CONCEPT & PROGRAMME

Towards new STI indicators and datasets in the SADC context

A workshop at the NCRST, Windhoek, Namibia

Friday, 28 February 2020

Background:

Since the OECD's R&D and innovation survey measurement models first spread to African countries, there has been widespread debate around how we adapt the instruments to be relevant to the specificities of our innovation systems, and how we maintain a standard core that allows for comparability between countries, within and across regions. There is now growing consensus that we need to better align what is measured, with what should be measured.

Over the past few years, CeSTII has been experimenting and growing its capacity to create new STI measures and indicators appropriate to Southern African development contexts. It has established baseline projects to measure innovation in the informal economy, and in the agricultural sector, currently two critical data gaps that may provide a more realistic assessment of the nature and scale of innovation in Africa.

Workshop activities:

Namibia is developing expertise in R&D and innovation surveys, which lays a solid foundation. The workshop aims to promote discussion of what new surveys are possible in the Namibian context. It will do so by reflecting on the South African experience, specifically sharing:

1. Steps to design a new STI measurement framework informed by the developmental priorities of the STI Strategy for Africa (STISA) and the Sustainable Development Goals.
2. The conceptualisation, design and operationalisation of a survey of innovation in agricultural businesses
3. The conceptualisation, design and operationalisation of a survey of innovation in informal enterprises

Facilitators:

- Dr Glenda Kruss, Executive Head, CeSTII
- Dr Moses Sithole, Research Director, CeSTII

Programme	
09h00-09h15	• Welcome by NCRCST
09h15-09h30	• Creating new STI indicators and datasets in the SADC context, Brief presentation & discussion facilitated by Dr Glenda Kruss
PART 1. A FOCUS ON MEASURING INNOVATION IN THE AGRICULTURAL SECTOR	
	*Presented and facilitated by **Dr Moses Sithole*** **Key documents:** - Sithole, M. M, Buchana, Y. & Zulu, T. 2019. Baseline Agricultural Business Innovation Survey: Conceptual Document. CeSTII, HSRC: Cape Town. - Questionnaire: South African Agricultural Business Innovation Survey 2016 – 2018, Including Farming, Forestry and Fisheries. CeSTII, HSRC: Cape Town.
09h30-12h00	**Topics for presentation and discussion:** • Conceptualising a survey of innovation in agricultural enterprises in Southern Africa • Designing a questionnaire to measure innovation in agricultural enterprises • Consulting with stakeholders in the agricultural sector to inform analysis
12h00-13h00	LUNCH BREAK
PART 2. A FOCUS ON MEASURING INNOVATION IN THE INFORMAL SECTOR	
	*Presented and facilitated by **Dr Glenda Kruss*** **Key documents:** - Mustapha, N., Jegede, O., Petersen, I. & Bortagaray, I. 2019. Survey to Measure Innovation in the Informal Economy. CeSTII, HSRC: Cape Town. - Questionnaire: Survey of Innovation in the Informal Sector. CeSTII, HSRC: Cape Town.
13h00-16h00	**Topics for presentation and discussion:** • Conceptualising a survey of innovation in informal enterprises in Southern Africa • New survey techniques to deal with methodological challenges
16h00-16h15	• Closure and way forward

Creating new STI indicators and datasets in the SADC context

Glenda Kruss, NCRST Namibia, 28 February 2020
Centre for Science, Technology & Innovation Indicators, HSRC.
CeSTII-NCRST Workshop, 28 February 2020, Namibia.

The STI measurement challenge in our context

Emerging economies require broader models of innovation that emphasise the systemic and dynamic nature of innovation; that are oriented to firms and the formal sector, but to other economic and social actors, and informal settings as well; that promote not only the development of technologies but equally, their effective social and economic use, processes, and organisation; and that focus on technological capability building, particularly at the local level

SA policy: how do we include measures of innovation oriented to inclusive and sustainable development?

> Innovation that addresses the triple challenge of inequality, poverty and unemployment and enables all sectors of society, particularly the **marginalised poor, informal sector actors and indigenous knowledge holders** to participate in creating, actualizing innovation opportunities as well as equitably sharing in the benefits of development

Department of Science and Technology, *Draft White Paper on STI*, May 2017

A big shift in Oslo manual 2018: extended definition of innovation

An innovation is a new or improved product or process (or combination thereof)

that differs significantly from the unit's previous products or processes and that

has been made available to potential users (product) or brought into use by the unit

(process).

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This definition uses the generic term "unit" to describe the actor responsible for

innovations. It refers to any institutional unit in any sector, including households and their

individual members.

Development challenges framed by the African Union's STI strategy for Africa (STISA), aligned with the UN Sustainable Development Goals

How do we develop indicators and measures reflecting each of these development challenges?

Centre for Science, Technology & Innovation Indicators, HSRC.
CeSTII-NCRST Workshop, 28 February 2020, Namibia.

Development priority	SDGs aligned to priority	Trends in the innovation literature that can inform measurement research
1. Eradicate Hunger and ensure Food and Nutrition Security	1 No Poverty 2 Zero Hunger	**Innovation surveys in agricultural sector** / aquatics / forestry Case studies of agricultural innovation networks Case studies of agro-processing global innovation networks
2. Prevent and Control Diseases and ensure Well-being	3 Good health and well being 6 Clean water and sanitation	Measuring health innovation Case studies of health innovation networks
3. Communication (Physical & Intellectual Mobility)	9 Industry, innovation and infrastructure	Analysis of ICT in R&D and innovation survey datasets Case studies of ICT networks / indigenous knowledge uses for physical communication
4. Protect our Space	7 Affordable and Clean energy 13 Climate action 14 Life below water 15 Life below land	Case studies of sustainable innovation and socio-technical systems Case studies of clean energy / water / sanitation use innovation networks **Analysis of green economy in R&D and innovation survey datasets**
5. Live Together, Build Society	5 Gender Equality 10 Reduced inequalities 11 Sustainable cities and communities 16 Peace, justice and strong institutions 17 Partnerships for the goals	Measuring innovation in public sector Case studies of city development / local economic development networks Case studies of local government capacity
6. Create wealth, Inclusive economic growth	4 Quality education 5 Gender Equality 7 Affordable and Clean energy 8 Decent work and economic growth 9 Industry, innovation and infrastructure 12 Responsible consumption	Measuring innovation at household level **Measuring innovation in the informal economy** Measuring learning and technological capabilities

An iterative and experimental process:

An example of new measures / indicators analysing existing R&D data

Development priority 4: protect our space

Are the levels of expenditure on R&D to 'protect our space' sufficient?

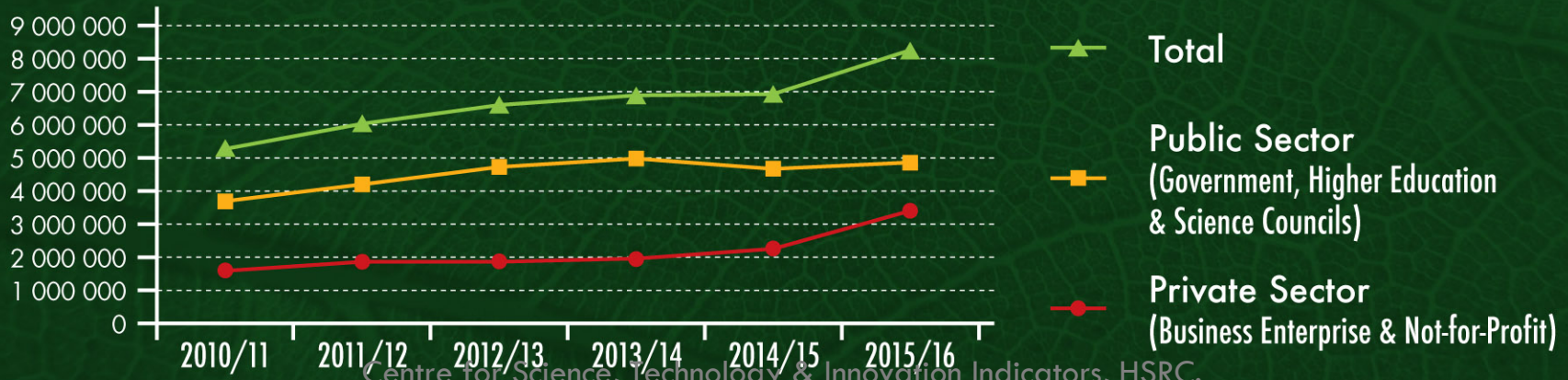
- Total spend / as proportion of GERD, over time
- Spend per socio-economic objective

SINCE 2010/11 THE SIZE AND VALUE OF THE SOUTH AFRICAN GREEN ECONOMY HAS BEEN INCREASING

IN THE **2015/16 R&D SURVEY**, **INVESTMENT IN GREEN R&D ACTIVITIES** ACCOUNTED FOR **R 8.230 BILLION** WHICH WAS **0.20% OF GDP**

THE **SIZE** OF **GREEN R&D INVESTMENT** RELATIVE TO ***GROSS DOMESTIC EXPENDITURE ON R&D*** (GERD) IN **2015/16** WAS

GREEN R&D EXPENDITURE INCREASED BETWEEN 2010/11 AND 2015/16



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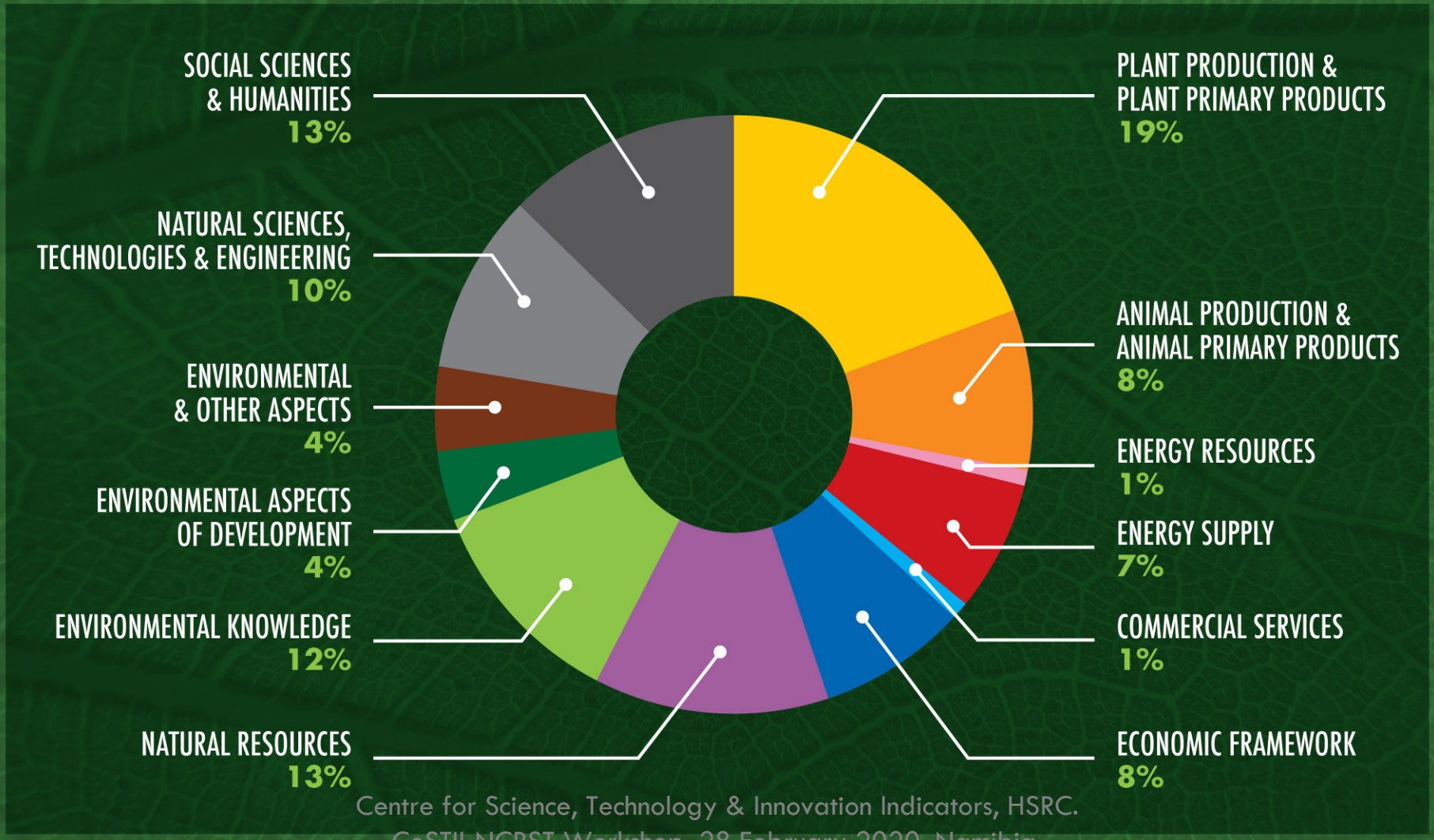
GREEN R&D EXPENDITURE
BY SOCIO-ECONOMIC OBJECTIVES (2015/16)



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12h00-13h00	LUNCH BREAK

Baseline Agricultural Business Innovation Survey:

Conceptual Document

Dr. Moses M. Sithole,

Dr. Yasser Buchana and

Mr Thembinkosi Zulu

April 2019

Centre for Science, Technology & Innovation Indicators, HSRC.
CeSTII-NCRST Workshop, 28 February 2020, Namibia.

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Background and Introduction

Policy urgency

The production component of the South African agriculture sector faces several challenges: high and rising input costs, preferential trade agreements and high export tariffs, crop or livestock diseases, and competition with imports. Food security and nutrition are critical issues in the discourse on development today. The impact of climate change on the sustainability of agriculture is a growing challenge globally, and farmers must increasingly contend with new dynamic factors that affect productivity. In South Africa in particular, in recent years many farmers have struggled to respond to drought conditions and other climate-related environmental challenges.

From the policy standpoint, agriculture needs to be revived in order to address the principles of the National Development Plan (NDP) and the Sustainable Development Goals (SDG). The 2019 White Paper on Science Technology and Innovation targets agriculture as one of the existing sectors requiring modernization in order to support growth and development, yet it acknowledges the complex relationships between innovation, sustaining employment, economic inclusion and export competitiveness. In this context, innovation is central to the ability of agriculturalists to withstand external shocks. There is growing potential to address these challenges through innovations, which includes but not limited to, the use of artificial intelligence, big data, remote sensing, and drone farming; in short, the digital technologies of the fourth industrial revolution. For example, thanks to big data technologies, farmers nowadays can achieve real-time information about crop health, soil and air moisture conditions, which allows for automated irrigation when optimal, to address inefficiencies. The challenge in South Africa is the diffusion of these technologies across the agricultural sector and, in turn, this means that we need to understand the state and nature of innovation in the agricultural sector.

Agriculture in South Africa

Agriculture plays an important role in the economic and social development of South Africa (SEDA, 2012). In the past twenty years, the country's agriculture sector has undergone considerable reforms. At this point in time, South Africa needs an effective and sustainable National Agricultural research System (NARS) to respond to the challenges of poverty and food security as well as the need for increased competitiveness and profitability (DAFF, 2010). Drought, adaptation to climate change and crop production to meet the needs of the biofuel industries as well as for food security and biosecurity are some of the challenges faced by the sector. Several policy initiatives (Department of Agriculture, 1998; DAFF, 1998a, 1998b) and strategic plans (DAFF, 2015; Department of Agriculture , 2001) have been put in place to respond to these demands and challenges, to contribute to social and economic reform.

The South African agriculture sector can be divided into distinct farming regions and farming activities, ranging from intensive crop production in winter rainfall and high summer rainfall areas, to cattle ranching in the bushveld and sheep farming in the more arid regions (Goldblatt, 2011). Agricultural

production falls broadly into two categories: Commercial production and Smallholder agriculture (DAFF, 2011). Smallholder producers are defined as those producers who "produce food for home consumption, as well as sell surplus produce to the market" while commercial producers are defined as large scale producers (DAFF, 2011). South Africa has approximately 122 million hectares (Ha) of surface area, of which about 20 million Ha are used. Of the 20 million Ha, approximately 5.5 Million (28%) is used for agriculture. Approximately 4 million Ha (20%) is used for farming and fisheries and the remaining 1 million Ha (8%) is used for forestry (DRDLR, 2013).

It is in the context of these priorities and challenges that we propose to initiate a baseline survey of innovation in agricultural firms, to fill a gap in the evidence available to inform policy making.

Why measure innovation in the agriculture sector

There is widespread realization globally of the importance of research and innovation in addressing global challenges such as food security, poverty alleviation and livelihoods, environmental sustainability, biodiversity and climate change. The National Agricultural Research Strategy (DAFF, 2008) recognises and promotes public investments in agricultural knowledge systems to promote interactive knowledge networks and capacity in core agricultural sciences in order to achieve developmental and sustainability goals.

Measuring innovation helps governments to better understand the innovative dynamics in firms. The data can help to inform the provision of appropriate support by governments to firms, with a view to stimulating and encouraging further innovation and, ultimately, increasing productivity and competiveness (Moses et al, 2012). This argument extends to the agriculture sector, as it is a strategic sector for most countries, with different roles and opportunities for the essential development of a nation. Examples include food quality and safety, interdependence with other sectors of the economy and bioenergy production (Ariza, et. al., 2013). However, innovation measurement in the agriculture sector is a recent task, with only some countries beginning theoretical reflections on what might be required to inform the design and implementation of surveys. This stands in contrast to the advances of innovation measurement in the industrial and services sectors, notwithstanding the general difficulties of the measurement task (Ariza. et al., 2013).

Introduction of the baseline study in South Africa

South Africa has completed five business innovation surveys, covering a wide range of industry and service sectors. These surveys excluded agricultural businesses, largely because of the complexity of measurement of the agriculture sector. The agricultural value chain spans a wide range of activities and crosses over with many other sectors. For example, to develop a key agricultural input such as pesticides requires innovation in the chemical industry; or, new seed varieties require innovation in the domain of

biotechnology. This complicates the measurement process, and the specific empirical focus needs to be carefully defined and delineated.

Nevertheless, given the significance of the agricultural sector in South Africa in terms of employment, livelihoods and food security, a review of innovation measurement and planning recommended a complementary baseline survey of the agricultural sector (CeSTII, 2017). The Baseline Agricultural Business Innovation survey will aim to produce results that will inform policy to stimulate growth and support for innovation and development in the agricultural sector.

Aim and objectives of the baseline survey

The main aim of the agricultural innovation baseline survey is to explore the feasibility of measuring agricultural innovation in South Africa and propose a method of measurement that best suits the context of South Africa.

The objectives of the study are to measure agricultural innovation in South Africa by:

- Exploring currently existing measurement frameworks and methods, and choosing those best suited to the South African context;
- Designing a measurement instrument that is aligned to the measurement framework and method of choice;
- Cognitive-testing the instrument and making any necessary adjustments;
- Conducting a baseline survey based on a sample of agricultural businesses obtained from Statistics South Africa.

Structure of the document

This document sets out a conceptual and methodological foundation for the baseline agricultural innovation survey. In the next section we begin by reviewing standard innovation concepts, followed by a review of innovation measurement frameworks in general, and those proposed for the measurement of agricultural innovation specifically. Thereafter, we explore who we should measure; what we should measure and how we should measure innovation in agricultural settings. This section includes the measurement framework and methodology of choice, providing a motivation and description of the survey design and proposed survey instrument.

Innovation concepts

A synthesis report reviewing innovation measurement in South Africa conducted by the Centre for Science, Technology and Innovation Indicators (CeSTII) in 2017 provides a general understanding of the evolution of innovation conceptualization and terms over time (CeSTII 2017).The international standard definition of innovation emerged from the work of the OECD over decades. The first version

of the Oslo manual (1992) considered innovation to include product and process changes only. Later, updates were made to the definition to include product, services, process and product delivery (OECD/Eurostat, 1997). The definition of innovation in the third version of the OM (2005) incorporated product, process and delivery as well as organisational and marketing innovations. Thus, for many years, measurement practice was based on the definition of innovation adopted in the third edition of the Oslo Manual:

> *"The implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations (OECD/Eurostat, 2005)".*

Moreover, paragraph 150 of the OM3, emphasised that:

> *"A common feature of an innovation is that it must have been implemented. A new or improved product is implemented when it is introduced on the market. New processes, marketing methods or organisational methods are implemented when they are brought into actual use in the firm's operations (OECD/Eurostat, 2005)".*

The new Oslo Manual (OECD/Eurostat, 2018) has revised and broadened the general definition of innovation:

> *"An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)".*

Chapter 3 of OM 2018 provides a specific definition for the business sector, which states that a business innovation is:

> *"A new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm".*

In contrast to previous definitions, the new definition is broader and shows that what counts as innovation activities is more than simply product and process innovations. This shift reflects evolution in the models of how innovation occurs, from a technology push linear model, to more complex models of systems and networks. Meissner et al (2016) reviewed and categorised the models of innovation, their essence and main proponents, since the 1950s to the present, summarised in Table 1.

Table 1. Models of innovation

GENERATION	INNOVATION MODEL	PERIOD	AUTHORS OF FUNDAMENTAL IDEAS	ESSENCE OF THE MODEL
1	Technology push	1950s—late 1960s	Usher (1955)	Linear process
2	Market (need) pull	Late 1960s—first half of 1970s	Myers and Marquis (1969a, b)	R&D based on customer wishes
3	Coupling model Interactive model	Second half of 1970s—end of 1980s	Mowery and Rosenberg (1979) Rothwell and Zegveld (1985)	Interaction of different functions Interaction with research institutions and market
4	Integrated model	End of 1980s—early 1990s	Kline and Rosenberg (1986)	Simultaneous process with feedback loops / 'Chain-linked model'
5	Networking -model	1990s	Rothwell (1992)	System integration and networks (SIN)
6	Open innovation	2000s	Chesbrough (2003a, b)	Innovation collaboration and multiple exploitation path

Source: Meissner et al 2016

Frameworks for Measuring Innovation in a Broad Sense

According to Godin (2006), in the development of the Oslo Manual and in consequent surveys, there has been a conceptual shift from simply measuring the outputs of innovation to also measuring the activities that facilitate innovation (see Table 1 above). The Oslo Manual Innovation Survey Framework adapted from Gamal et al (2011) seeks to measure innovation activities and behaviour of the following aspects:

- Innovation in the firm;
- Linkages with other firms and public research institutes;
- The institutional framework in which the firm operates; and,
- The role of demand.

The 'subject' approach to measurement focuses on the innovating agency—i.e. the firm. It has been widely adopted globally, including in previous innovation surveys in South Africa, which has adopted the

methodological recommendations for Community Innovation Surveys (CIS) provided by Eurostat, the Statistical Office of the European Commission, a survey model that has been used in more than 80 countries (Gault, 2013; Arundel 2013). The CIS questionnaire seeks to gather basic information on a wide range of innovation topics. A substantial portion of the questions are meant to identify innovative companies and their innovation activities. In order to construct indicators of potentially innovative firms, measurement instruments need to take into account all enterprises i.e. both innovation-active and enterprises without innovation activity to address the main issues related to innovation strategies, such as innovation activities, capabilities, linkages and results (OECD/Eurostat, 2005).

Frameworks for measuring innovation in developing economies

In all of the South African business innovation surveys, the concepts in the Oslo Manual and CIS guidelines were closely adopted, but adapted slightly. The surveys have been strongly shaped by the needs of international comparability. Recently, there is growing recognition that South Africa, being part of the Global South, and Africa, has a distinctive economic context, and social development challenges that require, and in turn shape, innovation. Both developing and developed countries have to turn measurement into useful policy tools to justify the considerable investment that is required to implement innovation surveys.

The Bogota Manual (RICYT/OEC/CYTED, 2001) was included as an annexure to the third edition of the Oslo Manual (OECD/Eurostat, 2005), to address innovation processes that are unique to developing countries in Latin America. The Bogota manual experience may contribute to addressing the innovation measurement challenges experienced by African countries. The lessons learned in Latin America, encapsulated in the Bogota Manual, are an attempt to focus more effectively on measuring innovation as a learning process, since this is a key barrier to innovation capability and absorptive capacity of firms in emerging economies. The manual proposes that questions on firm learning and capabilities should complement the core CIS questions, which are based on a narrow focus on successful innovations, to inform the design of the instrument.

Countries in Africa face distinctive innovation measurement challenges due to their own unique innovation contexts and processes that are dissimilar to those of European countries. One key difference in the structure of economies is the large contribution of agriculture to GDP and employment in African economies. In the absence of frameworks that address the contextual issues presented by the STI measurement challenges in Africa, the AU member states' representatives adopted the OECD frameworks in the Frascati and Oslo manuals as guidelines for measuring R&D and Innovation (Molotja, Sithole, Mumba, 2014). However, these measurements are limited mostly to formal businesses and do not include measurement of innovation in the informal sector or agricultural sector. The use of the Oslo Manual-based CIS in these settings has therefore been criticised in recent years (see the annotated

bibliography by Daniels 2014). However, there is still no equivalent manual for these developing economies in Africa.

Our challenge is to identify precedents for the measurement of innovation that take into account the complexities of measuring innovation in agricultural settings, in a South African context, building on the international measurement standards.

Frameworks and Methods for Measuring Agricultural Innovation

A review of the literature reveals that research towards the development of frameworks and methods for measuring agricultural innovation is emergent.

In South Africa, there is a precedent that can inform the current task potentially, in the form of a study that involved empirical investigation for the measurement of R&D and other science and technology (S&T) in agricultural settings. A survey of activities for the period 2010/11 was conducted by the Centre for Science, Technology and Innovation Indicators (CeSTII) on behalf of the Department of Agriculture, Forestry and Fisheries (DAFF, 2014). It was based on a suite of indicators developed by DAFF for monitoring R&D and other S&T activities, as part of an initiative to close information and developmental gaps within the sector, and was limited to public institutions. This research fills a data gap, and provides a critical review of South Africa's expenditure on public agricultural R&D (Sithole, et. al., 2019). However, in the sense of innovation as defined in the Oslo Manual (OECD, 2005), the study provided little data.

A key contribution to the literature is a World Bank report based on the work of Spielman and Birner (2008), who explored the application of the innovation systems framework to the design and construction of national agricultural innovation indicators in developing countries. These authors propose indicators that could be used to gauge and benchmark national performance in developing dynamic, and innovative agricultural sectors. Spielman and Kelemework (2009) similarly demonstrated how to measure innovation in developing-country agriculture. They achieve this by first identifying a set of indicators from secondary data sources that capture key elements of an agricultural innovation system. They then aggregate these indicators into a unique agriculture, development and innovation index that covers 35 countries. This forms a toolkit for collecting and analysing 'systems-oriented' indicators.

The Global Innovation Index report co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO), also provides a new approach to measuring agricultural innovation. The purpose of the GII Report is to provide a ranking of world economies' innovation capabilities and results. The 2017 GII report proposed a framework for measuring agricultural innovation. This framework provides a set of indicators which can "*be adapted to measuring innovation in*

specific systems and sectors". However, the literature shows that this agricultural innovation framework has not been tested in any particular empirical context.

The most promising research in this regard emerges from Latin America, from Colombia. Ariza et al (2013) both proposed a framework for measuring innovation, and applied this methodology in practice to four agricultural subsectors in Colombia. Their method aims to measure innovation and its key determinants in agricultural firms, using three main tools: an Innovation Matrix (IM), an Innovation Index (II) and an econometric model (OLS estimation procedures). The IM provides an overview landscape of the current state of technology in a given agricultural sub-sector. It includes information about innovation technological levels, in terms of their place on the technological spectrum of the sub-sector. The IM also includes information about the frequency of innovation, which refers to the degree of adoption of a particular innovation among the farmers.

The idea of using an Innovation Matrix based on a survey to organize and sort the information gathered in order to identify innovations was first introduced by Saavedra et. al. (2012). These authors proposed to design a methodology for researching innovation in the agriculture sector, both technological as well as non-technological.

After an extensive review of secondary sources and consulting with experts, Ariza et al designed a survey based mainly on the *Oslo Manual* (OECD and Eurostat, 2005). In other words, they established what is specific to the nature of innovation in agricultural firms by elaborating how the categories of the *Oslo Manual* apply (see below for further detail). Most of the questions in their survey were based on the CIS and were closed questions with multiple options and single or multiple choices, but there were also some open questions, specifically designed for identifying innovations.

Therefore, given the similar contexts between South Africa and Colombia, we propose adopting and adapting a similar methodology for South Africa.

Rationale for measuring agricultural innovation in South Africa

There are several reasons why it is more appropriate to measure agricultural innovation separately from the other sectors in the main business innovation survey.

Firstly, agriculture extends beyond the farming sector, across multiple goods and services, making it difficult to measure using the standard approach and instruments. Agricultural activities follow an agricultural value chain along which different types of innovations occur. These innovations may include the following:

1) Agricultural inputs such as seeds and fertilizers, with some coming from the biotechnology or chemical sectors;

2) Product novelties from the capital goods sector;
3) Process or organizational innovations to improve efficiency in payments, distribution services and logistics from the banking, retail and transport sectors.

Second, as described above, the first, second and third editions of the Oslo Manual focus on the manufacturing and services sectors, and largely exclude the agriculture sector. It is yet to be seen in the implementation of the new Oslo Manual (OECD/Eurostat, 2018) whether the reframing of business innovation into product innovation (goods, services and information products) and business process (production, distribution and logistics, information and communication technology services, administration and management, marketing, sales and aftercare services, and product and business process innovation) will adequately facilitate the measurement of the agriculture production sector in the main business survey.

The complexities outlined here, and the lack of robust methodologies for the measurement of agricultural innovation, make it necessary to develop a framework for the measurement of agricultural innovation in South Africa, which we propose to do by adapting the innovation matrix (IM) framework developed and used by Ariza et. al. (2013).

Measurement framework

We propose that the agricultural innovation baseline survey adopts the methodology designed by Saavedra, et. el. (2012) and Ariza. et. al (2013) to measure innovation in Colombian agricultural firms based on the Oslo Manual framework (OECD and Eurostat, 2005).

The Colombian methodology makes use of an innovation matrix (IM) to profile agricultural innovations based on the information gathered (Figure 1). The IM profiles the innovations according to the types of innovations as described in the Oslo manual (i.e. product, process, organization and marketing). Within each of these classifications, the IM further breaks down the innovations into five innovation paradigms (i.e. Quality, efficiency, information, transaction and sustainability) as well as fourteen innovation areas. The IM further breakdown the innovations into three technological levels (i.e. major, intermediate and minor).

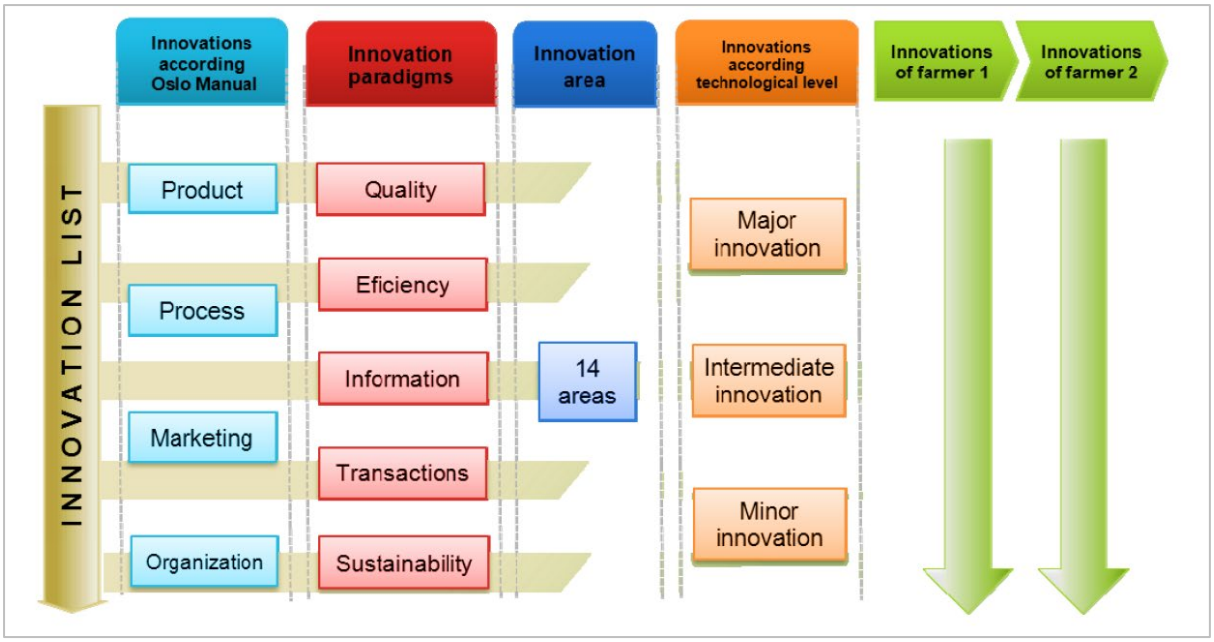

Figure 1: Innovation matrix proposed and used for profiling innovations in Colombian agricultural farms by Ariza, et. al. (2013)

Adaptations were made to this method to suit the South African context. The IM is applied at a higher level of sub-sectoring, than in the Colombian case. In our case, the IM is only applicable to higher level sub-sectoring, namely agricultural farms, fisheries and forestry. This is because the unit of measurement in the South African context is the agricultural firm, and all the innovations that take place in the firm. In the Colombian context, over and beyond the unit of measurement, they also profiled innovation of specific agricultural products. In other words, for the Colombians, the profiling is done for each agricultural product within a firm. For example, in the case of crop production, their measurement and profiling goes further to detail innovations in terms of the different types of crops, e.g., potatoes, tomatoes and flowers. This may be desirable in future, but will not be possible for a baseline survey in South Africa.

The adaptations also included simplification through a reduction in the number of types of innovation categories as used in the original IM (Ariza, et. al. 2013), by the exclusion of profiling by innovation paradigms and the 14 innovation areas. Figure 2 gives the form of the adapted innovation matrix for South Africa, where innovation novelty level (new to world, new to market, new to firm) is used to represent profiling innovations according to innovation technological level.

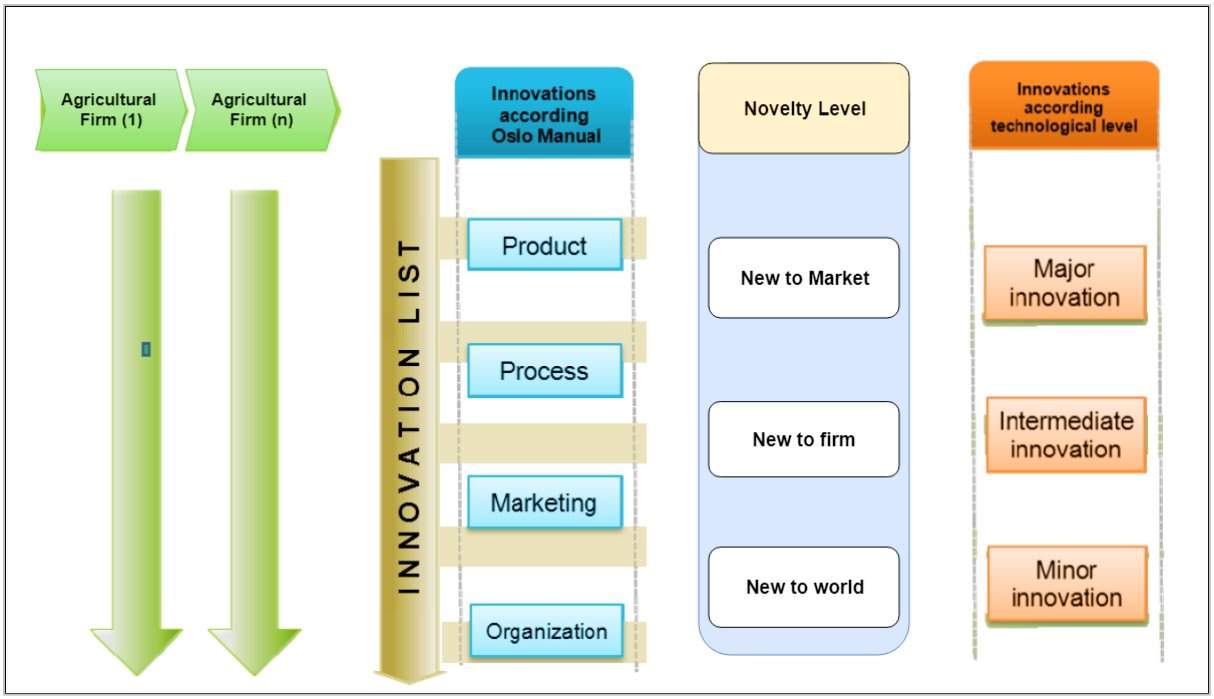

Figure 2: Adaptation to South African context of innovation matrix proposed and used by Ariza, et. al. (2013) for profiling innovations in Colombian farms

What should we measure?

The proposed Agricultural Business Innovation Indicators are adapted from the standard business innovation indicators in South Africa (Table 2), which are strongly shaped by the standard indicators in the Community Innovation Surveys (CIS) questionnaire. These include the type of innovation, how firms innovate, and benefits of innovation.

The survey questionnaire was designed to elicit information to compile these indicators. The adaptation of the instrument involved changes, additions and deletions of questions to make the questionnaire appropriate for measuring innovation in the agriculture sector specifically.

1. Changes to questions included adaptations to make indicators more specific to the agriculture sector, in particular for the items on Effects of innovation/Innovation outcomes and Factors hampering innovation activities.
2. One key addition was an item on factors that support and promote agricultural innovation.
3. There are some items that although relevant, were excluded from the baseline agricultural innovation survey, as they are currently not high on the priority list. These include sources of cooperation for innovation activities.
4. The inclusion of open ended questions to elicit information on specific innovations in an agricultural firm.

The resulting survey instrument is included as part of this conceptual document in Appendix A.

Table 2. Adaptation of SA BIS Questionnaire for Agricultural BIS

INDICATOR	QUESTIONS IN BIS (BASED ON CIS)	ADAPTATIONS FOR AGRICULTURAL BIS	COMMENT
Product (goods or services) innovation (Q1)	• Entirely new products (goods or services) • Significantly improved products • Responsibility for development of firm's product innovations • Main origin of product innovations (South Africa or abroad) • Novelty of product innovations and breakdown of turnover by product novelty level (new to the market, only new to the firm, new to the world)	We adapted the question to refer to an 'agricultural firm' as opposed to an 'enterprise'. The content of the questions did not change. The questions was rearranged from Q2 in BIS to Q3 to Agri-BIS.	The novelty levels (i.e. new to the market, new to the firm, new to the world) will be used in the profiling of the technological levels of agricultural innovations (i.e. Major, intermediate, minor). The classifications will be used to profile the innovations due to the diversity of the agricultural products and frequency of innovations. The profiling will apply to other types of innovations, i.e., process, organizational and marketing innovations.
Process innovation	• New or significantly improved manufacturing/production methods • New or significantly improved logistics, delivery or distribution methods for goods or services • New or significantly improved supporting activities for processes • Responsibility for development of firm's process innovations • Main origin of product innovations (South Africa or abroad)	This question was changed to ask whether the agricultural firms introduced new or improved processes to improve: (4.1) yields; (4.2) reduce production and/or distribution costs; etc. The question also allows firms to briefly describe these new or improved processes. The questions was rearranged from Q3 in BIS to Q4 to Agri-BIS.	In the original BIS, the question on process innovation were specific for manufacturing and services. Hence, the questions were adapted for the agricultural sector.

Organizational and marketing innovations	**Organisational innovations**
	• New or significantly improved business practice
	• Major changes to the organisation of work within your enterprise
	• New or significant changes in your external relations with other firms or public institutions
	• Effects of organizational innovations:
	  ○ Improved market share
	  ○ Reduced time to respond to customer or supplier needs
	  ○ Improved quality of goods or services
	  ○ Reduced costs per unit output
		This question was changed to ask whether the agricultural firms introduced new or improved organizational and marketing innovations.
		The question was adapted for the agricultural sector. Refer to questionnaire in appendix.
			In the original BIS, the question on organizational and marketing innovations were specific for manufacturing and services.
			Hence, the question was changed/adapted for the agricultural sector.

INDICATOR	QUESTIONS IN BIS (BASED ON CIS)	ADAPTATIONS FOR AGRICULTURAL BIS	COMMENT
	○ Improved employee satisfaction and/or reduced rates of employee turnover **Marketing innovations** • Significant changes to the design or packaging of a good or service • New or significantly changed sales or distribution methods • New media or techniques for good or service promotion • New methods for good or service placement or sales channels • New methods of pricing goods or services		
Ongoing or abandoned innovations	• Ongoing or abandoned innovation activities: ○ Product innovation ○ Process innovation ○ Organisational innovation ○ Marketing innovation	This question was not changed and was kept as in the BIS survey, except the enterprise is now referred to as 'agricultural innovation'.	The reason this question was not changed or adapted is because it is not asking anything that is particular to agriculture. The question aims to determine regardless of the innovation, whether there ongoing or abandoned innovations.
Innovation activities and expenditures	• Intramural (in-house) Research and Experimental Development (R&D) ○ Continuous or occasional • Extramural or outsourced R&D • Acquisition of machinery and equipment • Acquisition of buildings • Acquisition of other external knowledge • Training • Market introduction of innovations • Other activities • Lease or rental of machinery, equipment and other capital goods • Acquisition of computer hardware • Acquisition of computer software • Design • Engineering activities	The question was kept the same as in the BIS, however, the questions on expenditures were not included.	The reason for not including the questions on expenditures was to avoid respondent burden since this is only a baseline survey.
Sources of information and cooperation for innovation activities	• Internal sources • Market sources • Education & Research • Other Sources	The question on sources of information was not changed for the sources of information, but the second part of the question was not included that asked about cooperation for innovations.	We could not find sources of information outside of the ones in the main BIS survey that were different or peculiar to agriculture. The reason for not including the cooperation questions was that previous analysis of BIS data showed that there is no need for both questions given the high degree of convergence in the responses.
Effects of innovation/Innovations Outcomes	• Product outcomes • Strategic/marketing outcomes • Process Outcomes	This question was adapted to the agricultural sector to ask questions that	The reason why the question was changed is because, some of the questions in the main BIS were specific to

INDICATOR	QUESTIONS IN BIS (BASED ON CIS)	ADAPTATIONS FOR AGRICULTURAL BIS	COMMENT
	• Financial Outcomes • Other Outcomes	were more relevant to the Agri-sector.	manufacturing and services sector and were not relevant to the agricultural sector.
Public sector procurement and innovation	• Procurement with public sector organization • Procurement with Foreign/International public sector organization • Innovations as part of procurement contracts	This question was not included in the agricultural survey.	The reason for not including was because of prioritization, given that this is only a baseline survey.

Funding for innovation	• Own funds
	• Funds from related companies
	• Funds from other enterprises
	• Funds from SA Gov.
	• Foreign funds
	• Other sources
	• Type of support
	  ○ Financial
	  ○ Non-financial
		The question on funding for innovation was not included.	The reason for not including was because of prioritization, given that this is only a baseline survey.

Factors hampering innovation activities	• Cost factors • Knowledge factors • Market factors • Institutional factors • Reasons not to innovate	This question was adapted to the agricultural sector.	The questions in the main BIS were simplified to be more specific for the agricultural sector.
Intellectual property rights	• Formal methods • IP transactions	The question on funding for innovation was not included.	The reason for not including was because of prioritization, given that this is only a baseline survey.
Business capabilities for innovation	• Material handling • Computerised design and engineering • Business intelligence technologies • Green technologies • Advanced information control technologies • Geomatics or geospatial technologies • Nanotechnology • Biotechnologies/bioproducts • Other types advanced technologies	The question on funding for innovation was not included.	The reason for not including was because of prioritization, given that this is only a baseline survey.
		A new question that asks about factors that support/promote agricultural innovation was added.	This question was introduced as the first question in the questionnaire to capture respondents attention in terms of socio-economic and political contextual factors in the south Africa (e.g. land issue, etc.)

Who should we measure?

The South African agriculture sector covers three subsectors, namely agriculture, including farms, dealing with

1. crops, wineries, livestock and poultry
2. forestry
3. fisheries

Based on the recommendations in the Oslo Manual and Eurostat Guidelines, businesses to be included in the survey are those with 10 or more employees. In the context of South Africa, this should include commercial and small-holder farmers, but not subsistence farmers.

Agriculture, forestry and fisheries appear in Standard Industrial Classification (SIC) codes 11, 12 and 13, respectively. We have also considered the agricultural value chain, whereby there is a production and service side of agriculture. The production sector consists of production firms that produce crops, livestock/animal husbandry and forestry and other agricultural products. These firms are mainly covered under SIC 11, 12 and 13. However, Agri-food firms (food, beverages and tobacco) were covered in the main BIS under the manufacturing sector (SIC 3) and, hence, will not be included in this baseline agricultural innovation survey. Likewise, the agricultural service sector, which consists of firms that process and distribute agricultural products, was already included in the main business innovation survey and are not included here.

Stats SA drew a stratified random sample from the universe of agricultural firms, based on subsector (SIC 11, 12 or 13) and size-class. Given that Stats SA currently does not have information on employment, the specification to Stats SA for size cut-off was based on turnover. This is not ideal, as the Oslo Manual recommends size cut-offs based on employment but this is the best we can do under the circumstances.

The numbers of firms in the Stats SA Agricultural Business Innovation Survey (ABIS) frame are 7 090, 252 and 346 for SIC 11, 12 and 13, respectively (Table 3). A proportionate number of firms were randomly selected for the final sample, giving a total sample of 1 690 firms.

Table 3: Enterprises per SIC Stratum on ABIS sampling frame and sample

	Agriculture (SIC 11)	Forestry (SIC 12)	Fisheries (SIC 13)	Total
Frame size	7 090	252	346	7 688
Sample size	1 514	95	81	1 690

How should we measure agricultural innovation in South Africa?

Survey design

The survey design is informed by the Colombian framework, based on the Oslo Manual framework (Saavedra, et. al., 2012; Ariza, et. al., 2013), as adapted for the South African context. The survey design is further informed by Eurostat guidelines and the structure of the Stats SA Business Register.

We attempt to work smartly and cost-effectively, by reducing the amount of time and money spent. The survey design will be comprised of:

- A stratified random sample (by sector and size of enterprise) drawn from the Business Register database of Stats SA;
- An on-line questionnaire in Red Cap with at least two telephonic contacts and two written communications (follow up by e-mail, with postal administration on request);
- An electronic questionnaire in Adobe or paper questionnaire via the postal service where required or requested by the respondent. Such requests are expected to be small in number, as it is expected that most respondents will be able to access he online questionnaire on Red Cap.
- A non-response survey, which is to be conducted if the response rate is below 70%;
- The extrapolation of results to the target population based on the weighted sample.

It will be necessary to take into account the unique nature of agri-business, particularly, the production sector. Most of the work in the production sector is not office-based. Therefore, we might find a situation where a person who is supposed to complete the SQ spends most of the time in the field and is difficult to reach directly. This requires both a contact person and a designated person. The contact person may be anyone who spends most of the time in the office i.e. PA/HR/Admin staff, while the designated person will complete the survey. The contact person will be responsible for receiving and passing the questionnaire to the designated person.

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Appendix A

Proposed South African agricultural survey instrument

Appendix B

Consultative process

A consultative process with stakeholders is currently in progress to ensure that the proposed baseline survey is aligned with current policy priorities and survey initiatives in the agricultural sector, to maximum effect. CeSTII invited key stakeholder and expert input into the survey instrument, and shared high level plans for the rollout of the survey, including proposing collaborative advocacy and networking opportunities.

The main concern is that there should not be duplication or overlap with the Census of Commercial Agriculture (COCA) currently conducted by Stats SA in partnership with DAFF. Consultation at a national stakeholder meeting on 11 April 2019 confirmed that:

a. Stats SA normally conducts an annual survey of the agriculture sector, which has been replaced by the COCA this year. Therefore, there would never be a 'right' time to conduct the agricultural BIS.
b. The purpose and measurement instrument for the agricultural BIS is distinctive, and therefore complementary to the purpose and questions in the COCA, so that there is no duplication of effort.

The stakeholder engagement catalysed by consultation around the agricultural BIS is stimulating collaboration and building of a network on measurement of productive activity and innovation in the agricultural sector.

Actions undertaken as part of engagement with stakeholders

The following is a list of stakeholder organisations identified for consultations and collaboration:

Department of Agriculture, Forestry and Fisheries (DAFF)

Statistics South Africa (Stats SA)

Agricultural Research Council (ARC)

Water Research Commission (WRC)

Agricultural Business Chamber (AgBiz)

The following list of actions has been undertaken to date.

- November 2018: Survey concept introduced to CeSTII International Advisory Committee Members
- February 2019: Exploratory discussion with the Project Director: Census of Commercial Agriculture 2017, Stats SA
- March 2019: Exploratory discussion with the CEO Agricultural Business Chamber (AgBiz)
- A meeting with national stakeholders on 11 April 2019
- An advocacy workshop for sectoral industry associations and stakeholders, in partnership with AgBiz, is being planned to take place in early June 2019.

From several iterations that have taken place with the abovementioned stakeholders, some important issues were clarified. However, a consultative process is still underway to follow-up on outstanding matters. For instance, with DAFF to secure high-level buy in, and with industry and innovation experts, to refine the terminology used in the instrument so that it is appropriate for the sector.

SOUTH AFRICAN AGRICULTURAL BUSINESS INNOVATION SURVEY 2016 - 2018

INCLUDING FARMING, FORESTRY AND FISHERIES

This survey collects information on your firm's innovations and innovation activities between 2016 and 2018 inclusive.

Please note: In order to compare firms with and without innovation activities, we request **all firms** regardless of sector or size, to **respond to all questions**, unless otherwise instructed.

YOUR UNIQUE COMPANY ID* (required field):

* This number was provided by email to the company official contacted by our research team. Need help getting this? Contact innovation@hsrc.ac.za.

ADDRESS: *If your address has changed, please update here.*

Name (with title)	
Designation	
Company	
Address 1	
Address 2	
Address 3	
Postal code	

science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

HSRC Human Sciences Research Council

STATS SA STATISTICS SOUTH AFRICA

IMPORTANT INFORMATION

What is this survey about?
This survey collects information about innovations and innovation activities in the agricultural business sector, including farming, forestry and fisheries, during the three-year period 2016 to 2018 inclusive. The survey is meant to produce statistical information for understanding the sector's innovation performance, its determinants and impacts. Among other uses, the statistics will inform the government in developing policies to stimulate innovation, productivity and competitiveness.

What is an innovation?
An **innovation** is the introduction of a new or significantly improved product, process, organisational method, or marketing method by your firm/business. The innovation must be new to your firm, although it could have been originally developed by other firms.

Sections 3 to 5 of this questionnaire cover product, process, organisational and marketing innovations.

What is the scope of this survey?
The statistical unit for the survey is the **enterprise** as defined by Statistics South Africa: an enterprise is "a legal unit or a combination of legal units that includes and directly controls all functions necessary to carry out its production activities". It refers to a registered formal business, company or firm that is capable in its own right to own assets, incur liabilities and conduct economic activities. While the survey targets formal businesses, it excludes informal enterprises. In this survey we use the terms enterprise, business, company and firm interchangeably.

Who is the authority of this survey?
The Department of Science and Technology (DST), as a partner within the National Statistics System, mandated the Centre for Science, Technology and Innovation Indicators of the Human Sciences Research Council (HSRC) to perform this survey.

What about the confidentiality of my company's information?
All information gathered by this survey will be held in strictest confidence. The data may be used for statistical purposes to complement research and analysis of innovation indicators. Under no circumstances will the HSRC, DST or Statistics South Africa publish, release or disclose any information on or identifiable with, individual firms or business units.

Who should complete this questionnaire?
This questionnaire should be completed by the CEO, Managing Director, or a senior manager who has adequate knowledge of the strategy and innovation matters of the business.

Who can I contact if I need assistance?
If you have any problems in completing this questionnaire and/or meeting the due date, please do not hesitate to contact any of the survey management staff listed below for assistance:

Name of staff member	Telephone	Email address
Cheryl Heinamann	021 466 7843	cheinamann@hsrc.ac.za
Dr Yasser Buchana	021 466 7840	ybuchana@hsrc.ac.za
Gerard Ralphs	021 466 7916	gralphs@hsrc.ac.za
Natasha Saunders	021 466 7886	nsaunders@hsrc.ac.za
Dr Glenda Kruss (Survey Director)	021 466 8086 / 082 459 4455	gkruss@hsrc.ac.za
Dr Moses Sithole	021 466 7862	msithole@hsrc.ac.za

KEY: **Definition** **Instruction**

DETAILS OF PERSON COMPLETING THE QUESTIONNAIRE:

Name (with title)	
Company Name	
Job Title	
Telephone	
Email	
Signature/ Initials	

1 Factors that support/promote agricultural innovation

If your business is part of a group of firms, please answer **all questions about your firm only**, for its own activities in South Africa. Exclude all subsidiaries or parent companies.

1.1 During the three years 2016 to 2018, how important were the following factors in supporting/promoting your innovation activities or projects or influencing a decision to innovate?
Tick 'Not relevant' if there were no innovation outcomes.

Factor	Degree of importance			
	High	Medium	Low	Not relevant
Access to finance	☐	☐	☐	☐
Access to land	☐	☐	☐	☐
Access to water	☐	☐	☐	☐
Access to community support	☐	☐	☐	☐
Access to training/skills (farming skills, business skills, ICT skills, etc)	☐	☐	☐	☐
Access to agro-chemicals, including fertiliser, herbicides, pesticides, etc.	☐	☐	☐	☐
Labour	☐	☐	☐	☐
Weather/Climate change	☐	☐	☐	☐

Factor	Degree of importance			
	High	Medium	Low	Not relevant
Government support	☐	☐	☐	☐
Agricultural policies/Regulations	☐	☐	☐	☐
Competition from other farmers and food businesses	☐	☐	☐	☐
Competition from external players (i.e. non-traditional agricultural businesses)	☐	☐	☐	☐

2 Factors that impede agricultural innovation

2.1 How important were the following factors in hampering your innovation activities or projects or influencing a decision not to innovate?

Factor	Degree of importance			
	High	Medium	Low	Not relevant
Access to finance	☐	☐	☐	☐
Access to land	☐	☐	☐	☐
Access to water	☐	☐	☐	☐
Access to community support	☐	☐	☐	☐
Access to training/skills (farming skills, business skills, ICT skills, etc)	☐	☐	☐	☐
Access to agro-chemicals, including fertiliser, herbicides, pesticides, etc.	☐	☐	☐	☐
Labour	☐	☐	☐	☐
Weather/Climate change	☐	☐	☐	☐

Factor	Degree of importance			
	High	Medium	Low	Not relevant
Government support	☐	☐	☐	☐
Agricultural policies/Regulations	☐	☐	☐	☐
Competition from other farmers and food businesses	☐	☐	☐	☐
Competition from external players (i.e. non-traditional agricultural businesses)	☐	☐	☐	☐

2.2 Are you aware that the South African government offers financial support for innovation?

Yes ☐ No ☐

3 Product (goods or services) innovation

A product innovation is the introduction to market of a **new** or **significantly improved** good or service with respect to its capabilities, such as improved taste, user-friendliness, components, software or sub-systems. The innovation **must be new to your enterprise**, but it **does not need to be new to your industry sector or market**. It does not matter if the innovation was originally developed by your enterprise or by other enterprises. A **good** is usually a tangible object such as a phone, wheelbarrow, or packaged food. A **service** is usually intangible, such as educational courses, consulting, etc.

Please note: The latest terminology classifies "**products**" as consisting of both "**goods**" **and** "**services**". The provision of innovative services is of increasing importance in competitive economies.

3.1 During the three years 2016 to 2018, did your firm introduce:

	Yes	No
→ **Entirely new goods** *Exclude the simple resale of new goods purchased from other firms and minor changes that only alter the appearance of goods*	☐	☐
→ **Significantly improved goods** *An existing good whose performance has been significantly enhanced or upgraded*	☐	☐
→ **Entirely new services**	☐	☐
→ **Significantly improved services**	☐	☐

If **No** to all, please go to section 4.1

3.2 By whom were these product innovations developed?

- → Mainly your firm ☐
- → Other firms in your group of firms ☐
- → Your firm together with other firms or institutions ☐
- → Your firm by adapting or modifying goods or services originally developed by other firms or institutions ☐
- → Mainly other firms or institutions ☐

Select the single most appropriate option only

3.3 Were any of your product innovations during the three years 2016 to 2018 new to the market, new to your firm, or new to the world?

	Yes	No
→ **New to the market** *Your enterprise introduced a new or significantly improved good or service onto your market before your competitors (it may have already been available in other markets).*	☐	☐
→ **New to your firm** *Your enterprise introduced a new or significantly improved good or service that was already available from your competitors in your market.*	☐	☐
→ **New to the world** *Your enterprise introduced a good or service that is entirely new to the world.*	☐	☐

4 Process innovation

Process innovation is the use of **new** or **significantly improved** methods for the production or supply of goods and services. The innovation (new or improved) **must be new to your firm**, but it **does not need to be new to your industry sector or market**. It does not matter if the innovation was originally developed by your enterprise or by other enterprises. Exclude purely organisational innovations such as changes in firm structure or management practice – these are covered the next section.

4.1 Did your firm introduce new or improved processes within the business to improve yields? If Yes, please briefly describe these new or improved processes.

Yes ☐ No ☐

4.2 Did your firm introduce new or improved processes within the business to reduce any negative environmental impacts generated? If Yes, please briefly describe these new or improved processes.

Yes ☐ No ☐

Yes No

4.3 Did your firm introduce new or improved processes within the business to improve logistics (delivery or distribution) for the sale of your products? If Yes, please briefly describe these new or improved processes.

Yes No

4.4 Did your firm introduce new or significantly improved methods to deal with the effects of climate change (e.g. droughts, floods, etc.)? If Yes, please briefly describe these new or significantly improved methods.

5 Organisational and marketing innovations

An **organisational innovation** is the implementation of new or significant changes in firm structure, business practice or management methods that are intended to improve your firm's use of knowledge, the quality of your goods and services, or the efficiency of work flows. Exclude mergers or acquisitions, even if for the first time.

A **marketing innovation** is the implementation of new or significantly improved marketing or sales methods to increase the appeal of your goods and services or to enter new markets. Examples include changes in product design or packaging, product placement, product promotion or pricing but excludes seasonal, regular and other routine changes in marketing methods.

Organisational innovation

		Yes	No
5.1	Did your firm introduce new or significantly improved business processes, managerial methods, changes in firm structure intended to improve organisation?	☐	☐
5.2	Did your agricultural firm introduce new strategies to generate and/or strengthen links with outside companies or organisations for research, project development, technology transfer, etc.?	☐	☐

Marketing innovation

		Yes	No
5.3	Did your firm introduce new activities or strategies to reach new markets?	☐	☐
5.4	Did your firm implement activities or new methods to improve positioning, promotion and/or pricing of products?	☐	☐

6 Ongoing or abandoned innovation activities

Innovation activities include the acquisition of machinery, equipment, software, licenses, engineering and development work, training, marketing and research and experimental development (R&D) when they are **specifically** undertaken to develop and/or implement a product or process innovation.

6.1 During the three years 2016 to 2018:

→ Did your firm have any innovation activities that **did not** result in a product, process, marketing or organisational innovation because the activities were **abandoned**?

	Yes	No
Product innovation	☐	☐
Process innovation	☐	☐
Organisational innovation	☐	☐
Marketing innovation	☐	☐

6.2 During the three years 2016 to 2018:

→ Did your firm have any innovation activities that **did not** result in a product, process, marketing or organisational innovation because the activities were **still ongoing** at the end of 2018?

	Yes	No
Product innovation	☐	☐
Process innovation	☐	☐
Organisational innovation	☐	☐
Marketing innovation	☐	☐

7 Innovation activities

7.1 During the three years 2016 to 2018, did your firm engage in the following innovation activities?

		Yes	No
A	Intramural (in-house) research and experimental development (R&D) *Creative work undertaken on a systematic basis within your enterprise to increase the stock of knowledge and its use to devise new and improved products and processes (including software development).*	☐	☐
	If Yes, did your enterprise perform R&D during 2016 to 2018: Continuously ☐ Occasionally ☐		
B	Extramural or outsourced R&D *Same activities as above, but performed by other companies (including other firms within your group) or by public or private research organisations and purchased by your firm.*	☐	☐
C	Acquisition of agricultural land	☐	☐
D	Acquisition of machinery and equipment *Acquisition of advanced machinery and equipment to produce new or significantly improved products and processes.*	☐	☐
E	Acquisition of buildings *Acquisition of new buildings to be used for new or significantly improved products and processes.*	☐	☐
F	Acquisition of other external knowledge *Acquisition of existing know-how, copyrighted works, patented and non-patented inventions, etc. from other firms or organisations for the development of new or significantly improved products and processes.*	☐	☐
G	Training *Internal or external training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes.*	☐	☐

		Yes	No
H	Market introduction of innovations *Activities for the market introduction of your new or significantly improved goods and services, including market research and launch advertising.*	☐	☐
I	Other activities *Other in-house or contracted out activities to implement new or significantly improved products or processes such as feasibility studies, testing, tooling up, etc.*	☐	☐
J	Lease or rental of machinery, equipment and other capital goods	☐	☐
K	Acquisition of computer hardware	☐	☐
L	Acquisition of computer software	☐	☐
M	Design *In-house or contracted out activities to alter the shape, appearance or usability of goods or services.*	☐	☐
N	Engineering activities	☐	☐

7.2. Please provide the approximate number of employees involved in the innovation activities accounted for in 7.1 above.

Male	Female	Total
		0

8 Capabilities for agricultural innovation

8.1 During the three years 2016 to 2018, did your firm develop or use any of the following advanced technologies?

	Yes	No	Not relevant
Air and soil sensors	☐	☐	☐
Crop sensors	☐	☐	☐
Livestock biometrics	☐	☐	☐
Precision agriculture	☐	☐	☐
Drones/Robotics	☐	☐	☐
Smart plant/animal breeding	☐	☐	☐
Specify other:			

8.2 During the three years 2019 to 2021, does your firm plan to develop or use any of the following advanced technologies?

	Yes	No	Not relevant
Air and soil sensors	☐	☐	☐
Crop sensors	☐	☐	☐
Livestock biometrics	☐	☐	☐
Precision agriculture	☐	☐	☐
Drones/Robotics	☐	☐	☐
Smart plant/animal breeding	☐	☐	☐
Specify other:			

9 Effects of innovation during 2016 – 2018

9.1 How successful were each of the following types of outcomes for your agricultural product (goods or services) and process innovations introduced during the three years 2016 to 2018?
Tick 'Not relevant' if there were no innovation outcomes.

Innovation outcomes	**Level of success of outcomes**			
	High	Medium	Low	Not relevant
Increased revenue	☐	☐	☐	☐
Reduced costs	☐	☐	☐	☐
Increased crop yield / livestock / farmed birds (turkeys, chickens, pigeons, geese), fish, etc.	☐	☐	☐	☐
Increased biodiversity preservation	☐	☐	☐	☐
Increased water preservation	☐	☐	☐	☐
Improvement in soil fertility	☐	☐	☐	☐
Reached new markets	☐	☐	☐	☐
Reduced greenhouse gas emissions	☐	☐	☐	☐
Developed new intellectual properties (IP)	☐	☐	☐	☐
Increased varieties (e.g. cultivars)	☐	☐	☐	☐

10 Sources of information for innovation activities

10.1 During the three years 2016 to 2018, how important to your firm's innovation activities were each of the following information sources?

Include information sources that provided information for new innovation projects or contributed to the completion of existing projects.

Information source		Degree of importance			
		High	Medium	Low	Not used
Internal sources	Sources within your firm	☐	☐	☐	☐
Market resources	Suppliers of equipment, materials, components or software	☐	☐	☐	☐
	Clients or customers	☐	☐	☐	☐
	Competitors or other firms in your sector	☐	☐	☐	☐
	Consultants, commercial laboratories	☐	☐	☐	☐
Education & research	Universities/higher education institutions	☐	☐	☐	☐
	Government or public research institutes	☐	☐	☐	☐
	Private research institutes	☐	☐	☐	☐
Other sources	Conferences, trade fairs, exhibitions	☐	☐	☐	☐
	Scientific journals and trade/technical publications	☐	☐	☐	☐
	Professional and industry associations	☐	☐	☐	☐

11 General information about your business

11. Please provide a short description of your main business activity.

11.1 Is your firm part of a group of firms?

A group consists of two or more legally defined firms under common ownership. Each firm in the group may serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is also part of a group of firms.

Yes ☐ No ☐

In which country is the head office of your group located?

11.2 Does your firm have a subsidiary(ies) outside South Africa?

Yes ☐ No ☐

11.3 Please provide the year in which your firm was established.

Y Y Y Y

11.4 In which geographic markets did your firm sell goods or services during the three years 2016 to 2018?

- South Africa (national) ☐
- South Africa (only some provinces) ☐
- Rest of Africa ☐
- Europe ☐
- United States ☐
- Asia ☐

Other countries, please specify:

11.5 Please indicate which of these markets were the largest in terms of turnover?

11.6 What was your firm's total number of employees in 2016 and 2018?
Annual average number of employees, both full-time and part-time. If not available, give the number of employees at the end of each year.

2016
2018

11.7 Approximately what percentage of your total employees had a university degree or diploma in 2018?

%

11.8 What was your firm's approximate total turnover for 2016 and 2018?
Turnover is defined as the total amount received for goods sold and services rendered for the financial year (including amounts received for work done, services rendered, rent and or lease payments received for land and buildings, rent, leasing and hiring received for machinery, vehicles and other equipment; but excluding value added tax (VAT), net profit or loss on sales or revaluation of fixed assets (including profit or loss on foreign exchange), export freight charges, interest received). Please give exact turnover e.g. one million Rand should be entered as 1 000 000.

2016 R
2018 R

You've come to the end of the questionnaire. Thanks for taking the time to respond to our questions, and for interacting with us in the process.

We're planning to deliver results to your business and the rest of South Africa in the beginning of 2020.

What next? If you have completed this questionnaire using Adobe Acrobat Reader, please save the file to your desktop and return the file to us via email. Alternatively, if you would like to post the completed questionnaire to us, please use the address given (see right).

Your participation matters.

Centre for Science, Technology
and Innovation Indicators
Human Sciences Research Council
PO Box 15200
Vlaeberg
8018

innovation@hsrc.ac.za

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The Agricultural Business Innovation Survey 2016-2018 Team

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FOR A MORE INNOVATIVE SOUTH AFRICA

*INCLUDING FARMING, FORESTRY AND FISHERIES

Centre for Science, Technology & Innovation Indicators, HSRC.

CeSTII-NCRST Workshop, 28 February 2020, Namibia.

Towards new STI indicators and datasets in the SADC context

A workshop at the NCRST, Windhoek, Namibia

Friday, 28 February 2020

PART 2. A FOCUS ON MEASURING INNOVATION IN THE INFORMAL SECTOR

	Presented and facilitated by ***Dr Glenda Kruss*** **Key documents:** - Mustapha, N., Jegede, O., Petersen, I. & Bortagaray, I. 2019. Survey to Measure Innovation in the Informal Economy. CeSTII, HSRC: Cape Town. - Questionnaire: Survey of Innovation in the Informal Sector. CeSTII, HSRC: Cape Town.
13h00-16h00	**Topics for presentation and discussion:** • Conceptualising a survey of innovation in informal enterprises in Southern Africa • New survey techniques to deal with methodological challenges
16h00-16h15	• Closure and way forward

Survey to Measure Innovation in the Informal Economy

Nazeem Mustapha, Oluseye Jegede, Il-haam Petersen and Isabel Bortagaray

Introduction

A large amount of innovation occurs in informal settings. Economic growth and development in the informal economy demands that innovation should be inclusive of all stakeholders. The measurement of innovation in the informal economy in South Africa and other African countries is a topic that has, as yet, not been addressed to the extent that is required for commensurability. It is our intention to move towards closing this gap with the programme that we propose below.

Background: why do we need to focus on measuring innovation in the informal economy?

Much of the measurement of innovation on the African continent replicates programmes that originated in developed countries. This is the reason why the only data that can be found in Africa that allows (at least in principle, but not in practice) for comparison between and among African countries is R&D and Business Innovation data.

"*What gets measured, gets done*"

The earliest surveys on innovation measurement focused on R&D within the framework of what has come to be known as the "Linear Model of Innovation". This concept effectively came about through a piece by piece construction of heuristics, starting with the idea that innovation was essentially what was done by researchers in institutions dedicated to producing basic research, and then applying that basic research. However, this immediately raises a question. There are almost immeasurably many more cases of innovation that occur in the world than just those done by specialised researchers in laboratories. The defining quality of innovation is that something new is being created from the transformation of knowledge into something useful. Therefore, almost anybody is involved in the process of innovation at some time or another. Within the economic context, economists (right back to Adam Smith), recognised essentially two modes of innovation, one which may be called Doing Using and Interacting (DUI), and the other which may be called STI-based innovation (Lundvall (2016). The first of these refers to those activities that every person performs typically when confronted with a problem - DUI can be thought of the type of learning that takes place "on the job". This is the mode of innovation that is most important for technological upgrading. The STI mode is distinguished by being that which is performed by researchers and specialised machine makers. The linear model of innovation is perhaps the most clear illustration of the emphasis on the STI mode of learning that measurement has focused on over the last 60 years or so.

Measuring innovation in formal enterprises is a complex and difficult task - one that has evolved over decades through the iterations of the Oslo Manual. Even so, this measurement

framework and related instruments (CIS) have been designed for innovation that takes place in formal businesses in a developed economic context. The measurement challenges arising in informal contexts are even more daunting, and there is little international precedent.

A foundation has been laid by experimental African attempts, including sectoral studies such as that done in Senegal (Konte & Ndong, 2012); a set of case studies and surveys of innovation in the informal economy (Kraemer-Mbula & Wunch-Vincent, 2016), and a study of the informal economy in South Africa (Fourie, 2017). What is common to all these empirical studies on innovation in the informal economy is that they have all borrowed definitions and methodological approaches from the Oslo manual that has been extensively tested for the formal economy. In addition, these studies attempted to use sampling techniques to create representative samples of the unknown population. This was achieved in some cases through the trade associations the microenterprises belong to, as well as through direct counts for those operating within clusters.

None of these however have focused on a measurement programme that is not industry-specific.

The majority of informal businesses are single owner businesses. A key consideration is what are the necessary elements to facilitate technological upgrading, or what promotes the growth in complexity of businesses in the informal sector to transform them from simple or even survivalists businesses into employing firms?

Where large parts of an economy are informal, focusing measurement only on innovation in formal businesses potentially misses extensive innovation activity. This limits the kinds of funding and policy interventions that could be put in place to ensure that science, technology and innovation are harnessed to include the needs of informal enterprises.

On behalf of DST, CeSTII has initiated a pilot measurement program for innovation in the informal sector that would be applicable to the majority of economic activity on the continent and, most importantly, of policy value for South African decision makers. Our intention is to

- build an understanding of innovation in informal settings through quantitative measurement, and qualitative studies;
- Investigate how government can identify systemic problems;
- Along the way, build up a database of representative innovators in the informal economy.

Research Approach: innovation systems and developmental economics

Systems of Innovation

In measurement agendas, there is often an interplay between policy makers, academics and measurement professionals. In the measurement of science, technology and innovation, the Systems of Innovation (SI) approach is popular. The Systems of Innovation concept (Freeman, 1994; Lundvall, 1992; Nelson, 1993) emerged in the 90s from evolutionary economics, and several of the ideas got assimilated into the measurement goals of countries, overseen by the OECD.

In contrast to scientific studies in general, measurement requires data that is of high quality and possesses an element of commensurability. This latter element has two dimensions: spatial and temporal. All measurement frameworks have either one (usually both) of these facets, which act as analysis tools, especially useful for policy makers.

Within the Innovation Systems (IS) approach, innovation is understood as a complex, interactive process between actors within the system, where the interactions between actors is shaped by public and private institutions. These actors, interactions and framework conditions will vary depending on the context of the system under study. That is to say, this approach is very much context specific. A wide range of factors, organizations, and policies influence the capabilities of a nation's firms to innovate. Technology and pure science are identified, and the social institutions that play a role in innovation are included in IS conceptions. These social institutions commonly comprise industrial and government research laboratories, universities (traditional, comprehensive and technical), and innovation and industrial governmental policy bodies.

Theoretical Background

The chain-link model of innovation (Kline & Rosenberg, 1986) agued against "models that depict innovation as smooth, well-behaved linear process". Instead it argued that only a small number of innovations start with an invention process (e.g. formal R&D). Instead it is a response to a challenge, which is characterised by an ongoing innovation process, only sometimes involving formal R&D.

- Innovation is a learning process. This is not limited to formal knowledge gathering (in universities for example), but also from learning among companies, other institutions and users; and internal sources of knowledge.
- Innovation is a cumulative process that involves
  - Interactions
  - feedbacks

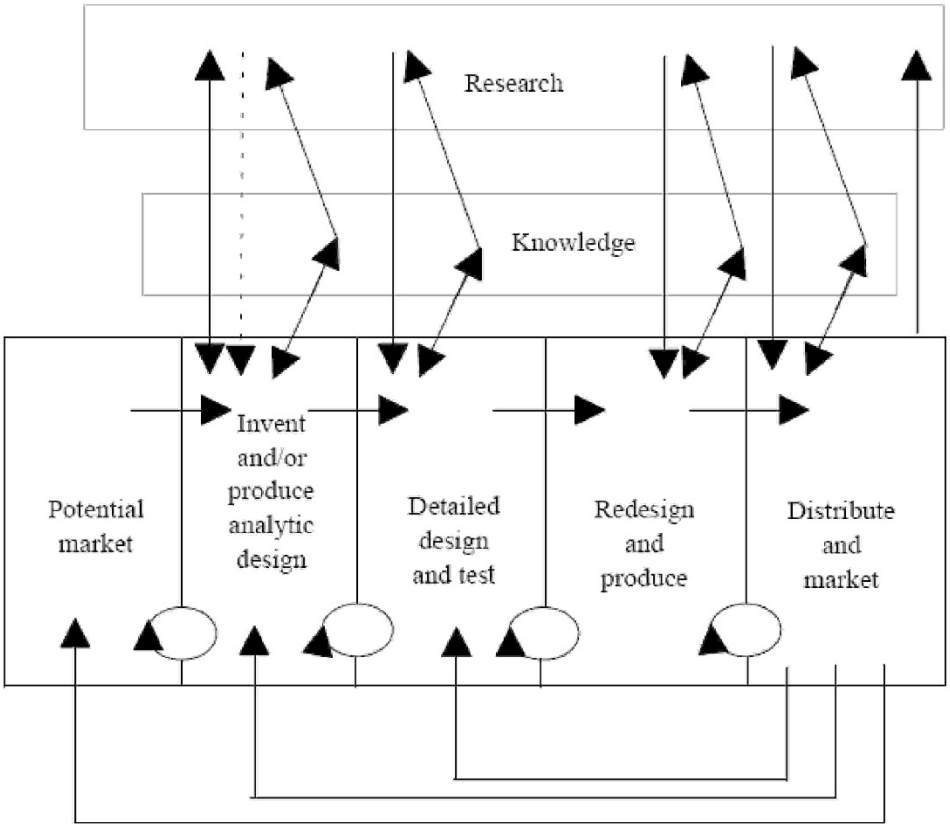

Figure 1. The chain-link model of innovation (Kline & Rosenberg, 1986).
Source: http://cnx.org/content/m43441/latest/graphics3.jpg

The implication for measurement of innovation is that we need to capture not only the products or processes of innovation, but also the process of *incremental change* to products that may have major technological, economic, societal, and environmental impact.

The Oslo Manual-guided surveys are able to capture a lot of the attributes of innovation that serve the purpose both of understanding the process by which innovation translates into economic growth and how policy makers can use the data for benchmarking geographic areas (usually at a country level). However, it is not sufficient to fully understand the former, and it does not need to confine policy makers to comparisons only at a country level. To understand innovative processes at a deeper level and provide greater information to policy makers for transformative change requires a dimension of qualitative study on a grand scale. Such qualitative studies also serve the purpose of building knowledge towards new indicators that are required in measurement of innovation from the quantitative component, and would serve as a data asset for future generations that will be better equipped with data scientific methods to take advantage of such assets.

Our lens falls on the informal economy. With a view to measuring and understanding this system we adapt the framework in the Oslo Manual (OECD & Eurostat, 2005). The context is that of a locally defined IS, specified by the attribute that the central element is the informal business/firm. It exists to produce a good or a service. It is ***distinguished from firms in the formal sector by the level of flexibility it has in complying or, perhaps better put, not complying with regulations that pertain to businesses.*** The adaptations to the framework take the following form:

1. The focal point of the framework is therefore the *informal* firm, instead of just the firm. The Oslo Manual framework implicitly assumes that the firms it speaks of are formal firms. It makes no distinction by formal or informal economy situation of the firm.
2. The firm interacts with other firms. In this case it interacts with both firms in the formal economy and the informal economy. In the standard conception of Innovation Systems, these interactions are of a learning type, collaborative engagements, technology exchange, funding arrangements, and so on.

Research Questions

Box 1: Emergent research question and sub-questions

Key research question

- How does innovation by informal economy businesses take place in peri-urban regions at a local level?

Sub-questions

- What are the main inputs and outcomes? Economic, social, environmental?

- What are the main types of innovation that take place?

- What are the main mechanisms and strategies for learning?

- Which actors, whether formal or informal, contribute to learning?

- What are the main sources of information?

- How is formal and informal knowledge acquired, used and diffused?

- Which forms of knowledge are valued most – scientific, traditional/indigenous or 'popular' knowledge in the community?

Conceptual and Measurement Framework

As a theoretical starting point, we will consider innovation in the informal economy as being centred on a production unit (similar to the concept of a "firm" in the formal economy). While we will allow for this conception to change as the research unfolds, taking into account other means of conceptualising innovation by informal economy actors, this conceptual starting point allows us to link this study to previous work on firm innovation that are useful for the purpose of measurement. Following Kline & Rosenberg (1986), we think of innovation as a response to a challenge, which is characterised by an ongoing innovation process.

Furthermore, a systems approach is useful to understand the processes that take place in innovation in informal settings. This may be done by combining innovation systems thinking at a local level, incorporating elements of spatial dynamics - important in developmental settings.

Research Design and Methodology

An observation on innovation in the informal economy within Africa was that the studies used mixed methods for data collection. The reasons are manifold. Firstly, it is difficult to find lists of businesses that may be used as sampling frames in informal business surveys, thus making purely quantitative studies problematic. Secondly, the questionnaires that are suitable for collecting information from informal businesses need to be adapted to suit informal business owners. This means that the mode of collection is preferably a face-to-face interview, rather than a telephonic, online or postal collection that is more suited to innovation surveys in the formal economy. More fundamentally, a quantitative tool is not the best tool to use to elicit understanding of innovation processes, in general. In order to promote both measurement and understanding of innovation, mixed methods become a necessity.

At the most general level, we will follow the same approach as others have before us, but extend this in order to ***build a more systematic programme for collecting information.*** In contrast to other studies reviewed above, our approach is not dependent on the availability of lists to use as sampling frames, which may or may not be available from informal institutions, within a specific trade or sector. Instead, it will build a database based on geocoded identifiers. The resultant data may be matched, ultimately, to other data collections obtained by the numerous household-based surveys that are done by the national statistical organisation and other organisations engaged in collecting socio-economic statistics. ***The ingenuity of this approach is that it will start from a local perspective and build in a bottom-up fashion towards greater representability of the findings over time.***

An understanding of the why and how innovation takes place in the informal economy is especially necessary given the developmental challenges countries such as South Africa face. Cassiolato, Lastres and their colleagues at RedeSist have developed a useful approach for researching local innovation and production systems (LIPS), based on their experience in Brazil (Cassiolato et al., 2003, 2017). LIPS refer to

> "…*groups of economic, political and social agents localised in the same area, performing related economic activities, in which formal and informal interdependence and consistent linkages usually result in cooperation and learning processes, with a potential to generate the increase of productive and innovative capabilities.*" (Lastres and Cassiolato, 2005, p.7)

The LIPS methodology is based on a systems approach to understanding innovation processes. It brings together innovation systems and development thinking (Cassiolato et al., 2014). As Cassiolato and colleagues argue, innovation processes are shaped by social, economic and institutional contexts, which necessitates an analysis of spatial dynamics and the local level. The LIPS approach provides useful tools for identifying and analysing the different components of the production value chain, linkages between them and how wider social, economic and institutional contexts influence these components. The approach will thus allow us to analyse and understand the interconnectivity between the formal and informal, and how this influences innovation and learning among informal businesses. The approach includes five dimensions:

1) a profile of the LIPS being studied;
2) production and innovation capacity building processes within the LIPS;
3) the socio-economic characteristics of the territory where the LIPS is located;
4) the national and international context in which the LIPS is embedded; and
5) the wider policy environment impacting on activities in the LIPS (see Cassiolato et al., 2017).

The primary outcome of this part of the study will be to lay the foundation for the compilation of a **database of local innovation productions systems, akin to those that had been built up in Brazil during the Lula government era**.

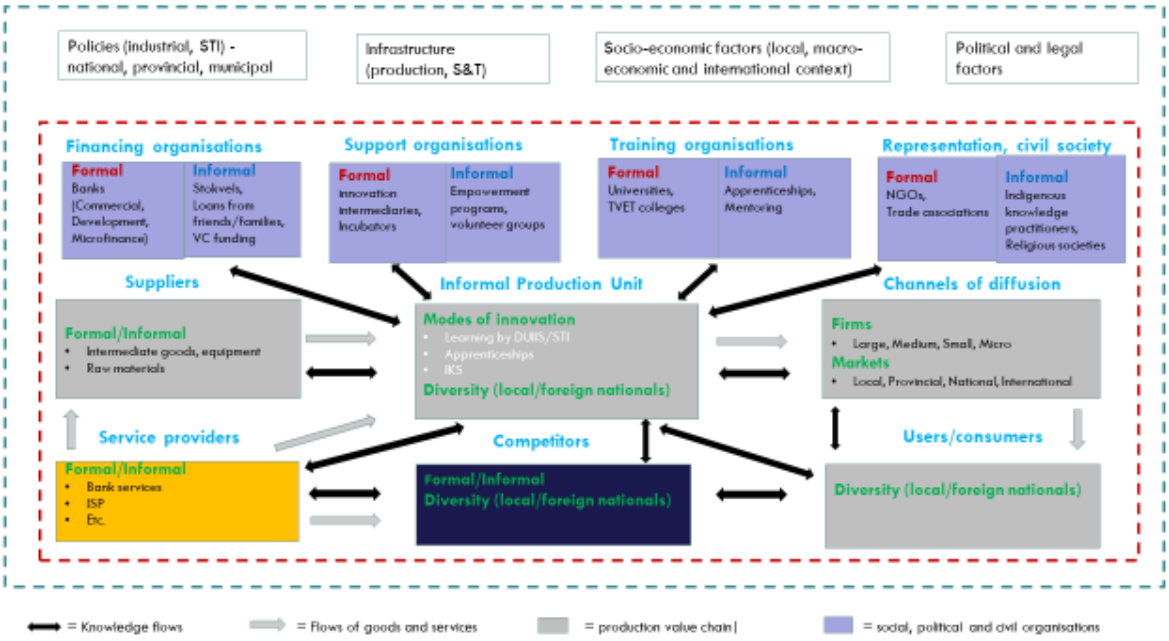

Figure 2. Framework for measuring innovation in the Informal Economy: an adaptation of the LIPS approach

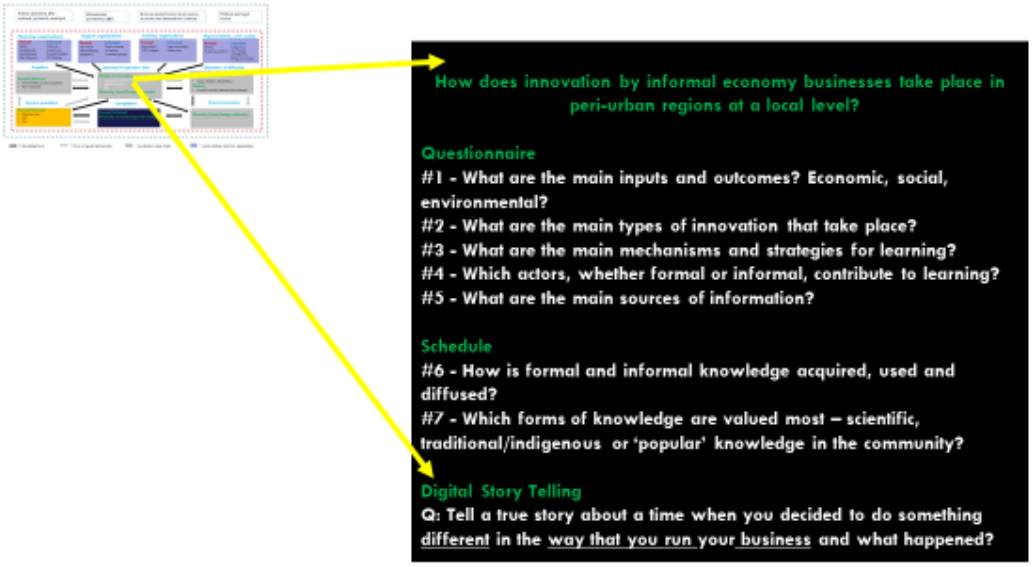

Figure 3. The Informal Production Unit forms the central focus of our approach.

Following the LIPS methodology, we will firstly, map the main actors, institutions and linkages, as well as identify the main goods or services in a selected set of LIPS. Institutions refer to informal and formal rules or guidelines for behaviour such as organisational policy and cultural values and norms. The range of actors traditionally include the main productive agents and suppliers of inputs and materials, which may include informal and formal businesses; universities, colleges and private education and training providers; science councils and research institutes; national, provincial and local government; customers and users of innovation; and community-based organisations. We will describe the development of the LIPS, the characteristics of the consumer market, the dynamics of interaction among the networks of actors, and the main technology and knowledge challenges and the knowledge infrastructure (formal and informal).

Secondly, we will analyse how learning takes place and contributes to the building of capabilities for innovation. This is a critical dimension considering that interactive learning among informal businesses often involves tacit and informal modes such as DUIIS, informal training and apprenticeships by family and community members and indigenous knowledge, more so than learning through interaction with suppliers, customers and technology transfer agencies in the formal sector. Specific questions that we aim to address include:

- What are the main mechanisms and strategies for learning?
- Which actors, whether formal or informal, contribute to learning?
- Which forms of knowledge are valued most – scientific, traditional/indigenous or 'popular' knowledge in the community?
- What are the main sources of information?
- How is formal and informal knowledge acquired, used and diffused?
- What is the history of the business owner with respect to sourcing relevant knowledge and business linkages?

Thirdly, we will describe the characteristics of the socio-economic context in which the LIPS is located. The focus will be on the local territory. For this dimension, we will analyse socio-economic development conditions in the local context and how these impact on production (see

for example, Williams (2006)) and innovation in the LIPS and vice versa. It will be important to consider the impact of power relations, social cohesion and social inequalities.

The fourth and fifth dimensions focus attention on the wider economic, technological, institutional and geopolitical contexts in which the LIPS is embedded. Through an analysis of the provincial, national and international contexts, we will be able to gain insight into external constraints and facilitators of production and innovation in the local system, and how these influence path dependency. Specific focus areas will include competition patterns, technological regimes, and relevant regulatory frameworks and policies.

Therefore research will be conducted with participants drawn from the businesses in the area under study. This consists of a quantitative survey, digital storytelling workshops and further qualitative interviews with businesspersons and other actors engaged in the LIPS.

Survey Methodology

In contrast to the prevailing definitions by researchers and measurement professionals, the informal sector here is defined in an inclusive manner by the use of local community individuals' own perceptions of what they consider to be informal businesses. There is no restriction on the size of the businesses selected consequently. However, we do expect that the selected businesses will have a large overlap with businesses that would have been selected using the ILO definition.

The collection of data for the baseline study will entail four inter-related methods. The first is PLACE (Priorities Local AIDS Control Efforts) method, followed by the Innovation Survey, Qualitative Interviews and Digital Storytelling Workshops.

PLACE Methodology

PLACE methodology is an engaged, participatory approach of identifying and mapping informal businesses in the local community. The key outcome of this phase is the establishment of a list of businesses, with a geocoded position and location, and an indication of economic activity. PLACE method is operationalised in two stages. The first stage is a listing tool, which is followed by the second stage, verification. The purpose of this two-step process is to develop an understanding of how the community perceives *informality,* and to generate a spatial representation of informal businesses.

Listing

The first stage of PLACE methodology is the listing tool, which involves engagement of local community members to identify informal businesses that they know of in the area. The tool was newly developed for the purposes of this study by adaptation from research done by researchers in previous research on health.

Verification

This list is then verified, using a number of cross-examination factors to eliminate duplicates or businesses that may be referred to by various names. The verified list is then confirmed in phase two of the PLACE method, by verifying the geo-location of the informal business, along with a façade image of the business and business name. This process is the final stage in gathering a clean list of verified businesses as a sample for the innovation survey.

Innovation Survey

The second step of the survey process is to perform a survey of informal businesses using face-to-face interviews of business owners with survey Data Collectors (DCs). Because the questionnaire developed for this purpose is a set of close-ended questions, this step can be

performed by DCs with relatively little expertise in innovation research. Depending on the number of businesses listed and verified in the PLACE phase, and the spatial heterogeneity of the area selected, either a census is done or a stratified sample is drawn that would be representative of the business activities in the area.

The outcome is a dataset of indicators on innovation in the informal sector, which also respects the spatial geography and dynamics of the informal sector. That is, it tells us how much innovation takes place, within a framework of what research already has established needs to be investigated in this context.

Digital Storytelling

Participants are identified for further participation in digital storytelling workshops. These workshops have been included in the research design because of their potential for eliciting in-depth understanding of how innovation takes place, thereby providing clues on how the established framework needs to be amended or extended. It also provides a stratagem that allows researchers and participants to explore the innovation process in a participatory fashion. In this way it also further promotes greater inclusivity of the research process by involving researchers and participants in co-creating knowledge.

The workshop takes place over five days and is an iterative process that centres on a story that the participants share from their life experience. This story is premised on the response to a key research question. The key question developed for this workshop is "*Tell a true story about a time when you decided to do something different in the way that you run your business and what happened?*"

Qualitative Interviews

Our investigation is centred on factors influencing diffusion and knowledge flows between informal businesses and formal or informal businesses, with a specific interest in structural upgrading in informal businesses. In order to achieve this, innovation studies have shown that it is not enough to simply collect innovation data on informal businesses from the businesses alone, but to also look at other actors and institutions engaged in that process of innovation. Therefore, the research design has to allow for in-depth data collection from these participants as well. It does this through qualitative interviews based on a schedule of open-ended questions, informed by the Digital Storytelling workshops.

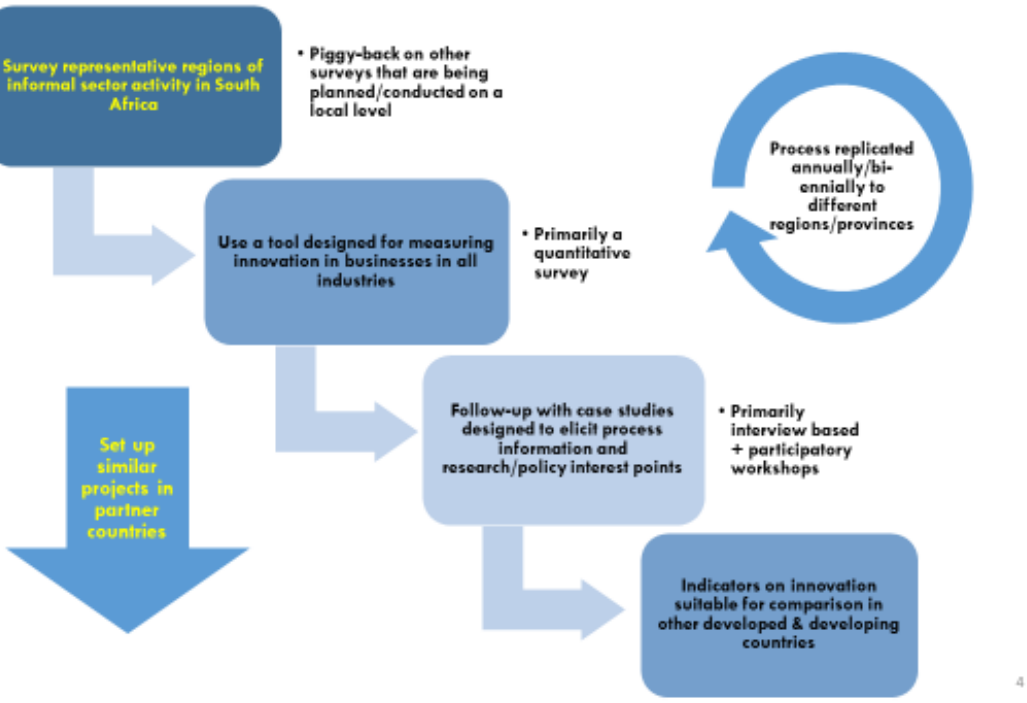

Figure 4. The methodology is that of a two-step approach, similar to what was done in the Senegal ICT study or to those of a mixed methods (1-2) approach, but not focusing on any one industry.

Measurement Programme

After combining the information derived from this these four methods with desktop study, the primary outcome of this collection of methodologies will be to lay the foundation for the compilation of a database of local innovation productions systems, akin to those that had been built up in Brazil during the Lula government era. The programme is designed to be repeated in different locations across the country and in other African contexts. Each iteration of the local system mapping and evaluation will inform the questionnaire thereby facilitating standardisation of the methodology, including the questionnaire itself. It is expected that there will be variation in innovative practices in different contexts both local and continental, which could be better dealt with and understood by adopting common methodologies.

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Survey of Innovation in the Informal Sector

We are researching how much innovation is done by informal businesses in your Ward. Innovative businesses are known to be more successful.

We want to promote an understanding of innovation in business to help grow businesses in this area.

Innovation is not just about how business is done, but more about how a business ***changes*** its way of doing business, or the products (goods and services) it sells.

In order to understand innovation, we need to know how businesses like yours learn; by looking at where they get information for new products to sell, or for organising their businesses differently.

We also want to get an idea of how profitable these successful innovations have been for individual businesses (or perhaps even for a group of people in a business) working together to make money.

Part 1: Business Listing

Name of interviewer:		
Interview code:		**Time and date:**
1.	**Enterprise number**	
2.	**Name of enterprise**	
3.	**Geo-positional no.**	° ‘ ” ° ‘ ”
4.	**SIC**	
5.	**Business location: from where does this business operate? Select one option.**	

01 = Within the owner's dwelling/s – with its own space (e.g. a separate room)

02 = Within the owner's dwelling/s – without its own space (e.g. a family room)

03 = In a structure attached to the owner's dwelling/s or on the same plot (e.g. a workshop in the back yard)

04 = Within another person's dwelling (e.g. a neighbour's dwelling)

05 = In a non-residential building (e.g. an office block or factory)

06 = From a taxi rank

07 = On a footpath, street or open space

08 = At a market

09 = No fixed location/mobile

10 = At customers' homes or offices

11 = From outside a shopping centre

12 = Other – If OTHER, then provide detail ……..

6.	**What type of business do you do?**	

7.	**Tell me about your main goods/services?**		
8.	**When was this business started?** ***Select one option***	01 = Less than a year 02= More than 1 but less than 3 years 03= More than 3 but less than 5 years 04= More than 5 but less than 10 years 05= More than 10 or more years 06= Don't know	
9.	**How to find the place?** **(Nearest landmark)**		
10.	**10.1 Busiest time of operation**	A. Early morning B. Late morning/lunchtime C. Afternoon	D. Evening/ night E. Whole Day/24 Hours F. Day Time Work Hours
11.	**11.1 When are the operating hours of this site?** ***Select one option***	A. Early morning B. Late morning/lunchtime C. Afternoon	D. Evening/night E. Whole Day / 24 Hours F. Day Time Work Hours
12.	**Is your business registered?**	Y N	**13. Do you keep financial records for your business?** Y N
14.	**Are you the owner of this business?**	Y N	
15.1	**OWNERS CONTACT NUMBER:**	☐☐☐ ☐☐☐ ☐☐☐☐	
15.2	**ALTERNATE NUMBER**		
15.3	**OWNERS EMAIL ADDRESS**		

Part 2: Innovation Survey

FIELDWORKER INFORMATION

B1. NAME	DATE:	TIME:	**B2.** NAME OF BUSINESS	**B3.** BUSINESS NO.

BUSINESS INFORMATION

B4. Reason for starting the business Select all that apply

What was the main reason you started in this business?

01= inherited/family tradition
02= unemployed/have no alternative income source
03= retrenched from formal business
04= inadequate income from the other source
05= I like the activity
06= the opportunity came up
07= I have the skills for this business
08= I have the equipment for this business
09= allows me to feed my family or send my children to school
10= only needed a small amount of money to start
11= unhappiness with previous work
12= allows me to spend more time with my family
13= other

B5. Difficulties for selling. Select all that apply

Which difficulties are you facing in selling your goods/services?

01= too few customers
02= too much competition
03= sales are low in some seasons
04= protest action, crises inside the community
05= can't get my goods/services directly to customers easily
06= lack of funds for marketing
07= other

We now turn to discuss innovation. That is we want to see if you have made significant changes in your business over the two years 1 January 2017 to 31 December 2018

INNOVATION

B6. Innovation activities		**Yes**	**No**
During the last two years (2017 to 2018), did your business do anything differently from the way it always does? Did you…			
B6.1	Bring in tools, machinery, and equipment for people to change what the business produces or how it produces it	☐	☐

B6.2	Bring in internet facilities and other devices to improve how the business does business	☐	☐
B6.3	Look for and use new sources of supply of raw materials and tools that are cheaper and/or better to old sources of supply	☐	☐
B6.4	Use indigenous knowledge sources (e.g. ancestral family secrets, chronicles, traditions, flashes of insights, amongst others) available to the employees or owner	☐	☐
B6.5	Train staff to introduce changes in the goods and services you sell, or how you do business	☐	☐
B6.6	Make changes to buildings/vehicles as well as other infrastructure for better running of the business	☐	☐
B6.7	Find out if customers are satisfied with the current product; or if the customers are interested in new products or are willing to pay for it	☐	☐
B6.8	Change/upgrade technology (tools & equipment)	☐	☐
B6.9	Search for new knowledge from sources such as the internet, searching for popular brands by competitors, consultants	☐	☐
B6.10	Bring in know-how or other types of knowledge (including indigenous knowledge) from **other businesses or organisations**	☐	☐
B6.11	Engage in a formal apprenticeship system (with certification at the end)	☐	☐
B6.12	Engage in on-the-job learning usually from a supervisor at work (without certification at the end of the training)	☐	☐
B6.13	Encounter "happy accidents" (unexpected discovery) during production	☐	☐
B6.14	Did you answer No to all of the above?	☐	☐

IF YOU MARKED NO FOR ALL OF THE OPTIONS IN B6, THEN GO TO B22 (PRODUCTION VALUE CHAIN)

Remember to restrict to only the employees that were actually involved in the changed goods/services or processes

B7. Employees involved in innovation	**B7.1 Male**	**B7.2 Female**
How many employees were involved in helping you do things differently?	☐☐	☐☐

B8. Description of the new goods/services		
B8.1 Describe in 2 sentences any new good/service that you started in the last two years.		

Use the infographic to explain the differences between new goods and services. Goods are things you can make like clothes, chairs, hair weaves, etc. Services are activities like doing people's hair; selling braai meats or clothing or chairs; providing transport; etc. Goods are things you notice when you see it. Services are activities you notice when you are not seeing it.

The next two sections will ask about your goods & services innovation, and process innovation separately. We start with goods & services innovation.

GOODS/SERVICES INNOVATION

B9. Goods/Services Innovation			
From those new activities that you put into action during 2017 and 2018, does your business now…		**Yes**	**No**
B9.1	**sell goods** that you had not sold before	☐	☐
B9.2	or sell goods that have been made better and **differ a lot** from what they were before	☐	☐
B9.3	**provide services** that you have not provided before	☐	☐
B9.4	or provide services that you have been made better and **differ a lot** from what you provided before	☐	☐
B9.5	Did you answer No in all of the above?	☐	☐

IF YOU MARKED NO FOR ALL OF THE OPTIONS IN B9, THEN GO TO B16 (PROCESS INNOVATION)

B10 Novelty			
Were any of these new goods/services during the two years (2017-2018):		**Yes**	**No**
B10.1	new to the people that your business and other businesses like yours sell to	☐	☐
B10.2	new to the people that your business sells to, but not other business like yours sell to	☐	☐

B11 **As far as you know, during the two years 2017 to 2018, did your business introduce a good or service that was:**
Select only one option (the most appropriate)

01= new to the world 02= not new to the world, but a first in South Africa?	03= not new to the world or South Africa, but a first in the business that you do? 04= a first in your local area?

B12 **Who created the new good or service?** Select the most appropriate

01= Mainly your business 02= Your business together with other businesses or organizations 03= Your business by adapting or modifying methods originally developed by other businesses or organizations	04= Mainly other businesses or organizations 05= It is common knowledge 06= Other

B13	Origin of the innovation		
B13.1	Did most of these new goods/services come from outside the country?	Yes ☐	No ☐
B13.1(a)	If Yes, which country mainly?		
B13.2	Did most of these new goods/services come from outside the province?	Yes ☐	No ☐
B13.2(a)	If Yes, which province mainly?		

☐Eastern Cape	☐Kwazulu Natal	☐North West
☐Free State	☐Limpopo	☐Northern Cape
☐Gauteng	☐Mpumalanga	☐Western Cape

B14. Share of innovative goods/services – 2018

B14 How many units of the new goods/services did you sell during 2018?	☐☐☐☐

B15	Knowledge used

What kind of knowledge did you use to develop these new goods/services? (Select all that apply)

01=traditional/family/ancestral knowledge	06=experience from previous work.
02= apprenticeship/on-the-job training	07=from technical knowledge/processes
03=just happened by chance	08=learning while conducting everyday business operations (e.g. customer feedback, and experimentation)
04=interacting with other businesses or organisations	09=searching for knowledge from information supplied through internet, popular brands
05=learning from what other businesses are doing	10= from work experience as an employee in formal business

Now we want to know more about things that you have done differently, other than sell new goods/services.

B16	PROCESS INNOVATION		
During the two years 2017 to 2018, did your business:		**Yes**	**No**
B16.1	change the way it made or sold goods/services	☐	☐
B16.2	change the way it delivers your goods/services?	☐	☐
B16.3	bring in new ways of organising your business by introducing record-keeping or accounting methods, or stocktaking	☐	☐
B16.4	find new ways of letting people know about your business	☐	☐
B16.5	work with new suppliers (including government suppliers or otherwise)	☐	☐
B16.6	Did you mark No for all of the above	☐	☐

IF YOU MARKED NO FOR ALL OF THE OPTIONS IN B9, THEN GO TO B20 (ABANDONED OR ONGOING INNOVATION)

B17 Degree of openness

B17.1 Who created these new methods? (Select the most appropriate)

01=Mainly your business 02=Your business together with other businesses or organizations 03=Your business by adapting or modifying methods originally developed by other businesses or organizations	04=Mainly other businesses or organizations 05=It is common knowledge 06=Other

B18	Origin of the innovation		
B18.1	Did most of these new methods come from outside the country?	☐ Yes	☐ No
B18.1(a)	If Yes, which country mainly?		
B18.2	Did most of these new methods come from outside the province?	☐ Yes	☐ No
B18.2(a)	If Yes, which province mainly?		

☐Eastern Cape	☐Kwazulu Natal	☐North West
☐Free State	☐Limpopo	☐Northern Cape
☐Gauteng	☐Mpumalanga	☐Western Cape

We also want to ask you about the goods & services innovation or process innovation that you did not complete in the two year period 2017-2018, or that you gave up

ABANDONED/ONGOING INNOVATION

B19 Abandoned or ongoing innovation activities			
During the years 2017 and 2018, did your business try something new, but have still not put it to use, or gave up on it?		**Yes**	**No**
B19.1(a)	New goods/services	☐	☐
B19.1(b)	New methods	☐	☐
B19.2	What kind of knowledge did you use to create these new goods/services? (select all that apply)		

01=traditional/family/ancestral knowledge 02= apprenticeship/on-the-job training 03=just happened by chance 04=interacting with other businesses or organisations 05=learning from what other businesses are doing	06=experience from previous work. 07=from technical knowledge/processes 08=learning while conducting everyday business operations (e.g. customer feedback, and experimentation) 09=searching for knowledge from information supplied through internet, popular brands

INNOVATION BARRIERS, TRAINING, SOURCES OF INFORMATION AND COLLABORATION

*We would like to know what are the things that stop you from **innovating** in your business. Note that these things may not be the same as what stops you from running your everyday business*

B20 During the two years (2017 to 2018), how did the following affect your business's new goods, services or methods?							
No effect: Nothing has stopped innovation from taking place **Low:** Your innovation was stopped for less than a year years **Medium:** Stopped for 1-2 years **High:** Stopped for more than 2 years				**Degrees of Severity**			
				No effect	**Low**	**Medium**	**High**
B20.1	Political Factors	(a)	Frequent changes in the policies and leadership of government departments	☐	☐	☐	☐
		(b)	Protest action, crises inside the community	☐	☐	☐	☐
B20.2	Economic (Financial) Factors	(a)	Cost of acquiring modern technologies and tools	☐	☐	☐	☐
		(b)	High cost of ensuring quality and complying to national standards	☐	☐	☐	☐
		(c)	High cost of training of workers to acquire new skills on how to use modern technology	☐	☐	☐	☐

				No effect	Low	Medium	High
		(d)	Unavailability of funding from family or friends	☐	☐	☐	☐
		(e)	Unwillingness on the part of commercial banks and other financial/credit institutions to fund businesses with low turnover	☐	☐	☐	☐
B20.3	Social Factors	(a)	Unwillingness of competitors to work together	☐	☐	☐	☐
		(b)	Competitors don't share information and knowledge	☐	☐	☐	☐
		(c)	Having too many businesses standalone; and don't come together in clusters	☐	☐	☐	☐
		(d)	Poor interaction between businesses and knowledge institutions (e.g. NGOS, universities, incubators)	☐	☐	☐	☐
B20.4	Technological Factors	(a)	High cost to import modern equipment	☐	☐	☐	☐
		(b)	Lack of access to modern technology	☐	☐	☐	☐
		(c)	Poor access to broadband/internet	☐	☐	☐	☐
		(d)	Poor training/irregular training on new tools and ways of doing business	☐	☐	☐	☐
		(e)	Rapid changes in technology	☐	☐	☐	☐
B20.5	Legal Factors	(a)	Red tape in registering innovations (patents, copyrights, etc.)	☐	☐	☐	☐
		(b)	Difficulty in getting loans (for innovation) from commercial banks due to business not being registered	☐	☐	☐	☐
B20.6	Environmental Factors	(a)	High employee turnover (loss of employees to larger business or to formal sector)	☐	☐	☐	☐
		(b)	Lack of access to basic infrastructure and shared facilities such as good buildings, roads, electricity, potable water, energy, health, toilets	☐	☐	☐	☐
		(c)	Fierce competition in the industry	☐	☐	☐	☐
		(d)	Distance of business to sources of raw materials	☐	☐	☐	☐
		(e)	Distance between where the goods and services are produced and where it is sold	☐	☐	☐	☐
		(f)	High levels of crime	☐	☐	☐	☐
B20.7	Other Factors	(a)	Lack of people who can manage workers adequately	☐	☐	☐	☐
		(b)	The owner of the business does not like to change the business	☐	☐	☐	☐
		(c)	The owner of the business doesn't see the need to innovate since sales are good and customers loyal	☐	☐	☐	☐

PRODUCTION VALUE CHAIN

B21 Value Chain (Select all that applies)		
Who are your main **customers?** 01=Government units 02=Formal businesses (e.g. Shoprite) 03=Informal businesses (e.g. traders)		04=NGOs, etc. 05=Households/individuals 06=Direct exports
B22 Are most of your customers from outside the neighbourhood?	☐ Yes	☐ No

B23 How do you attract customers? Do you: (Select all that applies)	
01=Newer and bigger signs 02=Tell family, friends, etc. about your business 03=Word of mouth (people other than yourself telling customers about your business)	04=Move your business closer to where the customers are 05=Use the internet or cell phone apps 06=Other

B24 Suppliers (Select all that applies)	
Who are your main **suppliers?** 01=Government units 02=Formal businesses (e.g. Shoprite) 03=Informal businesses (e.g. traders)	04= NGOs, etc. 05=Households/Individuals 06=Direct imports

B25 Where do you buy your most of your goods, or material to make your goods from?	
01=Locally 03=Within the province 02=A main city in the province	04=Within the country 05=Outside the country

B26 Do you use the internet to find most of your supplies?	☐ Yes	☐ No
B27 EXPORTS: Do you ship part of your goods/services?	☐ Yes	☐ No

COMPETITORS

B28 Are big businesses or small businesses your main competition?	☐ Big businesses	☐ Small businesses

B29 How many main competitors do you have? (fill in numbers)	**(a) In the local area**	**(b) Province**
B29.1 Formal local businesses	☐☐☐☐	☐☐☐☐
B29.2 Informal local businesses	☐☐☐☐	☐☐☐☐

B29.3 Please name your strongest competitors.

B.29.3(a)

B.29.3(b)

B.29.3(c)

B30	**Are your strongest competitors owned by South Africans?**	☐ 1=Yes	☐ 2=No

B31 Do the goods/services of your main competitor come from the local market (South Africa) or from outside the country?

01=South Africa	03=Both
02=Outside the country	04=Don't know

B32 If you SELECTED no. 2, then from which country mainly?

B33 Compared to your main competitors, your prices are: (Select only one option)

☐01= Higher	☐02= Lower	☐03= Similar

B34 If you selected 1 in the previous question, why are your prices higher? (Select all that apply)

01=Equipment less productive	04=Higher quality
02=Not enough customers	05=Goods and services from suppliers more expensive
03=Labour costs higher	06=Other

B35 If your prices are lower, why are your prices lower? (Select all that apply)

01=Labour costs lower	03=Quality inferior
02=Customers less wealthy	04=Goods and services from suppliers cheaper

	05=Other	
B36 Origin of goods/services that you sell		
Are most of your goods/services made in South Africa?	☐ 01=Yes	☐ 02=No
B37 If No, from which country mainly?		

SKILLS DEVELOPMENT ACTIVITIES

B38 During the two years (2017 to 2018), did the business engage in any of the following skills development activities?

		1=Yes	2=No
B38.1	Developed skills from working with new equipment; or from working with new raw materials, at workplace	☐	☐
B38.2	Learned skills at the workplace from working closely with supervisors, or other colleagues	☐	☐
B38.3	Learned by trying to understand and imitate/copy goods and services, and business practices (processes) of large formal enterprises	☐	☐
B38.4	Encouraged employees/apprentices to solve problems on their own	☐	☐
B38.5	Encouraged employees/apprentices to implement their own ideas in running the business	☐	☐
B38.6	Worked towards meeting quality standards (both local and international)	☐	☐
B38.7	Worked with employees to develop skills through formal channels	☐	☐

Innovation involves interacting with information sources, either through interacting (collaborating) with them in business, or through accessing knowledge from them

INFORMATION SOURCES AND COLLABORATORS

B39 During the two years (2017 to 2018), how often did you interact with the following as sources of information in your innovation activities?				
Not at all: Did not interact with the source between 2017 and 2018 **Sometimes:** Interacted with the source once or twice every six months **Frequently:** Interacted with the source once a month on average **Very frequently:** Interacted with more than once a month on average	**1=Not at all**	**2=Sometimes**	**3=Frequently**	**4=Very frequently**

				Not at all	Sometimes	Frequently	Very frequently
B39.1	**Internal sources**	(a)	Sources within your business	☐	☐	☐	☐
		(b)	Sources within other businesses connected to your business (i.e. a cluster)	☐	☐	☐	☐
B39.2	**Market resources**	(a)	Suppliers of tools, equipment, raw materials, components or software	☐	☐	☐	☐
		(b)	Customers	☐	☐	☐	☐
		(c)	Competitors or other businesses in your sector	☐	☐	☐	☐
B39.3	**Institutions**	(a)	NGOs	☐	☐	☐	☐
		(b)	Research organisations (e.g. HSRC)	☐	☐	☐	☐
		(c)	Government sources (departments, regulatory bodies and agencies such as Department of Small Business Development, department of trade and industry etc.)	☐	☐	☐	☐
		(d)	University departments, research laboratories, etc.	☐	☐	☐	☐
B39.4	**Financial sources**	(a)	Commercial banks, microfinance banks	☐	☐	☐	☐
		(b)	Stokvels, loan sharks	☐	☐	☐	☐
		(c)	Friends and family for loans	☐	☐	☐	☐
		(d)	Venture capital organisations, angel investors	☐	☐	☐	☐
B39.5	**Training sources**	(a)	University through outreach programs, workshops, diplomas, certificates, etc.	☐	☐	☐	☐
		(b)	TVET colleges and other technical colleges	☐	☐	☐	☐
		(c)	Larger firms through mentorship	☐	☐	☐	☐
		(d)	Organisations that provide other forms of mentorship	☐	☐	☐	☐
B39.6	**Support**	(a)	Incubators	☐	☐	☐	☐

				Not at all	Sometimes	Frequently	Very frequently
		(b)	Service providers (IT support)	☐	☐	☐	☐
		(c)	Extension workers (e.g. from government, university)	☐	☐	☐	☐
B39.7	**Other sources**	(a)	Trade fairs, exhibitions	☐	☐	☐	☐
		(b)	Trade/technical publications and scientific journals	☐	☐	☐	☐
		(c)	Adverts, billboards, commercials	☐	☐	☐	☐
		(d)	Graduate students, university lecturers	☐	☐	☐	☐
		(e)	Business websites, searchable databases, catalogues, brochures, magazines, newspapers	☐	☐	☐	☐
		(f)	Indigenous knowledge practitioners	☐	☐	☐	☐
		(g)	Informal groups such as religious groups, civil society, community associations, etc.	☐	☐	☐	☐
		(h)	Professional and trade associations (formal or informal)	☐	☐	☐	☐

B40 Why did you work with the collaborators in the previous question? (Select as many as necessary)	
(a)=Sharing the cost of developing new goods/services/methods (b)=Accessing information (c)=Accessing critical expertise/skills (d)=Experimenting	(e)=To sell more of the good or service (f)=Accessing new markets (g)=Find new ways to get goods and services to customers

BUSINESS INFORMATION

B41 Trade Association	**1=Yes**	**2=No**
Does your business belong to a group of other businesses doing the same work as your business?	☐	☐

Owner's age

B42 What is the owner's age group?

☐ 15-17	☐ 18-35	☐ 36-40	☐ 41-60	☐ 60+

B43	**Owner's gender**	☐ 01=Male	☐ 02=Female
B44	**Owner's ethnic group**	☐ 01=Black African	☐ 02=Coloured
☐ 03=Indian/Asian	☐ 04=White	☐ 05=Other.	

B45	**Owner's country of birth**			
In which country was the owner born?		☐ 01=South Africa	☐ 02=Other.	**B45.1** Specify
B46	**Owner's citizenship**	Is the owner a South African citizen?	☐ 01=Yes	☐ 02=No
B46.1	**If No, which country is the country of citizenship?**			
B47	**Number of businesses owned**			
B48	How many businesses does the owner have in this area?	☐☐☐☐		

B49	**Workplace's Language** (Select up to a maximum of three)		
Which language do you speak most often in your workplace?			
☐ English=01	☐ Afrikaans=02	☐ isiZulu=03	☐ isiXhosa=04
☐ Isindebele=05	☐ Sepedi=06	☐ Sesotho=07	☐ Setswana=08
☐ Tshivenda=09	☐ Xitsonga=10	☐ Siswati=11	☐ Others=12

B50	**Owner's level of education**		
What is the highest level of education of the owner?			
☐ Primary not completed=01	☐ Primary, or equivalent=02	☐ Intermediate (grade 9) /junior/group certification, or equivalent=03	
☐ School leaving certificate (matric), or equivalent=04	☐ Diploma/certificate=05	☐ Primary degree=06	☐ Postgraduate diploma/ degree=07

B51 In 2018

B51.1	How many people were working in the business? ☐☐	**B51.4**	How many of the people working in the business were family members? ☐☐		
B51.2	How many of the people working in the business were paid? ☐☐	**B51.5**	How many of the people working in the business were female? ☐☐	**B51.6**	How many of the people working in the business were male? ☐☐
B51.3	How many of the people working in the business finished school? ☐☐	**B51.7**	Were more than half of the people working in the business South African? ☐ Yes=01 ☐ No=02		

EMPLOYEES 2017

B52 In 2017

B52.1	How many people were working in the business? ☐☐	**B52.4**	How many of the people working in the business were family members? ☐☐		
B52.2	How many of the people working in the business were paid? ☐☐	**B52.5**	How many of the people working in the business were female? ☐☐	**B52.6**	How many of the people working in the business were male? ☐☐
B52.3	How many of the people working in the business finished school? ☐☐	**B52.7**	Were more than half of the people working in the business South African? ☐ Yes=01 ☐ No=02		

BUSINESS ACTIVITY

B53	**Was the business open every month of the year during 2017-2018?**

☐ 01=Yes, the business was open every month of the year.

☐ 02= No, there were months during the year that the business was closed.

B54	**If you answered No, what was the main reason that your business was closed during these months?** (Select all that apply)

☐ Seasonal factors=01	☐ Family reasons (e.g. sick child) =02	☐ Non-payment of government charges/taxes =03	☐ No customers =04
☐ Sickness of yourself or staff =05	☐ Other personal reasons than sickness (pregnancy, etc) =06	☐ Lack of raw materials =07	☐ Lack of funds to buy supplies =08
☐ No one to help during owner's absence =09	☐ Business created during the past 12 months =10	☐ Due to violence or criminal incident(s) =11	☐ Other =12

B55	**Infrastructure and service providers (Select all that applies)**		
☐ Piped (tap) water in structure =01	☐ Piped (tap) water on site=02	☐ Public tap/shared tap with others =03	☐ No water access =04
☐Other =5			
B56 What kind of toilet facility does the business have? (Select all that applies)			
☐ Flush toilet on site =01	☐ Flush toilet offsite =02	☐ None =03	☐ Other =04
B57 Where is the nearest telephone that the business can use? Give only one answer, the main one			
☐ Fixed telephone on site =01	☐ Cellular telephone =02	☐ The nearest telephone is a public telephone =03	☐ Other =04

B58 Do you use the following to market your business? Mark all that apply.	**1=Yes**	**2=No**
B58.1 Facebook	☐	☐
B58.2 WhatsApp	☐	☐
B58.4 Twitter	☐	☐
B58.5 Business website ("Google")	☐	☐
B58.6 Instagram	☐	☐

B59	**Last month business gross turnover**		
B59.1	Approximately how much money did your business make from selling your goods or service last month?	☐☐☐☐☐☐☐☐	
B59.2	Is that what you typically earn in a month?	☐ Yes =01	☐ No =02
B59.3	If the previous response is No, is that more than usual or less?	☐ More =01	☐ Less =02
2018 Gross earnings			
B60	Approximately how much money did your business make from selling your good or service during 2018 (South African Rands)	☐☐☐☐☐☐☐☐	
2017 Gross earnings			
B61	Approximately how much money did your business make from selling your good or service during 2017 (South African Rands)	☐☐☐☐☐☐☐☐	
B62	**Number (approx.) of goods/services in 2018**		
B62.1	Approximately how many units of your main goods/services did you sell during 2018?	☐☐☐☐	
B62.2	Approximately how many units of your main goods/services did you sell during 2017?	☐☐☐☐	

Profit

B63 In the last two years has your profit….

☐ 01=Increased	☐ 02=Decreased	☐ 03=Stabilized

B64 Business evolution (Select all that applies)

During the two years 2017 to 2018, did your business

☐ 01=Start employing people (part-time or unpaid)	☐ 02=Start employing full-time employee(s)	☐ 03=Get a person to manage the business other than the owner
☐ 04=Merge with or take over another business?	☐ 05=Sell, close or outsource parts of your business?	☐ 06=Establish new branches in other areas?
☐ 07=Establish new branches in other African countries?	☐ 08=Establish new branches outside Africa	

B65	Financial Support				
B65.1 Did your business receive financial support?				☐ Yes=01	☐ No=02
B65.2 If yes, who did you receive financial support from?					
01=Government ☐		02=Private Sector ☐	03=NGO ☐	04=Family/friends ☐	
05=Any other source ☐					

B66	Intellectual Property				
Do you protect your new ideas on doing business in any way? (Use the options below to decide)				☐ Yes=01	☐ No=02

How do you go about protecting your ideas?				Yes	No
B66.1	Semi-formal Protection	(a)	Keeping the "know-how" secret from competitors by refusing to disclose technical information	☐	☐
		(b)	Documentation in diaries and other records	☐	☐
		(c)	Making the design of the good or service too difficult to copy	☐	☐
B66.2	Informal Protection	(a)	Division of duties (anyone employee does not know the whole business)	☐	☐
		(b)	Selective sharing of technical information with employees/apprentices/competitors/customers	☐	☐
		(c)	Retaining employees/apprentices with great skills and knowledge by all means	☐	☐

B67	Are you receiving support in protecting your ideas/creations/inventions of your goods/services from?			
☐ 01= Trade Association	☐ 02=Local Government	☐ 03=National Government	☐ 04=Other	
☐ 05 = No support				

B68	Did you know that there are laws about the new goods, services or methods you create or invent?	☐ Yes=01	☐ No=02

Thank you for your participation! In the Informal Innovation Questionnaire!

Appendix: Infographic