the field and literature research of this thesis. From this analysis it could be identified that there is a substantial need from the small scale farmers for an innovation platform. Also Giyani as the location for an innovation platform in the agricultural sector is deemed suitable due to its fertile soils and advantageous climate. The initiator of the INNO Giyani project, who is at the same time the SPAR supermarket manager in Giyani, as well as the small scale farmers are willing to cooperate within an IP. Hence, the preconditions for the initiation of an innovation platform in Giyani are fulfilled.

2) After initiating the platform the actual set-up of the innovation platform can start with the selection of a physical space, as well as the engagement of relevant stakeholders. It is recommended to locate the innovation platform next to the maize mill in Giyani, which is a central place connected to the market. However, the long distances from the farms to the market need to be considered when choosing a fixed location for the IP. Therefore it is recommended that the facilitators, farm managers and researchers are able to provide on-site field trainings at the farms on a regular base.
The well-developed stakeholder network should involve local authorities from the Limpopo Department of Agriculture, small scale farmers from Giyani, agricultural knowledge experts, soil scientists, financial institutions, the local chiefs, a farm manager and partners of the SPAR supermarket. They will define the mission and vision of the platform to refine the initial focus. It is suggested to have an initial focus on the improvement of the local maize production, since this is the main aliment in the region of Giyani and has therewith the greatest demand and potential to succeed.

3) Following, the platform can be launched and the development of innovations can start. That will contain trainings and capability buildings focused on an improved maize production. Therefore, farmers can present current problems regarding their farming mechanisms (irrigation systems, use of input materials) in front of a group of extension officers, soil scientists and other farmers, to develop new ideas how to address these issues efficiently. During that process, roles and responsibilities will be distributed amongst the stakeholders to achieve a sound procedure of the development and implementation of agricultural innovations.

4) The final phase is the monitoring and evaluation of the implementation and diffusion of the agricultural innovations and whether the innovation platform functions well. As mentioned before, it is essential to have a competent facilitator during the entire process, who can manage the stakeholders and intervene in critical situations. This intermediate will be appointed by the SPAR supermarket manager, as he has currently the best overview and connections to the local people.

The recommended basic steps of the strategy to establish an IP are illustrated in Figure 15. Based on the findings from the field research combined with current literature, it became clear that there is not one single plan which can be adopted in the same manner to all projects. The strategy ought to have a circular character, to be able to steadily review the individual steps and the internal/external changing influences, and if necessary, to adapt the strategy towards the altered situation.

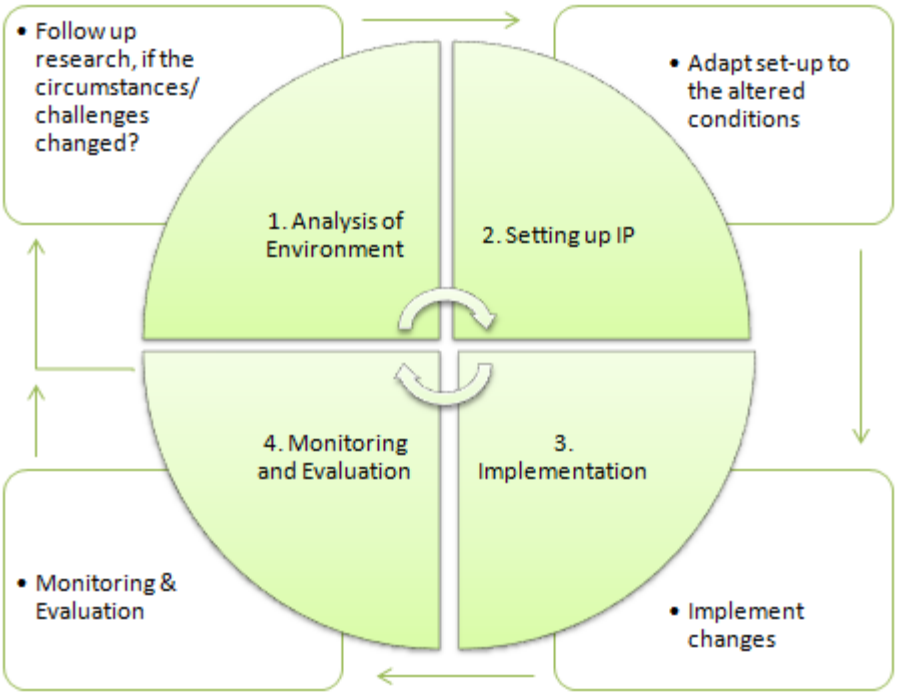

Figure 15 Strategy for Setting up an IP in Giyani (adapted from Unicef, 2012)

This strategy can be applied to set up a well-functioning innovation platform in Giyani which will stimulate the development and diffusion of agricultural innovations. This will lead to the creation of more jobs within the agricultural sector in Giyani and therewith to sustainable economic growth. Summarizing, it can be observed that developing and diffusing agricultural innovations is crucial to meet the food demand of the growing population in combination with the increase in land use and the change towards a more unpredictable climate.

6.2 Policy Recommendations for Managing an IP

It can be a leverage to support farmers in getting access to the right information, knowledge, people and resources to enable them to react on market dynamics and to detect business opportunities through innovations. With that impetus sustainable economic development can be created, so that the new way of making business will be accepted and sustained within the local farmers (Fairbanks et al, 2008), provided a cultural adaptation comes along. Detailed policy recommendations for project managers and facilitators of innovation platforms can be found in Appendix D. The focus is on three fundamental topics namely capacity building, partnership development and market orientation.

Capacity building can be achieved through applying a participatory extension approach, at which the impartment of knowledge about sustainable agriculture and organic farming should be the focus. It is also recommended to cooperate with the Limpopo University, in order to establish exchange programs for students to the farms, where they can co-develop new cultivation methods with the small scale farmers. To improve the communication between the small scale farmers, phone applications can be developed which simplify the information exchange.

The strengthening of the relation between the farmers and the market actors can be achieved through the establishment of written contracts. Furthermore, partnerships with insurance companies should be built, so that the farmers are able to protect their farming business against unpredictable incidents. The warrantee system, introduced through the case of the Nyagatare Maize IP, is a good example for an independent financial system for an innovation platform, where farmers can get access to financial resources.

It is suggested that all farming activities are oriented towards the requirements of the domestic market in Giyani, to constantly supply the local market with high-quality products.

These policy recommendations can support facilitators to enable agricultural innovations on a local level in Giyani.

6.3 Further Research

This research studied the preconditions for the establishment of an innovation platform in the agricultural innovation system in Giyani, South Africa. The project in Giyani did not started at the point of this research, due to its complexity. To what extent the planned Cooperative could fulfill similar tasks as the intended innovation platform can therefore only be analyzed at a later point. Having a well-functioning multi-stakeholder Cooperative in place could surely be beneficial to all stakeholders provided it will be carefully interlaced with the IP as they generally overlap in certain tasks and responsibilities.

Nevertheless, once the innovation platform is established it would be worth investing in a follow-up study to evaluate its performance, as well as its impact on the small scale farmers in Giyani. This should include an examination on how the involved stakeholders cooperated with each other, and whether a participation in the IP encouraged the farmers to improve their agricultural production and thereby were able to increase their income.

Yet, not only the outcomes should be studied but the overall process and methods applied, and whether the development and diffusion of innovations was stimulated through the innovation platform, and whether the barriers within the AIS could be overcome. Further research relevant for the establishment of a monitoring and evaluation tool of the innovation platform is also relevant to examine, whether the quality standards of the smallholder production reached the requirements of the national or international markets, or not. Consequently, replicating this research study at later point in time, when the Cooperative in Giyani was actually established, could lead to further useful insights that could be of great benefit to regions in South Africa that face similar agricultural problems. This investigation can be done by applying the seven system functions developed by Hekkert & Negro (2009), which study the functioning of innovation systems.

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Madiba, F., Limpopo University, informal conversation

Pienaar, C., Soil scientist, informal conversation

Spijkerman, A., Alterra WUR, informal conversations

Appendix A: Non-Governmental Organizations and their Support Mechanisms

Name of Organization	Target group	Support
TIA – Technology Innovation Agency	• South African registered company • Publicly-funded research organization	• The development and commercialization of competitive technology-based services and products • Financial and non-financial support
Prolinnova – Promoting local innovation	• Farmers • Community-based organizations	• Local innovation support fund • For agricultural research and development for local innovations and adaption initiatives
ARC – Agricultural Research Council	• Smallholders	• Capacity development and trainings
NEPAD[24] Business Foundation	• Rural farmers • Rural women	• Southern African Agricultural Development Partnership Platform • Agriculture Supply-Chain Entrepreneurship Development Program • Access to project funding, training, technical support services, mentorship, networks, capacity building • On-farm assistance • Support a favorable policy environment • Increasing agricultural production • Improving structure and functioning markets • Promoting investment • Fostering access to food and nutrition • Management of natural resources
AEASA - The Agricultural Economics Association of South Africa	• Support all agricultural economists active in the industry irrespective of race, language, gender, career choice and educational level	• Training, research in Agricultural Economics • Solve agricultural, rural and relevant national problems • Improve liaison between agricultural economists at regional, national and international levels
FARA – Forum for agricultural research in	• Farmers	• Coordinating and advocating for

[24] New Partnership for Africa's Development

Africa		agricultural research for development • Strengthening the building blocks of the agricultural innovations system, namely: research, extension, education, farmer organizations, civil society, agribusiness and policy
CASP - Comprehensive Agricultural Support Program	• Farmers	• Training • Infrastructure revitalization and re-opening of agricultural colleges
TechnoServe	• Farmers • Communities	• Help to acquire skills, share knowledge and apply the technologies needed to build successful farms and businesses • Strengthen market systems
Limpopo Department of Agriculture	• Extension service officers • Small scale farmers	• Launched a project (1998): Broadening Agricultural Services and Extension Delivery (BASED) • Developed competencies for extension officers • Support farmers to develop innovations
AECA – Africa Enterprise Challenge Fund	• Private sector entrepreneurs • Smallholder farmers • Rural poor	• Provides grants to support innovations in agribusiness • Stimulate economic growth in rural areas • Creating jobs
SAADPP - The Southern African Agriculture Development Partnership Platform	• Public and private partners • Farmers	• Promotes agricultural investment on policy level • Develops small-scale agriculture • Removes barriers to agricultural development
SARC – South African Research Center (African Development Group)	• Ministries, governments, citizens	• Economic development • Providing financial resources • Policy consultancy

Sources: (Ramaru, Mamabolo, & Lekgoro, 2000; Parlamentary Monitoring Group, 2012; NEPAD Business Foundation, 2012a; African Development Bank Group, 2015; NEPAD Business Foundation, 2012b; Heifer International-South Africa, 2013; AECF, 2015)

Appendix B: Questionnaire Farmers

Questionnaire Farmers

Introduction of research background and myself.

Date	
Place	
Gender	
Age	
Language	
Name	

1. **General Questions**
    - What do you cultivate on your farm and how big is your farm?
    - How much time do you invest in farming a day?
    - Which farming methods and inputs are you using currently?
    - How often can you harvest per year?
    - Is farming your solely source of income? If not, what else? Why not?
    - What daily challenges do you face regarding farming?
    - Are you a member of Cooperations; Associations; farmer Organisations? If yes, which ones and why these?

2. **Innovation**
    - Are you familiar with new/different farming methods/inputs? Would you be open to apply new/different methods/inputs?
    - Do you have innovative ideas, you want to realize? Which ones, why these, when did you started with them?
    - Do you have any experience with realizing innovations? What was the goal?
    - Did you experience constraining or supporting policies regarding innovations? If yes, which ones? How did they constrain/support?
    - Do you see innovations happening somewhere already?
    - Are you aware of the INNO Giyani project? If yes, where did you get the information from?

3. **Innovation Platform in Giyani**
    - Would you participate at an innovation platform? And why? What would motivate you?
    - Are you aware of your benefits when participating in the IP?
    - How should the innovation platform be structured, so that you would participate(leader, participants, organization, location, fee, meetings, training, workshops, involvement, communication channels) ?
    - What are your expectations towards the other stakeholder?
    - What would you require from an innovation platform?
    - What vision & focus should the innovation platform have?
    - What kind of skills could you contribute to the innovation platform?
    - Do you know about other innovation platforms? If yes, where, which ones?
    - Do you have any suggestions for other persons to interview?

Appendix C: Questionnaire Picoteam & Innovation HUB

Questionnaire PICOTEAM & IMPACT HUB

Introduction of research background and myself.

Date	
Place	
Gender	
Language	
Name	
Organisation	
Role	

4. General Questions

- What is your role within the IP/IS?
- Do you cooperate with the government? If yes, how, since when and why?
- How is the government involved?

5. Innovation Platform

- When was the IP implemented?
- What were the barriers for setting up the IP?
- How did the fiscal and legal policy context influence the innovation ability of the system?
- What ineffective or conservative behavior from the local people could you identify?
- What are the key aspects of a well-functioning IP? And why especially these?
- Who are the stakeholders of the IP? And what are the benfits for them to be involved?
- Which tasks and roles have the several stakeholders (financial support, technical support etc.)?
- What is the vision and focus of the IP?
- How is the IP structured and governed (leader, participants, organization, location, fee, meetings, training, workshops, involvement, communication channels, innovation markets)?
- How is the membership defined of the IP?
- How is the IP financed? Are you profiting from governmental fundings?
- What kind of innovations were developed so far?
- How does the process of the development and implementation of an innovation look like?
- Do you monitor the impact of the innovation? If yes, how?
- If the farmers achieve a financial surplus, how do they spend this?

Appendix D: Detailed Policy Recommendations

The practical relevance of this research is reflected in the following policy recommendations, especially for project managers and facilitators of innovation platforms, with a focus on three fundamental topics namely capacity building, partnership development and market orientation. These policy recommendations can support facilitators in enabling agricultural innovations on a local level in Giyani.

Capacity Building

Capacity building can be understood as the provision of education, enabling the access to financial resources and facilitating groups and organizations (Ramaru & Hagmann, 2009). One of the key activities of the innovation platform will be capacity building amongst the stakeholders. In this process it is suggested to apply a participatory extension approach, which means to combine the indigenous knowledge of the farmers with up-to-date scientific knowledge from agricultural researchers and scientists. This will lead to the development of innovations without loosing traditional cultivation methods, which were specifically adjusted to the local circumstances over several years (Sanginga, 2009).

A participatory development of new farming methods and technologies ensures the necessity and suitability of the implementation of the innovations for the small scale farmers and their environmental conditions (Sanginga, 2009). To support the partnership development amongst farmers it is recommended to conduct the practical trainings on the farms itself and invite nearby farmers to attend these trainings. This fosters the transparency between the farmers, they can see what and how their combatant cultivate, and get new insights through the on-site trainings how to improve their yield. This will be time-saving for the trainer and extension officers, since they can reach more farmers with one training session and get a better overview about the specific challenges in the individual districts. To enable these farm-visits, a transportation-sharing approach can be implemented at which farmers who own a car, can pick up neighboring farmers or the trainers organize a small bus shuttle service to bring the farmers to the training locations.

The focus of these trainings should be on sustainable agriculture and organic farming. Thereby the environment will be preserved, niche products can be developed, and the quality requirements especially for the export in metropolises can be achieved.

Another possibility to develop innovations is the involvement of students from agricultural related studies at the Limpopo University, who can conduct their internships in cooperation with the innovation platform. These trainees will be connected to the small scale farmers and can co-develop new cultivation methods on-site with the farmers. Thus, both parties will benefit: the students get practical insights and can try out their ideas, and the farmers can get knowledge and support on their farms.

An example for successful on-site trials is the implementation of quality protein maize in Ethiopia. The cooperation between farmers and scientists lead to the successful development of a type of maize, which has a higher level of nutritions but tastes similar to the traditional maize (Mall, 2014).

In terms of a successful communication infrastructure there are already mobile services developed, which improve the knowledge diffusion through messaging applications for regular mobile phones and smartphones in Africa (Nsehe, 2014). These innovative communication services can contribute to a more efficient communication amongst the stakeholders, as well as an improved access to market and cultivation information, assumed that the service users are not illiterate (Fripp, 2013). These ideas can also be used in Giyani, if further developed and adapted to the local circumstances.

Partnership Development

One specific approach to develop an efficient partnership between the farmers and the buyers is to implement contracts, incorporating fixed prices for the farmers´ products, as well as agreed quantities and qualities of the products. To overcome the complexity of managing contracts for every single farmer individually it is suggested to make the contracts between the buyer and the innovation platform, which will be serving as a representative body for the farmers. This ensures an efficient process and generates a security for the success of the partnership, insofar the partners comply with the rules. Other studies in Uganda, South Africa and Kenya have shown that contract farming leads to an increased income for the farmers and therewith improves their livelihoods (Wiggins et al, 2013). To overcome the mistrust amongst the farmers when developing a collaborative culture amongst them, it is important to highlight the benefits for the smallholders, e.g. buying inputs in bulk, achieve large scale output, increase bargaining power, reduce high transaction costs, improve private materialistic standards, exchange knowledge, and learn from each other, as well as support each other.

Another important partnership involves financial institutions and donors. For the long-term financial sustainability of the innovation platform it is advised to find different financial sources until the project is self-sustaining. Depending on one individual donor, or institution it can be destructive if the financial aid gets depleted or if the relation between the two partners is not in balance or conditional.

A partnership with the government can be beneficial, if a united group of farmers lobbies for their rights or the implementation for supportive policies, rules or the implementation of public service.

Other projects advocated the implementation of health and index insurances as an efficient tool to cover expenses in case of diseases or extreme weather events affecting the production of the farmers (Wiggins et al, 2013). Hence, the cooperation with insurance companies can be beneficial for the farmers, or the innovation platform respectively. In general it can be said that the small scale farmers will be more successful if they are organized and act united (GTZ (ed.), 2003).

To facilitate multi-stakeholder partnerships it is recommended to make use of the following specific tools, compiled by the CDI[25] of the University of Wageningen:

- the Human Spectrogram – connecting stakeholders based on finding out similarities and differences
- Ground Rules – create group principles for a harmonic collaboration
- Rich Picture – make complex issues understandable
- Stakeholder Identification – mapping roles and skills of stakeholders
- Appreciative Story Telling – sharing good practices
- Circle of Coherence – identify power relations between stakeholders
- Visioning – establish a common goal
- Partnership Agreement – clarify expectations and commitment (CDI, 2012).

The innovation platform can make use of these tools in order to conduct team buildings and manage the participants in an efficient manner to achieve a cooperative working attitude. Therefore these tools need to be reviewed, if they suit to the people and situation and if necessary adapted to the local circumstances in Giyani.

[25] Center for Development Innovation

Market Orientation

In order to achieve a higher income through agriculture it is essential that the farming activities of the smallholders are conform to the market requirements. Therefore it is advised to initially address the domestic market in Giyani before orienting towards regional, national or international export markets (Wiggins et al, 2013). With the support by the local SPAR supermarkets this entry point is already established, as well as the possibility to use the SPAR brand for the locally produced goods by the smallholders. Thus, it will be assured that the standards and requirements of the private supermarkets will be met by the farmers, which is simultaneously a precondition for entering the export markets. By coordinating the cultivation schemes with the market demands it will be ensured that the farmers can sell their harvest and the oversupply, or shortage of products at the markets can be prevented. In a long term it is recommended that the innovation platform focusses on niche products or certificates, as organic, biological, fair trade and locally produced, in order to increase their sales market (Wiggins & Keats, 2014).