FROM NICHE TO MAINSTREAM: CREATING A POLICY ENVIRONMENT FOR THE PROLIFERATION OF NON-STAPLE WHOLE GRAINS IN SOUTH AFRICA

By

THALENTE NDEBELE

Submitted in fulfilment of the academic requirement for the degree of

Master of Agriculture

In the discipline of

Agricultural Extension and Rural Resource Management,

School of Agriculture, Earth and Environmental Sciences,

College of Agriculture, Engineering and Sciences,

University of KwaZulu-Natal

January 2023

ABSTRACT

Over the centuries, non-staple agricultural commodities have been produced in limited quantities and are generally neglected yet bear a significant untapped potential. Preoccupation with staple grains has constrained the production of non-staple whole grains, and it remains fascinating to explore the barriers, and reluctance to shift toward non-staple crops. Admissibly, the contribution of these grains (sorghum, millet, oats, barley, and other wheat varieties) to the gross value of agriculture is hardly ever known. The nutritional and environmental benefits and other uses remain unexplored. To an extent, they are now mainly used for non-food purposes (brewery and industrial uses) contrary to being used as a source of food for human beings. The study assesses the functioning of the value chain of the non-staple wholegrains in South Africa.

The study used both primary and secondary data to understand the functioning of the non-staple value chain. A qualitative method was employed to collect data from the provinces of the Western Cape (Overberg, West Coast), Gauteng (Johannesburg, Pretoria), and North West (Taung). For primary data, a snowballing sampling procedure was used to select 25 respondents involved in the non-staple grain value chain. These participants included smallholder farmers, processors/traders (silo-owners), private/public extension and information organisations, policy organisations, landowners, input suppliers and financers (insurers). While Semi-structured questionnaires were used to conduct interviews. Desktop analysis was used to retrieve and analyse food policies relating to non-staple grains. A diagnostic research design was employed for analysis. Extension carousel, influence diagram, graph theory, policy map and Venn diagram were employed to analyse data, locate the leverage points, and track stakeholders' influence on each other which inevitably affects the production scale of non-staple wholegrains.

Three specific objectives were explored in this study. The first specific objective was to assess the extent to which emerging farmers in the wholegrain economies are pressured or incentivised by policies and other actors in the network. The second was to determine points of tension within grains networks where the potential for the proliferation of emerging wholegrains economies is curtailed. The third specific objective3 was to identify the policies that can enable the proliferation of new wholegrain economies and their ability to successfully increase production and access to ensure environmental, nutritional and equity objectives are met. Results from the extension carousel demonstrated that the farmers' participation in the type of grains they are involved in is influenced by the commodity supply and demand. Since market information is mainly about staple grains, this automatically create bias towards

participation in the staple grain than non-staple grains. The results revealed that access to land is a challenge for the smallholder, previously disadvantaged farmers who are given a small-sized land for grain production. The respondents indicated this is because the preference is given to livestock farmers and profit-orientated commodity growers. Some factors contributing to an unconducive environment for non-staple grain farmers include ever-increasing high input costs; lack of comprehensive support systems like incentives and subsidies to protect farmers from price fluctuations, and input unavailability due to domestic transportation difficulties and input shortages.

Additionally, while there is a commitment to help farmers purchase or lease machinery and other technological equipment, it is either delivered late or unavailable from international suppliers. Other challenges that cause difficulties for non-staple wholegrain farmers and set them back are finance-related policies, grain pricing, and limited markets. Results illustrated that smallholder farmer's access to finance is a challenge not only because they lack collateral to secure loans due to eligibility criteria, interest rates, and repayment plans (terms/ conditions). Findings also showed that grains like oats have a limited market (fewer buyers), whereas barley is climatically risky, which also causes farmers to be reluctant to produce non-staple grains. Results also revealed that stakeholders' relationships maintain the status quo of being biased toward staple grains. This includes market agents sensitizing farmers to determine grain choice, production quantities, and market choice. Shortage of input (fertilisers, machinery) influence farmers to deprioritize conservation measures. Landowners influence grain farmers not to continue growing non-staple wholegrain and shift to staple export orientated commodities. Investors influence the developmental financers' approach and conditions.

The study concludes that landowners, investors, market agents, and financers influence farmers' decision to grow non-staple wholegrain. The bottlenecks in the non-staple whole grain value chain were lack of support for non-staple grain farmers, limited market access, unfavourable terms and conditions of available funding opportunities, limited access to land, ill-structured coordination, communication, and transformation. Some policies that could strengthen the participation of non-staple whole grain farmers in the value include land policy, farm subsidy policy, tax incentive policy, funding framework, and equity policy. There is a need to realign and synergize the goals of the different actors to favour all grains equally. More attention needs to be given to neglected non-staple grains. Food-related policies need to be reviewed to reflect the importance of non-staple wholegrain.

DECLARATION

I, Thalente Ndebele, declare that:

i. The research reported in this dissertation, except where otherwise indicated, is my own original research.

ii. This dissertation has not been submitted for any degree or examination at any other university.

iii. This dissertation does not contain other person's data, pictures, graphs, or other information unless specifically acknowledged as being sourced from those people.

iv. This dissertation does not contain other authors' writing unless specifically acknowledged as being sourced out from them. Where other written sources have been quoted, then:

a) Their words have been re-written sources, but the general information attributed to them has been referenced.

b) Where their exact words have been used their writing has been placed inside quotation marks and referenced.

v. This dissertation does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, with the source(s) being detailed in the thesis and in the references section.

15 January 2023

_____ _____

Thalente Ndebele (candidate) Date

_____ 15 January 2023_____

Mjabuliseni Ngidi (Supervisor) Date

_____ _____

Tafadzwanashe Mabhaudhi (Co-supervisor) Date

_____ _____

Stephanie Walton (Co-supervisor) Date

DEDICATION

Tons of love to my beloved grandmother,

dear parents and the entire Hadebe family,

for all the support throughout my journey of learning.

ACKNOWLEDGEMENTS

Almighty God's grace and unconditional love never fail, fade nor do they run dry.

Much appreciation is extended to the following:

1. Dr Ngidi for supervision, remarkable support from the initial phase until the completion phase of this project and for endorsements.
2. Prof Mabhaudhi for Co-supervision and CTAFS for funding throughout the year and all the support.
3. Stephanie Walton for Co-supervision and incredible support.
4. Mallika Sardeshpande and Simphiwe Hlatshwayo for helping with my research and giving guidance.
5. UKZN administrative professionals - T Skye, M Manjoo, and B Groom for administrative support.
6. Busisiwe Hadebe, Thokozani, and Nonhlanhla Ndebele for their love and support all the time.
7. Rene Bastian and Khuleka Zulu for helping me reach Western Cape participants.
8. All my academic friends (Mzwanywa, Zondo, Khanyile, Smanga) and Mzwakhe Nkosi for always encouraging me to believe in my capabilities and complete my project.
9. Sinqobile, Nosihle, Nomusa, Mavuso, Thokozile, Gugu, and Nokuvela for their love and support.
10. As I climb the academic ladder, I reminisce and thank the individuals through whom I discovered my purpose and potential, to mention a few, Mrs. Zondo, Ms. Thandi Magubane, Mr. Mlungisi, Mlondo, Mr. Mzwakhe Dubazane, Ms. Andile Ngcobo, Dr. Fisiwe Nkwanyana, Prof Steve Worth, Godfrey Thwala and Jacob Tau.

So grateful and greatly indebted

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST APPENDICES

LIST OF ACRONYMS

COVID-19	Coronavirus
DAFF	Department of Agriculture, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform & Rural Development
ENE	Environmental, Nutritional & Equity objectives
GP	Gauteng
NW	North-West
POPI ACT	Promotion of Personal Information ACT
PESTLE	Political, Social, Economic, Technology, Legal and Ecological aspects
SGD	Sustainable Development Goals
SWOT	Strengths, Weaknesses, Opportunities, Threats
WC	Western Cape

CHAPTER 1

THE RESEARCH PROBLEM AND ITS SETTING

1.1.Importance of the study

Deteriorating Africa's nutrition predicament is a cause of concern. Exposure to micronutrient malnutrition and undernutrition is distressing (National Research Council 1996). This has been ascribed to the nutrition transition through which traditional food habits were replaced by the introduced internationalised food system (Raschke-Cheema & Cheema 2008). Although there have been differences in what could be the best diet for modern humans, there is a consensus that modern dietary practices (consumption of high calories) have adverse effects on human health. Another general harmony is that foods with cholesterol high-fibre nutrition, and low in fat and saturated fat such as whole grains are highly recommended (Shridhar 2015).

In some way, whole grains have been promoted, but the focus has been primarily on staple whole grains (maize and rice,) and other staple crops. However, as the middle-class (income) grows, consumers of that class become more interested in food quality and safety. This then generates demand for diverse whole grains, vegetables and fruits (Fafchamps 2006). Even though this has been known for years, in most developing countries the agricultural policy has not adequately pronounced diverse non-staple and other nutritional challenges. It is continually biased toward staple grains (esp. rice, maize, and wheat) (Pingali 2015). This demonstrates that the markets are not adequately developed to respond to the demand and diet diversity needs of both poor and middle-class consumers. It is, therefore, necessary to locate the root cause of this slow producer response, in the larger non-staple grains value chain. To investigate factors which underpin the marginal production of diverse non-staple crops and how to create a supportive environment for them.

This study is important as it identifies how policy and market mechanisms influence the ability of the emerging wholegrain networks to increase production and improve the accessibility of non-staple wholegrains while meeting environmental, health and equity objectives. Therefore, the study contributes to understanding how the non-staple wholegrain value chain operates and troubleshooting problems in the system i.e., where wholegrain economies are curtailed. It seeks to unearth the leverage points in creating a supportive business environment. It contributes to the body of literature on agricultural policies and prevailing indicators of the food system. It is important to understand why there are marginal amounts of diverse wholegrains, why

producer response for non-staple production is so low and the history of developments that may have engendered this trend. The study would also propose a new set of policies that aid in mainstreaming the non-staple wholegrains. This is imperative for mobilising support for underutilized crops and fundamental for food and agricultural policy formulation and evaluation.

1.2.Academic conversation

The main academic subject grounds on diversification of production systems and market supply. At the centre, is an attempt to shift focus beyond just securing food security, by diversifying the food supply while applying environmentally conserving practices. This is attributed to environmental, nutritional and equity (ENE) objectives, to measure progress toward Sustainable Development Goals (SDGs) indicators. That framework stipulates that at least by the year 2030, secure sustainable food production systems, apply resilient agricultural practices that proliferate production and productivity, maintain ecosystems, improve capacity for adaptation to climate change, natural hazards and other disasters and successively strengthen land and soil quality (FAO 2015).

Maintaining the diversity of underutilized grains would offer the consumer nutritious options and prevent scarcity. Within the same context, Marshall (2019) reported that two-thirds of people are deficient in micro-nutrients in their diets in the developing world, which could result in severe health conditions. The challenge here rests with the production of crops that could help combat nutrition deficiencies. These crops require enabling supportive environments. The other challenge is in capacitating producers to take advantage of the rising call for quality and whether markets can compromise their interests in the interest of the greater good. Markets are ingrained with principles of prioritising profits and efficiency while contradictory to crop diversity, environmental conservation and fair wages (Haessler 2020).

At the regional level, the economy is still primarily rural, and poverty is still the order of the day (de Klerk *et al.* 2013). Indicators point to the continual displacement of indigenous whole grains (sorghum spp., millets, pulses etc.), changes in traditional food habits, dependence on staple food imports, and loss of indigenous markets crops to political-economic forces since the dawn of colonisation and the new world order (which include policies and institution to govern production, trade and marketing) in Sub-Saharan Africa (Raschke-Cheema & Cheema (2008); FAO (2005). In this region, it is well known that agricultural production has been on the decline, underperforming and remains lower than in all other continents. After the transfer

of power to national governments, it is noted that there has been a lack of industrialisation, agricultural development and infrastructure development, further many countries are immersed in debt crises, and some are faced with structural adjustment policies (Bjornlund *et al.* 2020). At the local level in South Africa, it is known that a large percentage of the population is immersed in poverty, yet there is no nutritional data on adults' dietary intake or a mechanism to monitor dietary deficiencies. Villagers' access to healthy foods is still an issue (Mchiza 2015). The NDP (2013) acknowledges that there is a dire need for food security and access to nutritious diets. Additionally, consumer literacy is not satisfying, and citizens have insufficient access to information or resources to make informed dietary decisions. It also provides that nutritional education must be put in place, and investment in agriculture must be aligned in pursuit of rural economic development (this includes subsidisation of resources and support services to proliferate food production). Even though the high political priority of the democratic government has been creating an inclusive agricultural sector, developing black-owned entities, and ensuring land access, access to financial services and all other extension services, to date, the least success has been attained (De Klerk *et al.* 2013).

On these grounds, this study would investigate how policies and actors influence the production momentum in favour or disfavour of the diversification of production systems. It seeks to track 'points of tension' and pressure that actors in the networks face and where the potential challenge may lie in creating a supportive environment. In the end, it will recommend policies and incentives needed that will enable emerging wholegrain networks to increase the production of non-staple wholegrain and make them available and affordable while conscious of SDG and ENE objectives.

1.3.Statement of the researchable problem

Shifting consumption away from commodity staple grains and towards diverse wholegrains would have significant environmental and nutritional benefits. Dietary diversity and nutritional quality could be improved by increased consumption of different types of whole grains (less wheat and more quinoa and barley, for example) as well as wheat (einkorn, YQ wheat etc.). Environmental co-benefits would extend to more locale-appropriate crops that require fewer inputs, enrichment of the soil, more resilient strains of grain etc. (Nair *et al.* 2016). A shift towards small, decentralised grain economies could also be more equitable, distributing more value back to small producers and diverse participants.

There are several barriers, however, to making diverse wholegrains both available and affordable to entire populations and that limit their ability to fully deliver on potential nutritional, environmental and equity benefits. Only marginal amounts of diverse wholegrains are currently produced (Wholegrainscouncil 2017). They are typically only to be found at small independent retailers or markets rather than major supermarkets. Grains also require a complex infrastructure of land holdings, technology, transport, mills and processing to convert the grain into something edible. Increasing the large amount that is produced is difficult, to say the least. Just as staple grain production was expanded through a package of enabling policies and market incentives, non-staple wholegrains networks will require a supportive operating environment to deliver on their full potential. However, the existing policies and market incentives currently in place are ill-suited to alternative wholegrains networks that have explicit environmental, nutritional and equity (ENE) objectives at their core. They have been designed to maximise the prevailing indicators of food systems 'success' (productivity, profits, efficiency grains, GDP etc.) which, in many cases, operate in direct conflict with ENE goals (crop diversity, nutrient density, fair wages etc.). As a result, non-staple wholegrains networks are operating within a policy and market environment that exerts a homogenizing pressure to de-prioritise alternative objectives. For example, the prioritisation of efficiency gains would diminish the prioritisation of crop diversity. The prioritisation of resiliency in transport would diminish the prioritisation of nutritional quality (FAO 2018).

1.4.Main Objectives

This research aims to identify how policy and market mechanisms influence the ability of emerging wholegrain value chain to increase production and improve the accessibility of non-staple wholegrains while meeting environmental, health, and equity objectives.

Objectives:

- To explore the extent actors (primarily farmers) in emerging wholegrains economies are pressured or incentivised by policies, by other actors in the network and by financial/economic incentives to behave in certain ways that may go against environmental, nutritional and equity (ENE) objectives.
- To outline and analyse specific points of tension within the grain value chain where the potential for the proliferation of emerging wholegrains economies is curtailed.
- To identify and analyse the policies that can enable the proliferation of new wholegrain economies and their ability to successfully increase production and access in a way that ensures environmental, nutritional, and equity objectives are met.

1.5. Specific questions

- **Question 1**: How are actors (primarily farmers) in emerging wholegrains economies pressured or incentivised by policies, by other actors in the network and by financial/economic incentives to behave in certain ways that may go against environmental, nutritional and equity (ENE) objectives?
- **Question 2**: What are specific points of tension within grains value chain where the potential for the proliferation of emerging wholegrains economies is curtailed?
- **Question 3**: What are the policies that can enable the proliferation of new wholegrain economies and their ability to successfully increase production and access in a way that ensures environmental, nutritional and equity objectives are met?

1.6.Assumptions

Affordability and accessibility of different types of grains are a challenge. Wholegrain producers are not producing sufficient amounts of grains. Given that there are several barriers to the expansion of grain production. On the other hand, there is a demand for dietary diversity which is considered beneficial to human health and the environment. There are policies in place to regulate the marketing of agricultural commodities such as whole grains. There are various factors affecting the proliferation of non-staple whole grains. The proliferation of non-staple whole grains heavily relies on policies and grain industry actors. In the conduct of the investigation, it is expected PRA tool to be used will help track sound responses and that respondents will offer authentic answers.

1.7. Definitions of Terms

Extension officer/agent/advisor: someone assigned to provide extension services (sale 2013).
Non-staple: Any food that is not a staple (YourDictionary n.d.). To determine whether food is non-staple or not, one had to check its consumption scale, availability and accessibility within the confines of the country.

Policy: a law, regulation, procedure, administrative action, incentive or voluntary practice of governments and other institutions (CDC Policy and Strategy 2015)
Staple: food that is routinely consumed and constitutes a significant proportion of the calorie requirements of a standard diet in a community (Nutrient Delivery 2017)
Wholegrains: contain all the essential parts and naturally occurring nutrients of the entire grain seed in their original proportions (Whole Grains Council 2004)

1.8.Dissertation presentation

Chapter 1: Outlines the research problem and its setting, which include study importance, academic conversation, the problem under investigation, questions and objectives, limitations and assumptions.

Chapter 2: Explores the literature review of related literature. Aspects reviewed include the functioning of the value chain, grains cultivation, stakeholder analysis, PESTLE of the industry, market segmentation and three major policies.

Chapter 3: Provides characteristics of the research field (namely WC, NW, GP), in terms of socio-economic demographics, demographics and local governance. Outline research methodology which includes research design and explanation of research methods (sampling, data collection and analysis).

Chapter 4: Maps the policies and actors' influence and connection in the emerging wholegrain network.

Chapter 5: Traces the pressures and barriers within the emerging wholegrain network.

Chapter 6: Exhibits a new set of policies to improve the situation.

Chapter 7: Draws conclusion of the study and trends of the industry.

References

Bjornlund, V., Bjornlund, H., & Van Rooyen, A.F., 2020, 'Why agricultural production in sub-Saharan Africa remains low compared to the rest of the world- a historical perspective', *International Journal of Water Resources Development, Global Development Journals*, from https://www.tandfonline.com/doi/full/10.1080/07900627.2020.1739512#:~:text=Agricultural%20production%20in%20sub%2DSaharan%20Africa%20has%2C%20in%20recent%20times,soil%20quality%2C%20slavery%20and%20disease.

CDC Policy and Strategy, 2015, 'Definition of Policy', *Centres for Disease Control & Prevention*, from https://www.cdc.gov/policy/analysis/process/definition.html

Cobbet, M., 2001, 'Agricultural Extension in Zimbabwe: The Basis for Rural Development', LB Pmb S 880.

De klerk, M., Fraser, F. & Fullerton K., 2013, 'The status of Agricultural &Rural Finance in South Africa', *Finmark Trust*, from https://finmark.org.za/system/documents/files/000/000/443/original/Rep_statusAgrRurFin_SA_2013_FNL.pdf?1614938240

Fafchamps, M., Vargas-Hill, R. & Minten M., 2016, '10 Quality Control & Marketing of Non-staple Crops in India', from https://web.stanford.edu/~fafchamp/supplychain.pdf

Food and Agriculture Organisation of the United Nations (FAO), 2005, 'The state of Food and Agriculture 2005; Agricultural Trade and Poverty: Can Trade work for the poor?', Rome: FAO, 2005; 81-93

FAO, 2015, 'Sustainable Development Goals, Indicator- Zero Hunger', Food & Agriculture Organization of the United Nations from https://www.fao.org/sustainable-development-goals/indicators/241/en/

FAO, 2018, 'Sustainable Food Systems', Food & Agriculture Organization of the United Nations from https://www.fao.org/3/ca2079en/CA2079EN.pdf

Haessler, P., 2020, 'Strategic decisions between short-term profits and sustainability', *MDPI* from https://www.mdpi.com/2076-3387/10/3/63

Marshall, M., 2019, 'The hidden hunger affecting billions', *BBC* from https://www.bbc.com/future/bespoke/follow-the-food/the-hidden-hunger-affecting-billions/

Mchiza, M., 2015, 'Access to healthy foods', from hsrc.ac.za/en/research-data/view/1218

Mtombeni, S., Bove, D., & Thibane, T., 2019, 'An analysis of finance as a barrier to entry and expansion for emerging farmers', from https://www.compcom.co.za/wp-content/uploads/2019/09/CC201901-Mtombeni-S-Bove-D-Thibane-T-An-analysis-of-finance-as-a-barrier-to-entry-for-emerging-farmers.pdf

Nair, M.K., Augustine, L.F. & Konapur, J.A., 2016, 'Food-Based Intervention to Modify Diet Quality & Diversity to Address Multiple Micronutrient Deficiency', from https://www.frontiersin.org/articles/10.3389/fpubh.2015.00277/full

National Research Council, 1996, 'Lost crops of Africa', from https://nap.nationalacademies.org/catalog/2305/lost-crops-of-africa-volume-i-grains

NDP, 2013, 'National Development Plan: Vision 2030', from https://www.nationalplanningcommission.org.za/assets/Documents/NDP_Chapters/devplan_ch6_0.pdf

Nutrient Delivery, 2007, 'Staple Food', *ScienceDirect* from https://www.sciencedirect.com/topics/food-science/staple-food

Oladele, O. I., 2013, 'Linkage between Gown and Town: My experience in Sub-Saharan Africa and South East Asia', Mmabatho: The Office of the Vice-Rector, North West University.

Pingali, P.L, 2015, 'Agricultural policies and nutrition outcomes- getting beyond the preoccupation with staple grains', *ResearchGate,* from

https://www.researchgate.net/publication/276410296_Agricultural_policy_and_nutrition_outcomes_-_getting_beyond_the_preoccupation_with_staple_grains

Raschke, V., & Cheema, B., 2008, 'Colonisation, the new world order and eradication of traditional food habits in East Africa', *ResearchGate* from https://www.researchgate.net/publication/5888447_Colonisation_the_New_World_Order_and_the_Eradication_of_Traditional_Food_Habits_in_East_Africa_Historical_Perspective_on_the_Nutrition_Transition

Shridhar, C.G., Nerli, R. & Hiremath, M., 2015, 'Modern Diet & its Impact on Human Health', *ResearchGate* from

https://www.researchgate.net/publication/284167515_Modern_Diet_and_its_Impact_on_Human_Health

Whole Grains Council, 2004, 'Definition of a Whole Grain', from https://wholegrainscouncil.org/definition-whole-grain#:~:text=Following%20is%20the%20o%EF%AC%83cial%20de%EF%AC%81nition,seed%20in%20their%20original%20proportions

Whole Grains Council, 2017, 'Whole Grain Statistics', from https://wholegrainscouncil.org/newsroom/whole-grain-statistics

YourDictionary, n.d., 'Nonstaple definition', from https://www.yourdictionary.com/nonst

CHAPTER 2
LITERATURE RELATED TO NON-STAPLE WHOLEGRAINS

INTRODUCTION

Out of curiosity, how many non-staple grains are grown, known or available, perhaps why producer production response is so low and why so many grains are imported instead of increasing the production within the borders? It is without a doubt that the natural resources of the southern tip of Africa can best suit the different varieties of crops including grains and that this country has the potential and capability to produce enough to cater for its nation (Stevens *et al*. 2020). In search of a new future, there will never be the best opportunity, to learn more about this subject than in the present moment.

This study aims to assess how the value-chain of the non-staple agricultural commodity (in this case wholegrains) currently functioning in South Africa, which may have engendered low production and high importation of grains, furthermore, how can the situation be improved. Even though, the staple grains production industry is burdened by its challenges, however, can never be equated to the ones faced by its counterpart. If non-staple wholegrains value chain were to deliver on their full potential, they would require a responsive micro-business and supportive operating environment. Commonly defined, the business-friendly enabling environment is a set of policy, regulatory, institutional, and infrastructure embedded with cultural conditions that govern the activities of the business. It incorporates the enforcement of government policy, and all levels of institutional arrangement that exert influence on the behaviour of relevant stakeholders, in this instance, regulatory authorities, producers, processors, markets, banks and non-financial institutions as well as civic societies (USAID 2013).

The study attempts to unmask adverse manoeuvres, areas of tensions where the potential for the proliferation of whole grains economies is curtailed, and the existing policies that influence the actors within grains networks to behave in a certain manner (often carelessly) and policies that can help to increase production sustainably. Further, explores ill-suited market strategies that affect the pricing/ sales, which eventually affects the availability as well as accessibility. Only marginal amounts of diverse wholegrains are currently produced. They are typically only to be found in a few areas, at small retailers, rather than supermarkets. On the other hand, grains require a complex set of equipment, infrastructure, and transport and processing. Increasing the number of grains that are produced and making them available and convenient to access at an

affordable price for large populations is difficult. Hence there is a necessity to set scientific grounds that should be observed when adjusting the grain price.

As the middle class expands, better incomes are secured, and the domestic demand patterns for food quality change (Fafchamps 2006). Given that the modern diet (high calories food) has been related to several effects on human health (Shridhar 2015). By some means or other, shifting toward diverse wholegrains-based food gained increased recognition as in fact beneficial to human health. Implying that, increasing different grains amount has become imperative. The question that arises is whether the non-staple wholegrains networks are organised in a manner that enables the producers to capitalise on the steadily increasing demand for food quality. In that regard, this paper would explore how grains could be proliferated, without further harming the environment, while improving human health and equity. Environmental co-benefits would extend to more locale-appropriate crops that require fewer inputs, enrichment of the soil, more resilient strains of grain etc.

Further, analysed the capacity of the stakeholders of the industry at the micro-business level through SWOT analysis and macro-environments through PESTLE analysis. On a theoretical approach, given the above-outlined background, this study is premised on and incorporates components of Sustainable Food Systems, Extension Learning Carousel and Behaviour analysis since its grounds on non-staple grains availability, access, utilization and impact. This part of the paper concludes by critiquing the existing agricultural and nutrition policies and by proposing a new set of policies and incentives needed to mainstream and enable emerging wholegrain value chain to proliferate the production of non-staple wholegrains while upholding sustainable targets.

Theoretical framework: Agricultural Value Chain Framework

Agricultural Value Chain tool acts as guide for comprehending how the sector operates and use resources efficiently from conceptualization to delivery of agricultural products. Elements of each stage include inbound supply, production, trading, warehousing, processing, and wholesale or export and retail (Farm Radio International 2021). Value chain theories constitute a significant change in how view or think about interactions, development and relationships between farmers, traders, millers and consumers. Such that change in a value chain is positive to an extent that productive operations are improved and social benefits are improved, namely gender equity, income, poverty reduction, environmental protection and other development targets (Devaux *et al*. 2017). Without the enabling policy environment to guide and regulate

interests in the value chain, the negative changes in technological and economic constraints are likely to persist. It is for that reason that this study would delve into policies guiding each element of the wholegrains value chain, more especially that affecting the production. It would also look into behaviour of actors in the value chain, how they influence each other in a way that disadvantage the wholegrain value chain not to deliver to its full potential.

2.1.OVERVIEW OF NON-STAPLE WHOLEGRAINS VALUE CHAIN

Despite the land reform concerns, economic downturn, credit ratings and unreliable climatic conditions while reeling from the short-medium term effects of the COVID-19 pandemic, the South African grains industry is performing fairly well (USDA Wheat Association 2021). For the year 2020/21 the International Grains Council (abbreviated as IGC) situates South African grains production at 18,6 million tonnes, up from 18 million tonnes in 2020 (Lyddon 2021).

Notably, the performance of the industry is largely measured with the staple cereal grains namely Asian rice, maize and wheat-*T.aestivum*. Pingali (2015) decried that the industry is preoccupied with staple grains while neglecting its counterpart (non-staple). Further criticised the agricultural policy that has been biased towards what he termed as the big three grains. Although as far back as 2006, in the growing middle-class countries like China, Thailand, and Mexico the decline of the share of staple grains, and per capita consumption was noted meanwhile the diet transition was associated with the demand for quantity of the non-staple grains' commodity. This was in concurrence with (Joshi *et al.* 2003) when they explored the marketing, production vs consumption trends data which revealed the neglect of non-staple grains and biased promotion of staple cereal grains production against non-staple grains.

Although the emerging demand trend was reported in developing countries, over the years the farmers' response to taking advantage of the market signal has been low. On the question of why is the farmer response to non-staple crop production so low, the study conducted in Asia (Pingali 2012) pointed to the widespread adoption and persistence of the Green Revolution era policy which predominantly focused on enhancing the production of staple cereal grains, given the perception that these grains are self-sufficient in terms of yields hence they could play the significant role in combating food security challenge. While to a certain degree, the success of the agricultural policy is appreciated in increasing the staple cereal grains in pursuit of tackling food scarcity, self-evidently that the program has jeopardised dietary diversity (Gomez *et al*. 2013). In that regard, the traditional crops known for being sources of important micronutrients were displaced in favour of staple exotic crops (National Research Council 1996).

Diversification of production systems and market supply of enhanced diversity will only happen when the current distortions to farm and market-level incentives are corrected.

That conundrum is related to the growing disconnection between agricultural policy and nutritional challenges which among other things are weight and obesity. It is also associated with the lack of price incentives, infrastructure investments and high transaction costs (Pingali 2015). McKee (2012) noticed that the non-staples market commonly is poorly developed in local and national markets of the developing world. Not to mention the little investment in information systems, transport systems and storage facilities. To mention a few non-staples, cereals are other wheat species, rice, barley, rye, oats, millets, sorghum, teff, triticale, fonio and pseudo-cereals such as amaranth, buckwheat, and quinoa. GrainSA (2021) when international markets increase the input prices, grain production is most affected. This increase is influenced by, to mention the least fuel prices increase, trade wars, pollution policy and shortage of energy resources for silos and millers. The situation is severe for small-scale producers since they cannot capitalise on early purchases or benefit from economies of scale. The entire predicament can be explained by, among other things the need for farmers to acquire new knowledge and specialised skills for the production, processing as well as marketing of non-staples. In addition, the need for government intervention and donor assistance allocated to agricultural policy reforms, agricultural research, human capital development and rural infrastructure would alleviate the situation (Pingali 2015).

Significance of the grains value chain in the agricultural economy and challenges

The grains industry in the developing world plays an important economic role in the agricultural local economy and broad economy of a country. It is essential that the value chain is as efficient as possible to ensure that there are no unnecessary additional costs in the process that would make the end product too expensive for the consumer (Walt 2020).

The role that the wholegrain value chain plays in agriculture and the broader economy is enormous, given the fact that grains form such an important part of the food value chain. It must not go without notice that grains are processed limited for human food purposes, but for animal feed as well, in that regard, they play a role in the livestock industry and other industries in the agricultural sector such as breweries. This leaves the grains industry, as the primary input of various industries. That being the case, primary production as a starting point of the chain plays a very important role, the rest of the value chain is equally important in adding value to the primary product and thus a marketable product for the consumer to buy (Walt 2020). Other

key value chain activities include primary level (input, infrastructure and production), secondary (grading, processing, distribution and retail), regulation processes and finance (Figure 1: Grains value chain (Mtombeni 2019). For a developing economy like South Africa, agriculture is a key driver of economic growth. In the labour force, out of 4,989% of total employment in South Africa's agriculture, a certain progressive percentage is from the grains industry (Trading Economics 2022). Accordingly, towards South African GDP, agriculture contributed around 2,4 % in the year 2020 (Neill 2021).

However, the future of the chain depends on several factors such as climate change, knowledge and skills development, population growth, resources utility, consumer preference also shifts in the global economy and related markets (Johnston *et al*. 2020). Crop yields/ quality are depending on the amount of heat and rainfall as well as the timing thereof. Unreliable or unpredictable rainfall results in lower yields in many grains. Increase vulnerability to the frost during ripening and late ripening. Late planting leads to poor germination, especially during cold months (Johnston 2020). Well, a known fact is that in South Africa, producers are under pressure to intensify their agricultural outputs to meet increasing food demands from a population that would have grown by 25% in ten years (Mathews 2020).

As indicated above that the least attention has been paid to non-staple grains. To date, the least information is currently available to the public whereas much more specific details are needed to determine the true value of the industry. The important statistics such as the quantity produced per month, the gross production value percentage, the annual value and the store shelf value of these products are hard to find, to mention the least. The excuse is always that only marginal amounts are produced and in the market. The major obstacle to increasing those grains' production volume is beyond access to finance. What bred fertile ground for their abandonment is that, among other things, by then the cultivation process was described as long and processing too complex, time-consuming and highly laborious. Part of the obstacle is unresolved Africa-Europe contestations regarding setting quality criteria for grains originating in Africa such as Fonio and African rice (ICvolunteers 2022). Ancient grains were often characterized as tiny, coarse- most suitable for animal feed, not worthy of market status, famine- rather for people suffering from poverty. Besides the Green Revolution policy agenda, the urbanization and associated changes yielded a demand for what was described as sophisticated foods, which led to a shift from traditional grains to non-traditional grains. This

saw the ancient grains displaced by the exotic grains, mentioning two instances, maize replaced sorghum, and Asian rice replaced African rice (National Research Council 1996).

Given the present demand, and to bring balance to dietary diversity, the action towards mainstreaming all the underutilised grains is necessary. Whether it was by misunderstanding or deliberate manipulation tactics by the global decision-makers of the industry and scientists, the research effort in the promotion of all these grains closer to the danger of extinction is imperative. More focused on cultivar improvement, new ways of husking, new sustainable ways of cultivating and post-harvest handling.

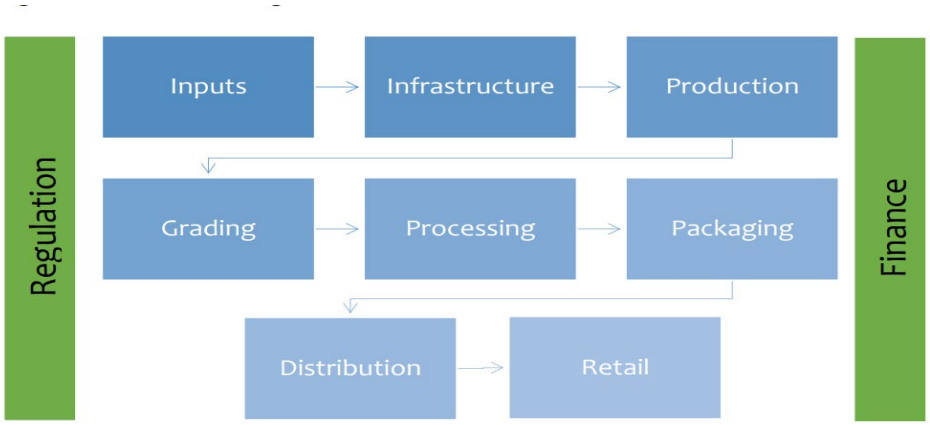


Figure 1: Grains value chain

2.2.Grains Cultivation

Across the world, in this century the industrialised methods of growing cereals are much similar. However, the processes may vary in different regions or countries, given the purpose of farming, and the degree of economic development. Kent-Jones (2022) also depends on amounts of rainfall, the nature of the soil and the type of technique to be applied to ensure growth. To give a picture of how the processes unfold from planting to milling, the wheat production information is put to service.

2.3.Cultivation Practices

a) Soil Preparation

Generally, cereals require less acidic soils with a pH of 6,0 to 7,5, well-drained fertile loamy to sandy loam. Soil temperature of less than 5C is detrimental to the germination of seeds. For rain-fed production soil's ability to bank a minimum of 180 mm of water is crucial. The farmer has to ensure that it is planted on soil with sufficient water-holding capacity. For production under irrigation, the wheat-on-wheat cropping system is recommended. On tillage, no-till

solely depends on factors like the type of cultivar, water availability, type of soil and perhaps the previous crop planted. Minimum tillage must not be beyond 130 mm, and deep tillage not be beyond 300 mm. Where the risk of water erosion, wind or root disease conventional tillage is recommended (DAFF 2016).

b) Field layout and design

Establish contour ridges, and ridges and introduce windbreaks, terraces, and field waterways to the prevention of water erosion or violent wind. Set the field free from stones, weeds, and waterlogging soils. When selecting fields, considering well-drained, smooth fields and practising crop rotation is recommended, whereas planting the same crop the on same land in the same year or consecutively is discouraged (DAFF 2016).

c) Planting and propagation:

Cereals are propagated by seeds. In the summer rainfall region, grains can be planted either in dryland or under irrigation conditions whereas in the winter rainfall region they can only be planted under dryland conditions. In the winter rainfall areas, the planting season commences in Mid-April and ends around mid-June and in the summer rainfall areas between mid-May and the end of July. It is recommended that the seed should place approximately 5 cm deep, must be treated for fungal disease control and planted in a moist seedbed shallowly and evenly. Preferably, when using the planter, the inter-row and intra-row spacing must between 40 cm and 50 cm and 7 cm and 15 cm. If conditions suit, a no-till planter can be used for seeding. If the soil is more acidic, lime can be used to neutralise the pH (DAFF 2016).

d) Irrigation

The need to supplement the water supply depends on the cultivar, type of soil, and whether the region is a summer rainfall area or a winter rainfall area. The method of irrigation depends on available irrigation equipment and water availability. Scheduling is set according to the growth stage and evaporate rate (DAFF 2016).

e) Control: Pests, Weeds and Diseases

The control measures of these organisms harmful to the life of grains must the ones that would give the best results in economic terms and be environmentally friendly. Crop rotation practice is quite recommended as an efficient method of controlling these challenges. Monoculture may be practised however, it is considered to be of high cost (DAFF 2016).

f) Harvesting

Grains must be fully ripened and dry before being approved to be harvested. Grain moisture must be at least 16% and at least 13% lower moisture content for storage. The harvesting season commences around late October, and November and ends in December. On machinery utilised, a combine is used to cut, separate as well as clean the grain. The machine must be calibrated to minimise grain losses. For wheat family crops, reaping, threshing and winnowing may be used (DAFF 2016).

2.4.Post-Harvest Handling to Milling

a) Sorting

The first step kicks off soon after harvesting, to ensure that the seeds comply with the standard market measures and requirements (ARC 2016).

b) Grading

Usually, for wheat family grains, seeds are determined by the grain protection content, the falling number and hectolitre mass. Management practices for soil, fertilizer and water management, conditions during grain filling and maturity determine the protein content and hectolitre (ARC 2016).

c) Packing

Different grains, and classes are packed in different containers, visibly written all the necessary information. It must all meet the measures and meet market requirements (ARC 2016).

d) Storage

Preferably, grains must be kept in silos or dry conditions this is to prevent the damages that may be caused by high or low temperatures, pests or moisture. When the product is stored dry and cool, the chances that it might be affected by physiological processes and fungal activities are slim. The length of time of storing grains before selling solely depends on the farmers' determination and the market (ARC 2016).

e) Transport

Grains are transported from the field to the silos after harvesting. Road trucks and rail trucks can be utilised for local markets and ships for export (ARC 2016).

f) Marketing

In South Africa grains market was deregulated in 1997, hence all grain farmers, processors and traders can trade in a free market, reacting to forces of international supply and demand in setting prices. Market prices are influenced by international prices, international supply, currency strength and weather conditions. Although, the government intervenes by introducing tariffs on imports. The marketing season starts in October and usually ends in September of the following year (DAFF 2016).

g) Milling

The process of grinding the grains into flour or for brewery use. Every mill is different, to produce the kind of flour required for a particular end product. Most mills follow many steps in a certain order, however, there are commonalities. Some steps include; product control, to detect any signs of infestation. Cleaning the grains, eliminating foreign material. Conditioning the grain, preparing and grinding kernels to be milled into flour, following purifying process and bleaching and enrichment of nutrition (Dvorak 2009)

2.5.Potential Benefits: Environmental, Nutritional and Economic

a) Environmental benefits

Grain production is considered less resource-intensive than livestock such as beef, dairy and poultry. As matter of fact, the wholegrain water requirement is significantly less than many food humans consume. To illustrate this, for a single calorie of grain one needs 0,51 litres of water whereas for beef 10,19 litres of water. This makes wholegrains acknowledged to be crucial for climate change resilience and sustainability. In comparison to other crops, grains are known to be more resilient to variable weather conditions (OldWays 2017).

University of Minnesota (2020) reported that small grains are preferable for diverse rotations, among other reasons, for possible greenhouse gas reductions. The crop rotations with whole grains could reach 21% lower emissions than other systems. Previous studies have found that synthetic fertilizer is a principal factor of environmental damage since it needs a great amount of fossil fuel to produce. Its application releases greenhouse gases and air quality-harming pollutants, mainly ammonia. By rotations with small grains, less pollution is discharged, and less chemical fertilizer is needed, therefore less environmental damage. Kaspar *et al.* (2007) early maturing grains such as rye, triticale, winter wheat, and other winter-ha can be utilised for conservation purposes as cover crops to improve infiltrate small germination rate, drainage, organic matter mitigating nitrate loss and erosion. Despite all the desirable benefits, if the best

practices for improving soil fertility and water management are not adequately employed the environmental constraints may not cease. Management techniques such as crop rotation, reduced tillage, and intercropping.

b) Nutritional benefits

Shridhar (2015) points out that there is too much confusing dietary-related information out there which raises the need to strengthen knowledge about scientifically grounded dietary recommendations. Oldways (2017) concur that in the age of social media, consumers are exposed to myths and misinformation. Nevertheless, scientific studies provide that consumption of whole grains is associated with lowering risks of chronic diseases- obesity, diabetes, heart diseases, stroke cancer, and inflammation while contributing to healthier long life. They improve the health of one's gut microbiome, and digestion and fascinatingly they can help students to achieve better reading and mathematics scores. Over centuries grains have been recognised as the powerhouse of human sustenance.

Nutrients found in grains include; proteins- which are essential for body cells and the repair of tissues. Important for bones, skin, muscles, blood, cartilage hair, nails and body chemicals. Iron- is vital for body energy. Important in carrying oxygen from the lungs to different parts of the body. Fibre- insoluble improves digestion and is known to reduce cancer. On the other hand, soluble may help in reducing cholesterol levels, controlling blood pressure and diabetes and lowering the risk of cardiovascular diseases. Thiamin (Vitamin B1)- is essential for healthy nerves, good digestion and appetite. Riboflavin (Vitamin B2)- is vital for the utilisation of protein by the human body. Niacin (Vitamin B3)- is important to challenge pellagra (Dvorak 2009).

c) Economic benefits

Grains are energy-dense, less resource-intensive and considered to be less expensive to produce compared to other crops. Provided that crop rotation with small grains is practised, the less fertiliser, less water required hence less crop maintenance costs (Oldways 2017). Jabran (2015) conservation till systems (reduced, zero, conventional or deep tillage) lower production costs and help to improve yields. Yield stability improves farm income and contributes to exports. Above and beyond that, grains contribute to dietary diversity demand mitigation. Again, are at the centre of the bakery and alcoholic beverages industries. Other industrial utilisation includes making explosives, synthetic rubber, the starch used for pastes, straws used for baskets, mats

and other non-food products. Grains are an essential source of livestock nutritious feed (DAFF 2016).

2.6.WHOLEGRAINS AGRI-BUSINESS CHAIN

2.6.1 Analogy of the Grain Industry

2.6.1.1.Stakeholders' Analysis of the Industry- SWOT

This is to assess the position of the key actors in the wholegrain networks namely grains producers, millers, bakers, policymakers and extension officers at the micro-business level. It is important to bring to light each actor's vulnerability and resistance as well as some leverage points.

a) Table 1: ***Grains producers (farmers)***

Strengths	**Weaknesses**
Grain production basic information is available; many have acquired it already.	High production costs (input and land value ratio) result in a lot of production risks. Not all farmers have access to public extension services. Crop insurance is expensive and has limited capacity. The adoption of hedging mechanisms to reduce price risk is slow. Climatic variability negatively affects production processes, in summer rainfall areas the most. A limited number of new entrants and sponsorships.
Opportunities	**Threats**
There are possibilities to proliferate the production in satisfying the demand (both at the local and regional level) and niche export markets. That would result in job creation in rural areas. Incorporate smallholder farmers and develop commercial farmers for capacity development. Significant productive capacity is available.	Subsidies imports or dumping posing as a major threat. Administrative processes in adjusting tariffs are slow. Further deterioration poor maintenance or lack of rail networks servicing the silos. Transport costs are high which leads to low farm gate prices. Non-tariff barriers negatively affect SA's grains exports. Small-scale farmers are unable to make an early purchase of inputs.
Sources:	

DAFF, 2016, 'Wheat Market Value Chain Profile', from https://www.dalrrd.gov.za/Portals/0/Brochures%20and%20Production%20guidelines/Wheat%20-%20Production%20Guideline.pdf

b) Table 2: ***Millers and Traders***

Strengths	**Weaknesses**
Industry associations are well organised. Effective infrastructure and training standards. The telecommunication network is sufficiently developed. The Labour force is sufficiently available. For grains like the wheat Export Committee, well-skilled research institutions and professionals.	Insufficient protection against unfair competition. High input costs and maintenance costs. Innovation for new products is lacking. Low export orientation. Immensely distorted international market.
Opportunities	**Threats**
Beneficiation of raw material. Production capacity is available. Domestic and regional demand prevail. Consumer preference shifted from maize meals to bread. Preferential export markets (in terms of the African Growth & Opportunities Act, EU, and SADC).	Competition from cheap subsidised imports is unfair and unregulated. Non-tariff barriers by SADC and SACU members. Consumer preferences changes. Dynamic regional dynamics and evolving multilateral agreements and arrangements. Lack of customized incentives. Poor domestic/regional market economic conditions.
Sources: DAFF, 2016, 'Wheat Market Value Chain Profile', from https://www.dalrrd.gov.za/Portals/0/Brochures%20and%20Production%20guidelines/Wheat%20-%20Production%20Guideline.pdf	

c) Table 3: ***Bakers***

Strengths	**Weaknesses**

The market is stable for products like bread. The market growth is noticeable for confectionery products. A diversified product market with all-inclusive baked products can be well-marketed. The domestic market is bold and stable. Utilising first-world technology, equipment and processes. Well, skilled dynamic business professionals as well as baking specialists.	Baking industry most entrants are inexperienced, and without basic knowledge. Nonconformity with regulations such as read mass regulations. Unsatisfactory commitment to train, and fully empowering women and BEE. In total, legislative monitoring, and control together with quality control is poor.
Opportunities	**Threats**
As household income increases, the bread market growth potential stands a better chance. Feasible market opportunities for an all-inclusive value chain of diverse baked products. New opportunities after introducing fortified bread. Baking stakeholders including bakers will enjoy new opportunities from Africa's Development of HACCP systems. Introduction of products with health-enhancing properties. Development of financing packages to help small businesses and new entrants in the industry.	There are high input and maintenance costs. There is market saturation. There have been health concerns raised with imported baked products. Scarcity of trained personnel in the industry.

Sources:

DAFF, 2016, 'Wheat Market Value Chain Profile', from https://www.dalrrd.gov.za/Portals/0/Brochures%20and%20Production%20guidelines/Wheat%20-%20Production%20Guideline.pdf

d) Table 4: ***Policy Makers***

Strengths	**Weaknesses**
Highly educated personnel. Information Technology is utilised to manage and process data. Policy indicators are intact. Intact sources of information for agricultural policymakers.	Acquisition and supplying information are costly. There is a huge volume of data, processing is time-consuming. Not all information needed is readily available and sometimes it is complex. Competencies to add value to inform decisions are scarce.
Opportunities	**Threats**
Establish relationships with the institutions of research for accurate data. Information to be supplied by the producers. New technological and methodological developments to aid in mitigating information deficiencies.	Uncertainties are due to unresolved complex political and policy matters. Information deficiencies in agricultural policy design, implementation and monitoring. Uncoordinated relationships with key stakeholders such as farmers and extension practitioners.
Sources: Blandford, D., 2007, "Information Deficiencies in Agricultural Policy Design, Implementation and Monitoring", *OECD Food, Agriculture and Fisheries Papers*, No. 6, OECD Publishing, Paris, from https://doi.org/10.1787/067228574571. https://www.oecd-ilibrary.org/docserver/067228574571.pdf?expires=1643504328&id=id&accname=guest&checksum=3E5996AD22A92E55E8CF0496442E21BBbgb	

e) Table 5: ***Extension Officer/ Research Organisations***

Strengths	**Weaknesses**
Highly educated personnel. Noticeable capacity to apply extension techniques in the provision of extension services. Identified with pluralistic, market-orientated extension and advisory services.	Confusing and misinformation from unauthentic sources on the internet. The effectiveness of the services is being questioned. Some forefront officers do not

	have access to national surveys or online material.
Opportunities	**Threats**
Digitalization of extension and the introduction of new data exchange platforms will improve services. Capacity strengthening for efficiency.	Intensively bureaucratic processes influence policymaking. A distant relationship with agricultural policymakers. Undefined scope of frontline officers.
Sources: Davis, K., Joseph, J., Barry, T., Maltitz, L., Niekerk, J., Ngomane, T., & Rasoanindrainy, A., 2021, 'Global Agricultural Extension Staff Functional Competencies', from https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/134857/filename/135070.pdf	

f) Table 6: ***Input Suppliers***

Strengths	**Weaknesses**
Input availability is fairly satisfactory. Knowledge about crop input information.	Limited accessibility to smallholders due to long-distance and transport costs. Limited options due to international demand. Transportation from the international supplier to the local supplier to the farmer is a challenge. Poor road and railway infrastructure.
Opportunities	**Threats**
With farmers' stable financial resources, demand for inputs is promised. New technology.	With climate change, pests develop resistance. Price fluctuations. Some kind of monopolization of imported inputs by well-financed corporates. Difficulty in access to updated market information, inadequate extension research and business support.
Sources:	

Scopeinsight, 2020, 'The top five challenges you need to know and which frustrate agricultural input retailers in emerging markets', from https://scopeinsight.com/the-top-five-challenges-you-need-to-know-and-which-frustrate-agricultural-input-retailers-in-emerging-markets/

Anglade, B., Swisher, M.E., & Koenig R., 2021, 'The Formal Agricultural Input Sector: A Missing Asset in Developing Nations?', *MDPI*, from https://www.mdpi.com/2071-1050/13/19/10697/pdf

g) *Table 7:* ***Silo Owners***

Strengths	**Weaknesses**
Income-making properties. World-class technology infrastructure with variance heights, cross-section, and geometric properties storage structure.	Expensive costs of installation. Expensive control of storage conditions. High costs of fumigation services. Major losses due to a suitable temperature, and humidity for pests (mites and insects) activity during the longer term. More water content of grains is harmful.
Opportunities	**Threats**
Demand for storage space and occupancy rates are fairly high. Advanced technology, new methods, and processes of storage bring new opportunities.	Climate change (hot weather) is associated with the outbreak of diseases and pests. Incorrect measurements of temperature and moisture of grains content. Income fluctuates from season to season, indeed that of the size/yield of annual harvest). Non-payment by the lease.

Sources:

Mysilo Grains storage systems, 2020, 'Structural problems in agricultural product silos', SiloPort, from https://www.mysilo.com/en/page/To-Need-to-Know-in-Grain-Storage

Wineckler, C., & Boshoff, D., 2016, 'The valuation of commercial grain silos', University of Pretoria, from

https://www.ajol.info/index.php/actas/article/view/151800/141412

h) Table 8: ***Financiers (Public/Private Financial Institutions)***

Strengths	**Weaknesses**
Highly advanced financial infrastructure matches one of the developed countries. Funding farmers is a top political priority, with public financial services delivery through state grants available and equipment grants.	Several financial institutions least understand the agricultural sector operates and how difficult it is for farmers to make income and profit, further graduating from being emerging farmers to being commercial farmers. Difficult for private institutions to lend money due to low-income farmers limited financial security and lack of collateral.
Opportunities	**Threats**
Growing rural financial and non-financial support institutions to support farmers. Developing communications infrastructure and financial technology to improve the situation.	Unsatisfactory macroeconomic performance, inflation, and interest rates. Financial illiteracy by rural farmers. Dishonouring financial commitment by low-income farmers (inability to repay loans). Lack of collateral. Poor communication between public/private financiers, policymakers and farmers.

Sources:

Mtombeni, S., Bove, D., & Thibane, T., 2019, 'An analysis of finance as a barrier to entry and expansion for emerging famers', from https://www.compcom.co.za/wp-content/uploads/2019/09/CC201901-Mtombeni-S-Bove-D-Thibane-T-An-analysis-of-finance-as-a-barrier-to-entry-for-emerging-farmers.pdf

de Klerk, M., Fraser, F., & Fullerton, K., 2013, 'The status of agricultural and rural finance in South Africa', FinMark Trust, from

https://finmark.org.za/system/documents/files/000/000/443/original/Rep_statusAgrRurFin_SA_2013_FNL.pdf?1614938240

2.6.1.2.PESTLE Analysis of the Grains Industry

This is to explore the system environment of the wholegrain networks at the macro-business level. It is important to understand the environment in which grain stakeholders are operating.

a) Political aspect

It is inevitable to observe the developments of African countries without reflecting on past historical facts. The displacement of certain crops (indigenous in particular) and their markets, seizure of land, the introduction of exotic cash crops and adverse agricultural techniques can be traced back to the colonial era- mid-19th and 20th-century policies and institutions. The political-economic forces promoted the adoption of the cultivation of maize, wheat and rice. Since they are perceived to be grown easily, resilient to poor soils, ecologically sustainable and economically viable. These moves were accompanied by cultural indoctrination, nutrition transition and loss of indigenous markets (Raschke-Cheema *et al.* 2007). Upon independence, the globalised food system continued, while the region got occupied with Green Revolution policies which were still grounded on promoting the staple cereal grain cultivation in an account to address famine. The long-term effects of these developments left markets for non-staples poorly developed, some crops less utilized for a human meal and some crops on the verge of extinction (Pingali 2015).

b) Economical aspect

Although statistics hugely account for staple cereal, well South African total grains production seats 18,6 million tons, with imports at 2,2 million tons in the year 2020-21 and export below 2 million in 2019 (Lyddon 2021). In marketing, the South African present-day government introduced the Marketing of Agricultural Products Act (1997) to put an end to earlier government marketing boards and schemes and established forums. Well, what remained the same is that the prices are determined by the market captains, Trust for each crop, state-funded institutions of research and information (such as SAGIS and ARC), import tariffs and the forums in place for the crops that were already well mainstreamed.

c) Social aspect

Global food culture meant a transition in dietary practices, which includes consumption of high calories, refined sugars, white flour and food additives namely monosodium, glutamate and tartrazine lacking essential minerals, vitamins and proteins (Shridhar 2015). A new trend being observed, increased income makes consumers concerned about food quality and safety, in the process, they become less occupied with staple foods and seek for diverse diet (Fafchamps 2006).

d) Technical aspect

Digital evolution is upon agriculture across the world. The use of agricultural technologies helps farmers to optimize the farming inputs, in a way that reduces the cost of production, reduces water consumption, and reduces the use of fertilizers, herbicides and pesticides in an endeavour for combatting climate change while improving food quality and increasing yields (Pienaar 2021). Precision or smart farming includes drone and aerial imagery, satellite imagery, merging datasets, GIS software and GPS agriculture, Farming software and online data. Promising technologies are making farming more simple, efficient and profitable (Earth Observing System 2019).

e) Legal aspect

South African agriculture is regulated by national legislation and the Department of Agriculture. Provincial departments are in place with a mandate to implement the development and offer extension support, services and research. The National Development Plan (2011) was adopted to reduce all forms of inequalities and poverty. In the subsidies system, the government is involved in international trade agreements and also has established programs such as the Comprehensive Agricultural Support Programme to offer financial support, training and capacity building, technical and advisory support, information and technology, marketing and business development, especially for previously disadvantaged communities and farmers. Environmentally sustainable agriculture is also supported through tax incentives such as Income Tax Act (Opperman *et al.* 2020).

f) Ecological aspect

In the protection of natural resources, the country has not approved an inclusive policy for sustainable agriculture. Agricultural extension plays a pivotal role in putting an end to the further exploitation of natural resources by farmers (Khwidzhili 2018). The Dept. of Forestry, Fishes and Environmental Affairs (2022) has several programmes for addressing biodiversity

and conservation towards resource-efficient and low carbon, to mention the two, Green Fund and Green Economy for Sustainable Development etc.

2.6.2. Market Segmentation

Here one observes the market trends, in the unavailability of sufficient information about the domestic market intelligence, global statistics were used.

a) Production analysis VS Consumption analysis

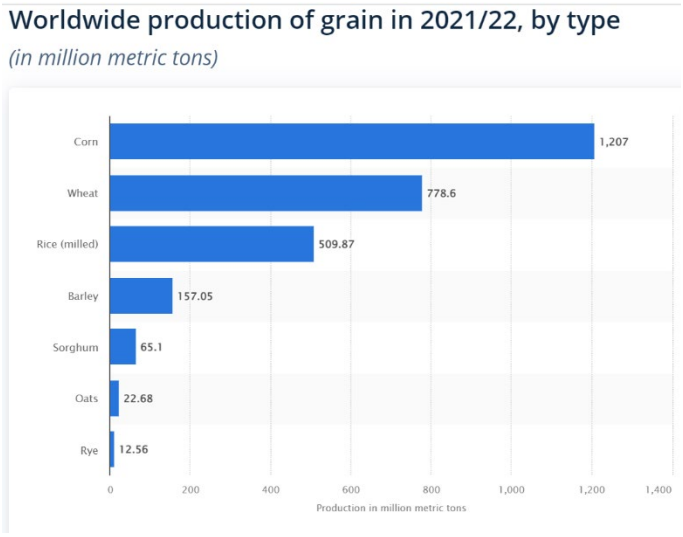


Figure 2: Global grain production in 2021/22 (Statista 2022)

According to Statista (2022), corn is a world-leading grain followed by wheat and rice. This proves that there is some kind of attention the three grains enjoy compared to other grains.

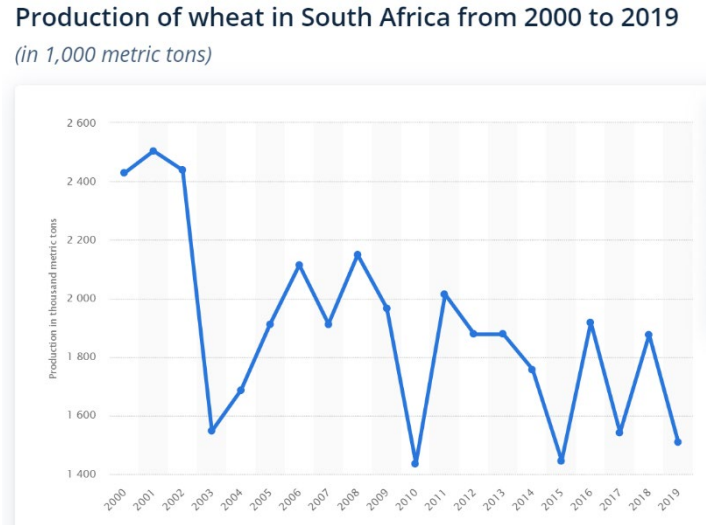


Figure 3: Wheat production in South Africa from the year 2000-2019 from Statista (2022)

Statista (2022), shows that South Africa is not doing well given that its population is growing. The production is on a steady decline, now sitting at just above 1500 m/tons.

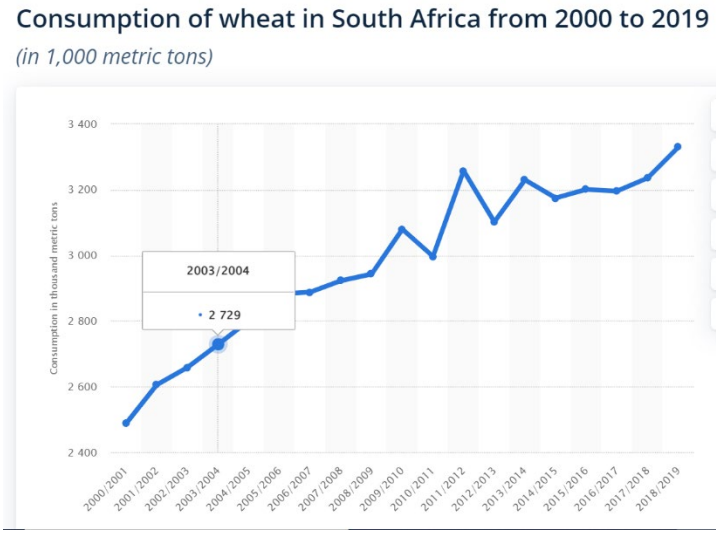


Figure 4: South Africa's consumption of wheat between 2000 and 2019 (Statista 2022)

The consumption of wheat is on a steady incline, now comparing the production and consumption of wheat (alone) tells one that South Africa is short on production then which means more wheat is imported.

b) Import analysis vs Export analysis.

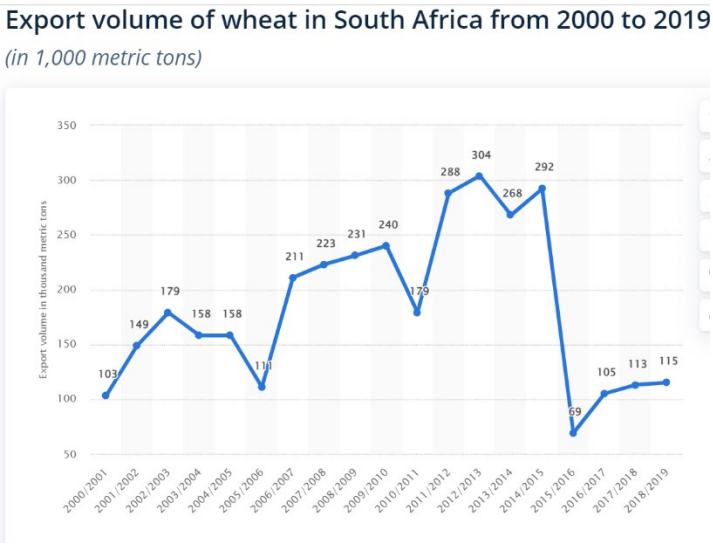


Figure 5: South Africa's export volume of wheat between 2000 and 2019 (Statista 2022)

The exports are sitting just above 100 m/tons. Even though the import statistics were not readily available, however, from comparing the production and consumption stats, one is convinced that import stats must be high.

c) Gross value, Tariffs and Price trends analysis

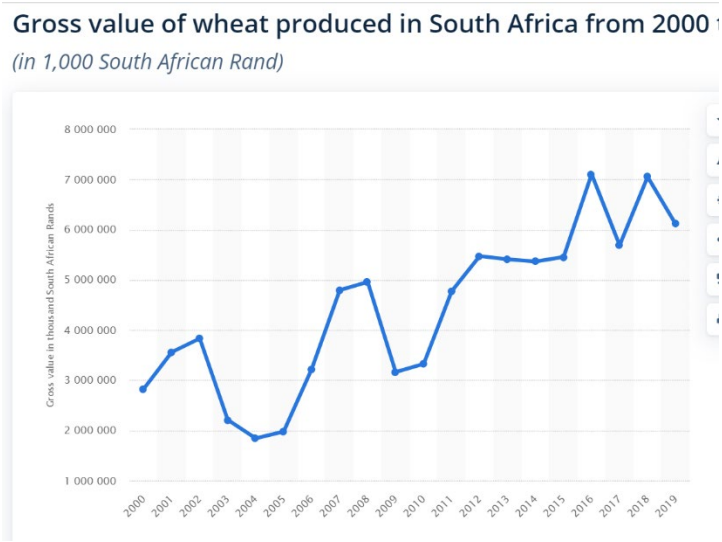


Figure 6: South Africa's gross value of wheat produced between 2000 and 2019 (Statista 2022)

The gross value of wheat produced is sitting at just above 6000,000 ZAR. However, this does not mean other grains are anywhere closer to the wheat's gross value.

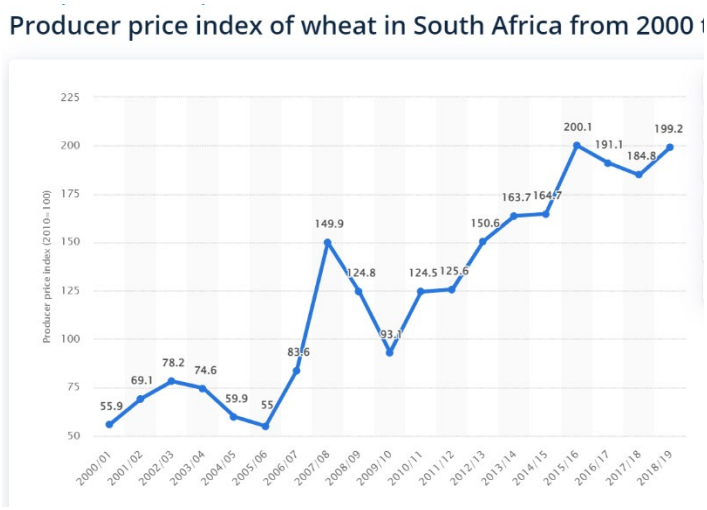


Figure 7: South Africa's producer price index of wheat between 2000 and 2019 from Statista (2022)

As things stand, the producer price index of wheat is just below 200. In the past 10 years, it has been increasing.

2.7. Policy Implications, Other Ways to Mainstream, Streamline and Improve Agri-Business Chain

2.7.1. Policy Critique

These are some of the South African policies confirmed to be currently used by provinces and municipalities.

a) *Table 9:* ***Trading/Pricing Policy: Marketing of Agricultural Products ACT***

Date of publication	**2 October 1996**
Download site/ URL	https://www.gov.za/sites/default/files/gcis_document/ 201409/act47of1996.pdf
Objective/ Vision for agriculture:	Increasing market access for all market participants while promoting the efficiency of marketing agricultural products.
The extent to which the policy addresses farmer capacity, generally.	Improve the level of market accessibility by agricultural producers. Optimizes the export earnings from agricultural products. Put statutory measures to be effected only if support is sought by affected parties.
The extent to which the policy influences the wholegrain economies to behave in a certain way that may go against ENE objectives	The policy grounds on the free market, the production of agricultural products such as grains in South Africa, is deregulated and operated in a free-market environment. This implies that the government has limited intervention, in unfair competition between small-scale and commercial producers. This perpetuates stakeholders' self-serving elements and creates an environment to maximize profit as possible while compromising the environment and quality. This implies that farmers would apply practices that would ensure the yields are high, in order to make more income.
The big gaps; How might policy need to change	The policy pronounces least on market transparency. The prices are freely determined by market forces. This leaves more influence on regional and international demand and supply, inflation and Rand-Dollar exchange. This leaves room for area differential to largely affect prices. Note that the policy guarantees minimum intervention by the government to alleviate the predicament of the previously disadvantaged groups. Too much market power is outsourced and the notion is that the survival of the fittest thrives. Producers have fewer or no alternatives to market their produce at fair pricing.

b) *Table 10:* ***South African Land Policy***

Date of publication	**April 1997 (***currently used by state institutions***)**
Download site/ URL	https://www.gov.za/sites/default/files/gcis_document/ 201411/whitepaperlandreform.pdf

	Read in conjunction with: -Subdivision of Agricultural Land Act No. 70 of 1970: https://www.gov.za/sites/default/files/gcis_document/201505/act-70-1970.pdf
Objective/Vision for agriculture:	To address the injustices of apartheid and foster national reconciliation and stability. To improve economic growth, household and welfare and eliminate poverty.
The extent to which the policy addresses farmer capacity, generally.	Usage rights over agricultural land for over a certain interval or under certain conditions. In line with this policy, the government has put in place programs such as Land Distribution for Agricultural Development to grant previously deprived actors to obtain land for agriculture, to a maximum of ZAR 100k, and Comprehensive Agricultural Support Program to offer financial, information, advisory, business development, training and capacity building.
The extent to which the policy influences the wholegrain economies to behave in a certain way that may go against ENE objectives	Security of tenure is guaranteed for a specific period. The policy implies that agricultural land cannot exceed ten years unless there are consents filed or re-application is executed. This sparks competition for land, and the lease (smallholder) would want to maximize high yields and profits as much as possible to survive after the lease period has lapsed or in an event that a landlord gives it to another individual.
The big gaps; How might policy need to change	The maximum leasing period is short. Currently, the policy is silent on restrictions on the acquisition of agricultural land (by foreign nationals) and the limited amount of the piece of land one farmer can acquire. This means an individual can own as much as he would afford, which could sabotage the smallholder farmers to expand their production.

c) *Table 11:* ***Agricultural Policy: National Development Plan***

Date of publication	**November 2011**

Download site/ URL	https://www.nationalplanningcommission.org.za/assets/ Documents/NDP_Chapters/devplan_ch6_0.pdf ***Read in conjunction with:*** -South African Bio-economy Strategy: https://www.gov.za/sites/default/files/gcis_document/ 201409/bioeconomy-strategya.pdf
Vision for agriculture:	This policy envisions agriculture as a potential large labour absorption industry and achieved desirable integration of rural areas. Agriculture is envisaged to create about one million jobs through the commercialisation of the sector. The policy seeks to integrate rural communities into the mainstream of the economy, through the expansion of irrigated and rain-fed agriculture, conversion of under-utilised land, support of new entrants, support of potential growing commercial agricultural entities, successful land reform and working on the capacity of public institutions to implement proposed interventions.
The extent to which the policy addresses farmer capacity, generally.	The policy reflects on the proposed programs to be implemented to enhance farmer capacity. The policy suggests that skill development and training such as entrepreneurship training must be extended. Fostering the farmer-to-farmer knowledge and skill transfer as well as engagement with commercial farmers. It is focused on changing the systems (how things are done), structures and institutions. In one way or another, it focuses on changing the whole system as it reflects on land reform, tenure security, poverty alleviation and job creation.
The extent to which the policy influences the wholegrain economies to behave in a certain way that may go	On environmental sustainability, NDP encourages development that strongly safeguards the environment through the expansion of irrigated and rain-fed agriculture, improving the efficiency of irrigation infrastructure and water sources and the huge support from smallholder farmers. Social viability reflects on the maintenance of social relationships and a strong balance of processed and primary agricultural products. The policy is in line with ENE objectives.

against ENE objectives	
The big gaps: How might policy need to change	This policy reflects black farmers as end-user of technology and passive receiver of services that would be mentored by white commercial farmers. The policy says least about sustainability context namely improving social viability and environmental sustainability. Generally, the nature of this policy is more of a vision than a practical plan, in a process, it could fall short to produce interventions contained. The policy needs to project black farmers as equal contributors to the rural economy. Also needs put focus on fostering learning and relations between farmers, researchers, and extension workers. Again, this policy needs to be a programmatic, actionable plan for the integration of rural economies.

2.7.2. Crop-Neutral Agricultural Policy to Aid in Mainstreaming Non-Staple

Notably, there is the least investment in infrastructure namely transport systems, cold storage systems as well as information systems the non-staples markets are poorly developed in local and national markets in many developing countries (McKee 2012). Policies primarily promoted staple crop production, through price supports, irrigation, and fertilizer as well as credit subsidies. Pingali (2015) against this backdrop proposes a crop-neutral agricultural policy that would create a level business arena, which would permit farmers to respond to market signals rather than one that is biased towards a particular set of staple crops. This would correct incentive bias, enhancing farmers to diversify production systems would require intense public and private investment in value chain activities (such as storage, transport as well as market development) and mainly to reduce transition costs for smallholders emerging into non-staple agricultural commodities markets.

2.8.Conclusion

It is evident that agricultural policy has been preoccupied and predominantly concentrated on strengthening staple crop production in most developing countries. The promotion of staple crops succeeded through subsidies and price support ousted the production of non-staple crops. Diversification of diet demands that policies must focus on the shift towards food supply diversification. As time intensive and costly the production, processing and marketing of non-

staple crops are, they too, need the same supportive operating environment to deliver on their potential. The potential environmental, nutritional and economic benefits revealed the importance of intensifying the production of non-staple wholegrains. The micro and macro business environment analysis through SWOT, PESTLE and market trends displayed the existing circumstances.

References

ARC- Small Grain Institute, 2020, 'Guideline Production of Small grains in the Winter Rainfall Area', from https://www.arc.agric.za/arc-sgi/Documents/2020%20Production%20Guidelines/2020%20Guideline%20for%20the%20production%20of%20small%20grains%20in%20the%20winter%20rainfall%20area.pdf

DAFF, 2016, 'Production Guideline for wheat', from https://www.dalrrd.gov.za/Portals/0/Brochures%20and%20Production%20guidelines/Wheat%20-%20Production%20Guideline.pdf

Devaux, A., Terero, M., Donovan, J., Horton, D., 2017, 'Value Chain Development', from https://www.emerald.com/insight/content/doi/10.1108/JADEE-06-2017-0065/full/pdf

Dvorak, C., 2009, 'Wheat from field to flour', *Nebraska Wheat,* from https://nebraskawheat.com/wp-content/uploads/2014/01/WheatFromFieldToFlour.pdf

Earth Observing System, 2019, 'Top 5 Newest Technologies In Agriculture, *EOS Data Analytics,* from https://eos.com/blog/top-5-newest-technologies-in-agriculture/

Fafchamps, M., Vargas-Hill, R. & Minten M., 2016, '10 Quality Control & Marketing of Non-staple Crops in India' from https://web.stanford.edu/~fafchamp/supplychain.pdf

Farm Radio International, 2021, 'Agricultural Value Chain', from https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/52685/IDL-52685.pdf

Gomez M.L., Barret C.B., Raney T., Pinstrup-Andersen P., Meerman J., Cropperstedt A., 2013, 'Post green revolution food systems and the triple burden of malnutrition*.', ESA working paper no13-02.* Rome: FAO

GrainSA, 2021, 'Input costs pose a threat to profitability', from https://sagrainmag.co.za/2021/12/02/input-costs-pose-a-threat-to-profitability/

IC-volunteers, 2022, 'AgriGuide Cereals', *E-TIC* from http://www.agriguide.org/index.php?what=agriguide&id=185&language=en

Jabran, K., 2015, 'Higher Yield and Economic Benefits for Wheat Planted in Conservation Till Systems', *Omer Halisdemir University*, from https://www.researchgate.net/publication/275827127_Higher_Yield_and_Economic_Benefits_for_Wheat_Planted_in_Conservation_Till_Systems

Johnston P., Human, M., Arowolo, S., 2020, 'Climate change will impact entire grain value chain', *GrainSA*, https://sagrainmag.co.za/2020/06/12/climate-change-will-impact-entire-grain-value-chain/

Johnson, D.G., 1995, 'Elmhirst Memorial lecture: The limited but essential role of government in agriculture and rural life.' In Agrekon Volume 37, Number 4 published in December 1998.

Joshi, P.K., Gulati, A., Birthal, P.S., Tewari L., 2003, Agricultural diversification in South Asia: Patterns, determinants and policy implications. MSSD working paper 57. Washington: IFPRI

Kaspar T.C., Singer, J., Knutson, B., Kohler, K.A. & Jaynes, D.B., 2007, Environmental Benefits and Management of Small Grain Cover Crops in Corn-Soybean Rotation', *Iowa State University*, from https://naturalresources.extension.iastate.edu/files/encyclopedia/files/environmental_benefits_and_management_of_small_grain_cover_crops.pdf

Katherine Hall, 2019, 'Income poverty, Unemployment and Social grants', the University of Cape Town from http://www.ci.uct.ac.za/sites/default/files/image_tool/images/367/Child_Gauge/South_African_Child_Gauge_2019/CC/CC2019%20-%20Income%20poverty%2C%20unemployment%20and%20social%20grants.pdf

Khwidzhili R.H. & Worth, S., 2018, 'Evaluation of policies promoting sustainable agriculture in South Africa', from https://www.ajol.info/index.php/sajae/article/view/167350

Kent-Jones, A., Douglas W., 2017, 'cereal farming', Encyclopedia Britannica, 24 Oct. 2017, from https://www.britannica.com/topic/cereal-farming.

Lyddon, C., 2021, 'Focus on South Africa', *World-Grain.com,* from https://www.world-grain.com/articles/15331-focus-on-south-africa#:~:text=South%20Africa's%20total%20grain%20imports,2.4%20million%20in%202019%2D20.

Mathews, J., 2020, 'Taking the agricultural value chain into the future', *GrainSA* from https://sagrainmag.co.za/2020/06/10/taking-the-agricultural-value-chain-into-the-future/.

McKee, D., 2012, 'Strategic grain reserves', In B. Lilliston & A. Ranallo (Eds.), *Grain reserves and the food price crisis: Selected writings from 2008- 2012* (pp 33-35). Washington: Institute for Agriculture and Trade Policy.

National Research Council, 1996, 'Lost crops of Africa' from https://nap.nationalacademies.org/catalog/2305/lost-crops-of-africa-volume-i-grains

NDP, 2013, 'National Development Plan: Vision 2030', from https://www.nationalplanningcommission.org.za/assets/Documents/NDP_Chapters/devplan_ch6_0.pdf

Neill A., 2021, 'South African: Distribution of Gross Domestic Product economic sectors from 2011 to 2021', *Statista*, from https://www.statista.com/statistics/371233/south-africa-gdp-distribution-across-economic-sectors/#:~:text=In%202020%2C%20agriculture%20had%20contributed,the%20total%20value%20added%2C%20respectively.

OldWays, 2017, 'Whole grains: Good for the planet and good for you', from https://oldwayspt.org/blog/whole-grains-good-planet-and-good-you

Opperman, A., Roux, S., Van Der Merwe, P., Badenhorst, H., Delport, A., Vadelka, M., Mahomed, A., 2020 (2021), 'Agricultural Law in South Africa: Overview', *Thomson Reuters Practical Law,* from https://uk.practicallaw.thomsonreuters.com/6-622-8796?transitionType=Default&contextData=(sc.Default)&firstPage=true

Pienaar 2021, 'Smart Farming: Embracing the digital revolution in agriculture, *CDH*, from https://www.cliffedekkerhofmeyr.com/en/news/publications/2021/Agri/agriculture-aquaculture-and-fishing-sector-alert-29-july-smart-farming-embracing-the-digital-evolution-in-agriculture.html.

Pingali, P.L. 2012, 'Green revolution: impacts, limits and the path ahead', *PNAS*, 109 (31), 12302-12308

Pingali, P.L, 2015, 'Agricultural policies and nutrition outcomes- getting beyond the preoccupation with staple grains', *ResearchGate,* from

https://www.researchgate.net/publication/276410296_Agricultural_policy_and_nutrition_outcomes_-_getting_beyond_the_preoccupation_with_staple_grains

Raschke-Cheema, V., Elmadfa, I., Wahlaquist, M.L., & Kouris-Blazos, A., 2007, 'The need for an online collection of traditional African food habits' ResearchGate from https://www.researchgate.net/publication/43554705_THE_NEED_FOR_AN_ONLINE_COLLECTION_OF_TRADITIONAL_AFRICAN_FOOD_HABITS

Shridhar, C.G., Nerli, R. & Hiremath, M., 2015, 'Modern Diet & its Impact on Human Health', *ResearchGate* from https://www.researchgate.net/publication/284167515_Modern_Diet_and_its_Impact_on_Human_Health

Statista, 2022, 'Food & Nutrition', from https://www.statista.com/statistics/1135822/consumption-of-wheat-in-south-africa/

Stevens, J., Heerden, P., & Laker, M.C., 2020, 'Climate and farming in South Africa', from https://southafrica.co.za/climate-farming-south-africa.html

Trading Economics, 2022, 'South Africa- Employment in Agriculture (% of Total Employment)', from https://tradingeconomics.com/south-africa/employment-in-agriculture-percent-of-total-employment-wb-data.html

University of Minnesota, 2020, 'Diversifying crop rotations improves environmental outcomes while keeping farms profitable', from https://twin-cities.umn.edu/news-events/diversifying-crop-rotations-improves-environmental-outcomes-while-keeping-farms.

USAID, 2013, 'Business enabling environment program final report- July 2010-13', from https://pdf.usaid.gov/pdf_docs/PBAAA009.pdf

USDA Wheat Association, 2021, 'South Africa- Country Commercial Guide', from https://www.trade.gov/country-commercial-guides/south-africa-agricultural-sector

Walt, L., 2020, 'Graanwaardeketting se waarde', *GraanSA* from https://sagrainmag.co.za/2020/06/12/graanwaardeketting-se-waarde/

CHAPTER 3

CHARACTERISTICS OF THE RESEARCH FIELD

3.1. Introduction

This section highlights the features of the areas, where the research study has been conducted. This includes the map showing the location, the preliminary background and the context of the broader community, which includes, demographics, socio-economic characteristics, local governance, and biophysical information.

3.2. Description of study areas

The study was conducted in three provinces of South Africa namely the Western Cape, North-West and Gauteng (Figure 8: South African map (Pintrest n.d.). The study gathered data from winter rainfall areas and summer rainfall areas. According to Thompson *et al.* (2022), South Africa is a multiparty democratic republic with approximately 60, 143 000 population size at the southernmost of Africa. Of that number, 50,4% are female, 49,6% are male, part of that is 76,4% of Black citizens, 9.1% Whites, 8,9% Mixed-race, 2,5% Indian and 0,5% unspecified. The unemployment rate has increased to 35,3%, the number of households without an employed adult decreased to 29,9% and children living in income poverty are 58,8% (Katherine Hall, 2019). 24,4% of all households and 25,2% of all citizens including 40,5% of households in metropolitan municipalities receive social grants such as child support and old age pension grants as the primary source (BusinessTech 2022). South Africa is known for its natural beauty, constitutional democracy and cultural diversity. Plateau covers a major part of 1,220 million km^2, the climate is cool such that extreme heat and cold are rare. Agriculture is an important economic sector, contributing immensely to the GDP. Crops dominating are maize, citrus, sugarcane, peanuts, wheat, fruits and tobacco. This country is more than 600 miles from the European continent and is boarded by Eswatini, Zimbabwe, Namibia and Mozambique (Vigne *et al.* 2022).

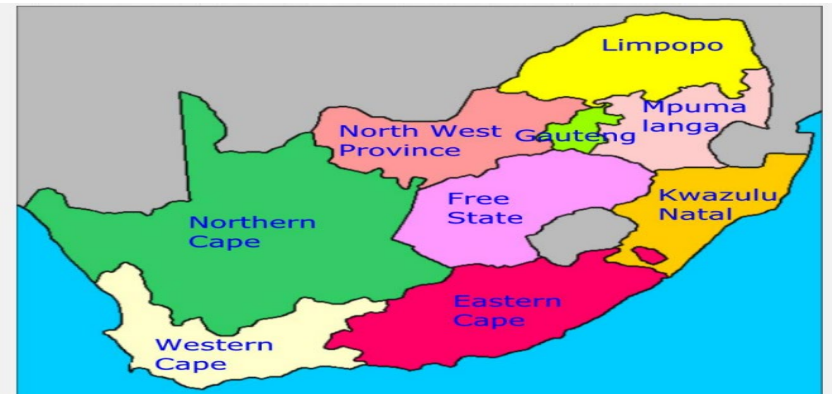


Figure 8: South African Map

3.3. Socio-economic characteristics, demographics and local governance

a) Western Cape- Overberg and Westcoast District Municipality

A province situated on the south-western coast of the Republic of South Africa is branched into five district municipalities and one metropolitan municipality (Figure 9: Western Cape map (Ncube 2022.). Most of the study data were collected from the Overberg district (Caledon, Swellendam, Suurbraak, Napier and Bredasdorp) and Westcoast (Mooreesburg). Approximately 300,000 citizens, with population growth estimated at 2,06% per annum from 2009 to 2019. The number of males is slightly higher than females, 50,5% over 49,5%. Health stats show that Covid-19 infections were quite lower than in the other four to five districts. Instead, the causes of death are still HIV and TB in the age cohorts of 25 to 64. 67,3% of the population constitutes the working-age cohort (15-65) and 25% of children (WC Overberg Municipality 2020).

Education-wise, the literacy rate is quite lower than the average of the Western Cape, however, the matric pass rate is higher than in all other districts. The unemployment rate is noticed to be higher than that of the province. In terms of poverty, GDPR per capita is lower than province and other districts of the Western Cape. Income equality levels are below other districts and that of the province. It is known to be the utmost southerly tip of the continent- of Africa, furnished with temperate weather conditions. Heavy rainfalls are in winter, between June and August, whereas summers are just hot and a bit dry. The mild cold and mild hot seasons are between March to April (Overberg District Municipality 2019). The agricultural industry majorly focuses on grain production, farming cattle, blue crane, sheep and horses. Far East parts are also producing some berries, and honey and west ones have dairy and wine. Most land pieces are under private ownership and the rest is under government (through the municipality, Dept. Public works) (AgriSell 2018).

The racial profile shows that coloureds are 51,6% Blacks are 31,54% and Whites are 16,45%, and the languages spoken are Afrikaans, English and IsiXhosa (WC Overberg Municipality 2020). By just driving around, one could observe that the residents are highly dependent on agriculture while having limited availability of natural resources (far from water sources), vulnerable to floods and severe drought and limited to access economic opportunities. These seem to be old towns of South Africa fascinatingly with proper road infrastructure. They are

distant from each other, and where you find white or coloureds, rarely do you find blacks. Not to mention finding them in businesses and this signifies debris of a previous political construct.

Figure 9: South Africa- Western Cape Map

b) North-West- Mompati

A largely rural province with approximately 3,2 million citizens, the majority speaking the Setswana language. Bracketed by Botswana, Free State, Gauteng and Northern Cape. It is comprised of four district municipalities (Figure 10: North West map (municipalities n.d.). The mining economy contributes fifty percent of the North West's gross domestic product and offers more jobs than other industries. Minerals include platinum, diamond, and gold to mention a few. Agriculture stands with sheep, cattle, maize, citrus and cotton (North West Government n.d). The study targeted a small village, Taung of Dr Ruth Segomotsi Mompati district municipality, far from other villages, far from resources, and predominantly rural with scattered households. It has communal land, where most of the economic activities take place.

People have small plots for farming maize, barley, and livestock such as sheep and cattle. This is a summer rainfall area, most farmers rely on irrigation to grow their crops due to unreliable rainfall. The last records recorded that females were about 53% whereas males were about 47%, while the working-age group constitute 58,4%. The unemployment rate at 49,8%, on the other side people over 20 years old, 13,8% are without a matric, 19,8% with matric and 4.3% with post-matric education. Only ±7% with access to a flushing toilet, refusal removal, piped water and 92% access to electricity (Greater Taung Local Education 2019). This is a deep rural area, with dusty deteriorating gravel roads with low water bridges, fewer transport options (for that matter donkeys are still used as a mode of transport) and scattered villages. Farms are

owned by traditional authorities and mostly unfenced and some pieces are not well-divided into camps. Farmers are given small plots to work. Private owners own a huge size of land than the community. Traditions are still ingrained in citizens and tribal leaders enjoy some influence at the local level.

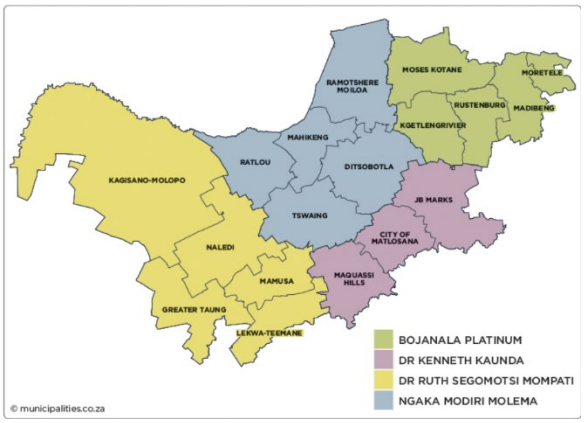


Figure 10: South Africa- North West Map

c) Gauteng- Johannesburg and Pretoria

An economic powerhouse, the urban smallest province of South Africa with three major metropolitan municipalities (Figure 11: South Africa- Gauteng (Nhamo 2021). Bracketed by North West, Limpopo, Mpumalanga and Free State. Approximately 75% of the population is black and 12-15% is white. The languages most spoken are IsiZulu, Sesotho, Afrikaans and English. Highveld with the temperate and warm climate, the rainfall average is estimated at 650mm per year (Britannica 2017). As urbanized as it is, mining (minerals such as platinum, gold, and iron ore to mention a few), financial services, communication, logistics, and agriculture (secondary and tertiary) are important industries. Educational and scientific institutes and manufacturing (food, electrical products, chemical products, metal products). Farming practised include grains like maize, barley and sorghum, other crops like peanuts, horticultural plants, and livestock such as dairy and beef (to mention a few) (Ritsbids 2022).

The study concentrated on a few grain institutions based in Johannesburg and Pretoria. While Johannesburg is more focused on industrial and commercial sectors, Pretoria is the administrative capital of the country and is where the head offices of many organizations are found. JSE and some important price-making, financial services organizations are based in Johannesburg (Joburg City 2018). Due to limited land, in 2010 it was reported that 90% of

cereals were imported. Since then Joburg city has attempted urban farming which includes modern hydroponics systems (rooftops) (UAI 2018). This is a densely populated city, has high stats of economically active citizens, and contributes 15% to South African wealth. From observation, roads are tarred but are not well maintained (Joburg City 2018). The majority of the people are staying in squatter camps, primary agriculture is not at the centre of the economy. Most of the inputs are transported from Durban to Johannesburg and later dispatched to clients. The land is limited, water and sanitation are a challenge, landfill sites are over-packed, and towns are not that unhygienic.

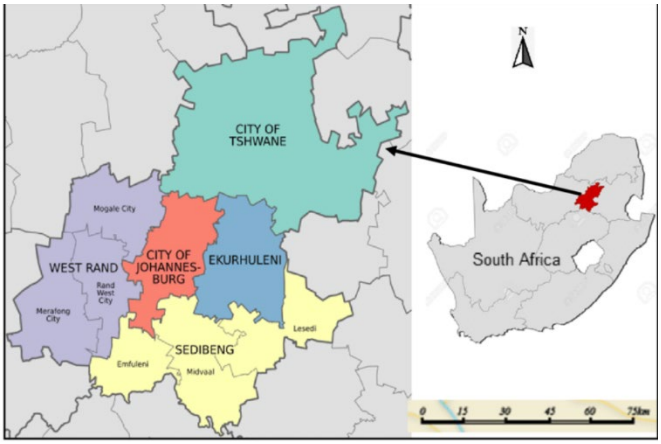


Figure 11: South Africa- Gauteng

3.4. Research Design and General Approach

This study employed the qualitative research methodology. Bhandari (2020) defines qualitative research as one that includes collecting and interpreting non-numerical data (for example text, audio or video) to understand phenomena or concepts, lived experiences or opinions. It is employed to gather important insights into understanding a problem or formulate new ideas significant for research. Incongruent, Goodman (2022) describes it as a process of naturalistic inquiry to pursue an understanding of social phenomena within a particular setting. It centres on the "why" of the phenomena and is grounded on the experiences of the participants.

Within the scope of the qualitative research approach, the diagnostic research design method was employed. As explained by QuestionPro (2022), a diagnostic research design is utilized by researchers to evaluate the underlying cause of the problem, subject or phenomena under investigation. It aids in learning more about the full picture of the situation and specific factors that make troublesome and messy situations. It includes three parts namely: inception (when/what), diagnosis (how, where, why and other influencing factors) and solution of the

issue. In addition, it helps to learn when is the problem is less noticeable and the consequences it likely to cause (Voxco 2021).

This study is primarily concerned with, how stakeholders (involved in production, processing, and marketing) are connected and the policies that are related and impact the production of grains. The purpose is to understand the phenomena of the key actors involved in the non-staple wholegrains networks of South Africa. The research design allowed a researcher to apply situation diagnostic tools in order to draw a conclusion.

3.5 Sample size and Sampling method

Initially there were no specific sample size because there was not easy to predict how many actors that the researcher will find. Hence the researcher was careful in selecting a suitable sampling methodology. A non-probability, snowball sampling technique renowned as chain-referral, was employed. The method is based on referrals and involves respondents nominating other potential respondents or primary data sources. It is used when the information about a particular subject is sensitive, difficult or rare to find (Dudovskiy n.d.). As such, the method was utilized to identify key institutions and relevant stakeholders in the wholegrains networks to participate in this study.

Using the snowball sampling method, the researcher approached the institutions like the Department of Agriculture extension office as key informants to help identify farmers. Farmers also helped with identifying traders, millers, financiers and input suppliers. The method helped to find other relevant stakeholders such as information institutions, assignees, trusts, pricing institutions and unions. After selection, the researcher extended an invitation letter via email (Appendix A) to invite potential participants, checking their availability and explaining the importance and the whole process. The follow-up and appointment arrangements were made telephonically. Not all actors were reachable nor were all willing to part take. Due to their unavailability, some parts of the investigation scope were compromised. Given these constraints, the sample size amounted to 25. For each area, it was through extension officer that would determine the number of actors available.

3.6 Data collection methods

A participatory tool, semi-structured interview one-on-one, and an interview guide with questions were utilized for data collection. Semi-structured interview (one-to-one dialogue) is defined as a data collection method or type of interview that includes asking a set of guiding questions and open-ended questions to guide the conversation instead of a strictly formalized

list of questions. The interviewer may further make follow-up questions to learn more about a particular subject (Doyle 2022). This type of interview allows two-way communication and comprehensive discussion between the interviewer and interviewee (Doyle 2022). After the identification of key informants (key stakeholders in the non-staple wholegrain products), the invitation was extended. The information sheet and interview guide (Appendix C) were disseminated. Before the first session, a letter of consent (Appendix B) was given to each participant. Due to lockdown restrictions, the researcher was unable to physically meet with all informants and many resorted to giving responses over the telephone. The ones the researcher met physically, their responses were audiotaped. The answers were expressed verbally to the researcher. For flexibility, the researcher allowed the respondents to respond in their local language (Afrikaanse- South African spoken largely by Dutch settlers' decedents), later translated into English. Data was recorded as words on transcripts. The researcher adopted an iterative stakeholder-led approach to building the knowledge base shown in Figure 12.

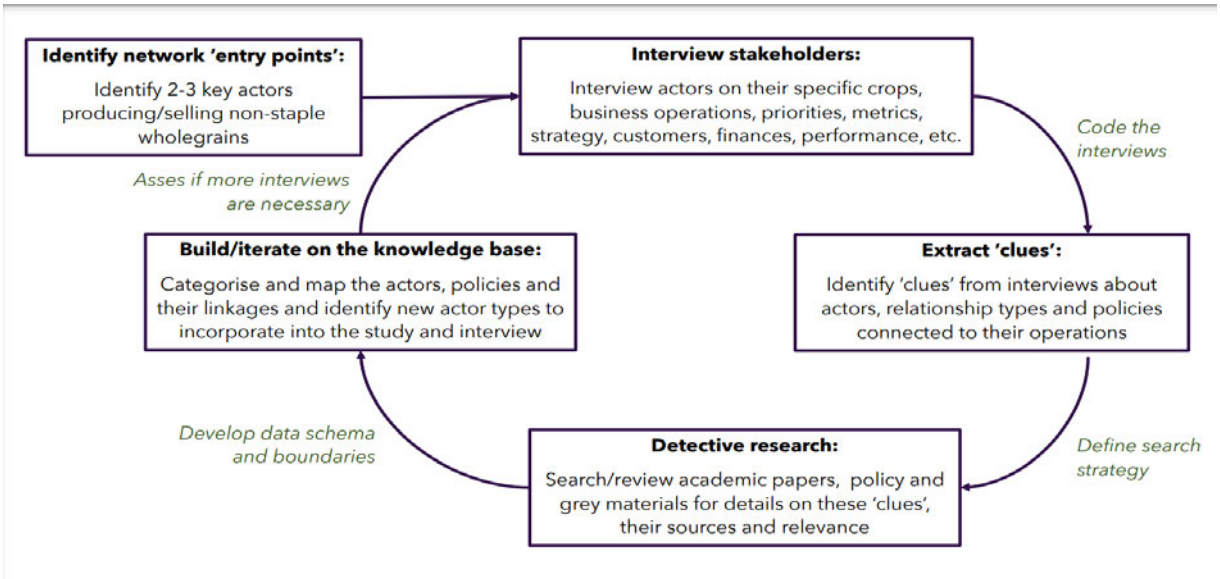


Figure 12: Iterative stakeholder-led approach

a) Interviews

The researcher held three in-depth sessions through semi-structured interviews in line with the different objectives of the study shown in Figure 13.

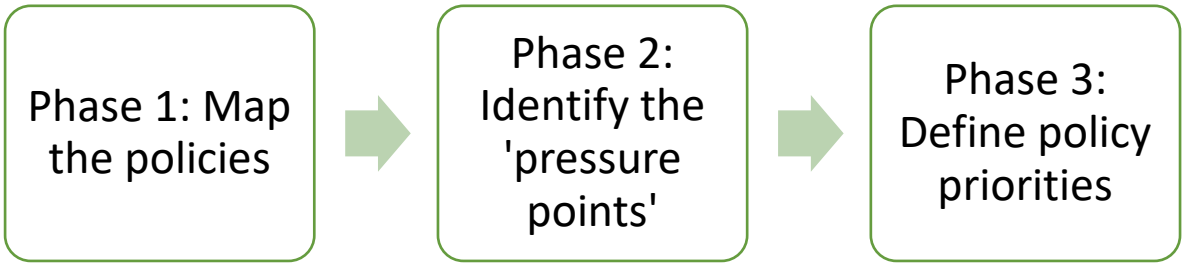


Figure 13: Interview and coding phases

Phase 1: Map the policies and actors.

This session was about questions on the micro-business environment which includes business operations, strategies, priorities, customers and partners.

Phase 2: Identify the 'pressure points.

This session was to track the relationship with other enterprises and government institutions. Important for gaining insights into how the actors (e.g., farmers) and enterprises sit within the wider non-staple wholegrain economy, the nature of relationships with outside actors and what government policies are relevant to one's daily operations.

Phase 3: Define policy priorities.

This session was about identifying and singling out the specific policies that are most impactful on actors' enterprise operations. Determining priority areas for policy reforms and action.

Due to COVID-19 lockdown restrictions, most of the interview sessions had to be telephonically, and/or compressed into a one-day event. The Focus group approach also failed for the same reason and farmers were not well equipped with technology, besides it was a harvesting season. On ethics, the ethical approval was granted through SHEFS (Appendix D). The ethical guidelines were set up in protection of the participants; participants were given consent form (Appendix B); were also permitted to participate on an anonymous basis and the research data remained confidential.

b) Desk Review (Policy Analysis)

The Desk Review Approach was employed. This approach refers to assessment which evaluates the population data's completeness, internal consistency, external comparability and external consistency (WHO 2023). In reviewing policies, the researcher developed a policy critique tool that covers the vision of each policy, the actual philosophy behind the policy, gabs and necessary amendments. Policies related to wholegrain farming were accessed from the Department of Agriculture (DALRRD) and DAFF websites). This was collected as part of secondary data. This was to give a glimpse summary from the existing policies and their effectiveness. During the phase of mapping policies, patterns were drawn and policy linkages were discovered from the primary data collected. Thereafter, the policy proposals to address the constraints and barriers were furnished benchmarked from developing countries that mainstream non-staple agricultural products.

3.7 Data analysis methods

Thematic Content Analysis was used, which is described as the presentation of qualitative data. Such data is derived from transcripts collected, including videos, and images in a form of or accompanying textual data (Anderson, 2007). The data collected was organized through a coding system and into themes. Thematic analysis is employed in qualitative research to analyse text, and non-numerical data by identifying and examining themes and patterns (Caulified 2020). The extension carousel was also used to present the data set. For coding interviews, the researcher used a spreadsheet (Microsoft Excel) and extension tools to determine actors, policies from the literature review, and data set for the knowledge base. Visualisation of the knowledge base based on key findings is developed using graph theory, Venn diagram and influence diagram. Digital graphic design (Photoshop cc2019) was a software used for drawings.

A theory/network graph is defined as a representation of asymmetric or symmetric relations between items. It is a powerful diagnostic tool to conduct the investigation and it delivers an improved understanding of the breakdown of complex networks or systems (Mukherjee 2019). For the policy mapping of this study, the graph theory was used to create a prototype of a knowledge graph of all of the connections. Included policy and people involved but as items, not as concepts.

A Venn diagram is defined as the diagramming style used to portray logical relations between items or sets (m 2022). For this study, it was used to summarize the results from interviews.

To visualize specifically the farmers' direct communication and connection with other stakeholders. An influence diagram is defined as a diagnostic tool that is extracted from the exploration of different parts involved in a real-world situation. It indicates the influence one element has on the other in the situation. Arrows are used to indicate the relationship or interconnection of items (Hudson 1997). In this study, it was used to visualize the series of activities happening in the wholegrain sector that influence the production of grains.

3.8 Reliability and Validity

This is qualitative research, reliability involves the stability of insights coded from the data sets. It is backed by the field notes details, other recorded contents and transcribed digital files. At the centre of reliability and validity is trustworthiness, this include criteria such as credibility, authenticity, criticality and integrity. Credibility is interpreted as accurate interpretation of participant's responses. Authenticity refers to audibility of the recordings. Integrity can be interpreted investigators self-critical (University of Miama 2020). The researcher ensured that key notes were taken during interviews, all interviews were recorded and are available. The code and themes reflect the data contained in those recording and participants were actors in the wholegrains sector. The data was interpreted correctly (refer to data analysis tools: Venn diagram, influence diagram and policy map). All recordings are clear, what one must indicate is that they are in Afrikaans language. When translated into English, Google translator was used and Ms Genete (Afrikaans teacher) ensured that raw content is preserved.

3.9 . Ethical consideration

The imperative standard that study upheld is autonomy. Which emphasizes the regard of privileges and rights of the respondents partaking in the research study (Orb 2001). Individuals were given consent letter and right to participate as anonymous status. Another standard that was upheld to, is Beneficence. This standard include ethical commitment while ensuring the welfare and safety of participants (Cummings & Mercurio 2010). The researcher ensured everything was transparent, and met the participants at their space of comfort (farms and homes). Justice elements which refers to ensuring fair treatment and right to privacy (Owonikoko 2013). When invitation was extended to participants, it was highlighted that they are allowed to pull-out or reserve information if deemed sensitive and to give a feedback if they are unhappy with treatment.

3.10 Critique of methods and processes

In snowballing methodology, data of large amounts could be unmanageable and hard to determine sampling error. Respondents are hesitant to provide key information, including contact details. The whole data is more qualitative than quantitative. Managing data manually and recording a large amount of data and putting it through a coding system and further breaking it down into themes is time-consuming. The data is subjective because it is about estimations, not exact figures or straightforward answers and the researcher decides on what is relevant to the topic.

References

AgriSell, 2018, 'Overberg Area Information', from https://www.agrisell.co.za/area-profiles/overberg/

Anderson, R., 2007, 'Thematic Content Analysis (TCA) Descriptive Presentation of Qualitative Data', *Institute of Transpersonal Psychology* from https://rosemarieanderson.com/wp-content/uploads/2014/08/ThematicContentAnalysis.pdf

Bhandari, R., 2020, 'What is Qualitative Research | Methods and Examples', *SCRIBBR*, from https://www.scribbr.com/methodology/qualitative-research/

Britannica, 2017, 'The Editors of Encyclopaedia. "Gauteng". Encyclopedia Britannica', 12 Apr. 2017, https://www.britannica.com/place/Gauteng. Accessed 7 July 2022.

BusinessTech, 2022, 'Nearly a quarter of South Africa households depends on grants as the main source of income: Survey', from https://businesstech.co.za/news/government/599784/nearly-a-quarter-of-south-african-households-depend-on-grants-as-main-source-of-income-survey/

Caulified, J., 2020, 'How to do Thematic Analysis', *SCRIRP* from https://www.scirp.org/(S(vtj3fa45qm1ean45wffcz5%205))/reference/referencespapers.aspx?referenceid=2746367

Cummings, C.L. & Mercurio, M.R., 2010. Autonomy, beneficence, and rights, *Pediatrics in Review* 31, 252-255.

Doyle, A., 2022, 'What is a Semi-structured Interview?', *The balance,* from https://www.thebalancecareers.com/what-is-a-semi-structured-interview-2061632

Dudovskiy n.d., 'Snowball Sampling', *Business Research Methodology* from https://research-methodology.net/sampling-in-primary-data-collection/snowball-sampling/

Goodman, D.V., 2022, 'Qualitative research and the modern library', *ALA Libraries* from https://pdf.usaid.gov/pdf_docs/PBAAA009.pdf

Greater Taung, 2019, 'Greater Taung Local Municipality', from https://municipalities.co.za/financial/1196/greater-taung-local-municipality

Hudson, J.R., 1997, 'Using diagrams in Systems Thinking', from https://johnrhudson.me.uk/systems/Using_diagrams_in_systems_thinking.pdf

Joburg City, 2018, 'Work in Joburg- Economic Growth', from https://www.joburg.org.za/work_/Pages/Work%20in%20Joburg/General%20Advice/Links/Economic-Growth.aspx

Katherine Hall, 2019, 'Income poverty, Unemployment and Social grants', *the University of Cape Town* from http://www.ci.uct.ac.za/sites/default/files/image_tool/images/367/Child_Gauge/South_African_Child_Gauge_2019/CC/CC2019%20-%20Income%20poverty%2C%20unemployment%20and%20social%20grants.pdf

Kenton, W., 2022, 'Venn diagram', *Investopedia- Dotdash Meredith* from https://www.investopedia.com/terms/v/venn-diagram.asp#:~:text=A%20Venn%20diagram%20is%20an,and%20differences%20between%20two%20concepts.

Mukherjee, S., 2019, 'Graph Theory', *ScienceDirect,* from https://www.sciencedirect.com/topics/earth-and-planetary-sciences/graph-theoryolade

Municipalities, n.d., 'North-West Municipalities' from https://www.google.com/url?sa=i&url=https%3A%2F%2Fmunicipalities.co.za%2Fprovinces%2Fview%2F8%2Fnorth-west&psig=AOvVaw2YZCvkBeQXQALM2aK7x02R&ust=1673386028979000&source=images&cd=vfe&ved=0CBAQjhxqFwoTCPDTgfC2u_wCFQAAAAAdAAAAABAJ

Ncube, B., 2022, 'Map showing Overberg and West Coast Districts, Western Cape', *ResearchGate* from https://www.researchgate.net/figure/Map-showing-Overberg-and-West-Coast-Districts-Western-Cape_fig1_358221192

Nhamo, L., 2021, 'Gauteng Province showing metropolitan areas', *ResearchGate* from https://www.researchgate.net/figure/The-Gauteng-Province-showing-the-metropolitan-areas-which-include-Johannesburg-Tshwane_fig1_351811824ris

North West Government, n.d., 'Mineral resources', from http://www.nwpg.gov.za/

Orb, A., Eisenhauer, L. & Wynaden, D., 2001. Ethics in Qualitative Research, *Journal of Nursing Scholarship* 33(1), 93-96.

Overberg District Municipality, 2019, 'Profile & Analysis: District Development Model', from https://www.cogta.gov.za/ddm/wp-content/uploads/2020/11/Overberg-DM-September-2020.pdf

Owonikoko, T.K., 2013. Upholding the principle of autonomy, beneficence and justice in phase 1 clinical trials, *The Oncologist* 18(3), 242.BN

Pinterest, n.d, 'Provinces, Geography for kids, South African map', from https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.pinterest.com%2Fpin%2F515591857325598844%2F&psig=AOvVaw1KBKukRSuOwr_dLsTWpe6K&ust=1673385061733000&source=images&cd=vfe&ved=0CBEQjhxqFwoTCPC9uqOzu_wCFQAAAAAdAAAAABAK

QuestionPro, 2022, 'Research Design: What it is, Elements and Types', from https://www.questionpro.com/blog/research-design/

Ritsgids, 2018, 'Economy of Gauteng', from https://www.southafrica.to/provinces/Gauteng/economy.php#:~:text=The%20major%20industries%20are%20appliances,motor%20vehicle%20parts%20and%20accessories.

Thompson, L.M., Gordon, D.F., Cobbing, J.R.D., Vigne, R.L., Christopher C. , Hall, M.B., Colin J., Mabin, A.S. and Nel, A., "South Africa". Encyclopedia Britannica, 3 Apr. 2022, https://www.britannica.com/place/South-Africa. Accessed 9 April 2022.

UAI, 2018, 'Urban Agriculture Initiative', *Inner City Partnership* from https://www.jicp.org.za/urban-agriculture-initiative/

University of Miama, 2020, 'How is validity and reliability are realized in qualitative research' from https://sites.education.miami.edu/statsu/2020/09/22/how-is-reliability-and-validity-realized-in-qualitative-research/#:~:text=Reliability%20in%20qualitative%20research%20refers,terms%20than%20in%20quantitative%20research.

Vigne, R.L., Christopher C. , Gordon, D.F., Nel, A., Mabin, AS., Cobbing, Julian R.D., Hall, M.B., Colin J. and Thompson, L.M., "South Africa". Encyclopedia Britannica, 3 Jul. 2022, https://www.britannica.com/place/South-Africa

Voxco, 2021, ‘Research Design: Definition, Methods & Examples’ from https://www.voxco.com/blog/research-design/#:~:text=In%20a%20diagnostic%20research%20design,creating%20problems%20in%20the%20company.

WC Overberg Municipality, 2020, ‘Socio-Economic Profile’ from https://www.westerncape.gov.za/provincial-treasury/files/atoms/files/SEP-LG%202020%20-%20DC03%20Overberg%20District%20Municipality.pdf

CHAPTER 4

AGRICULTURAL POLICIES AND STAKEHOLDERS' INFLUENCE ON NON-STAPLE WHOLEGRAIN FARMERS' COMMITMENT TOWARDS ENVIRONMENTAL, NUTRITIONAL AND EQUITY OBJECTIVES

Abstract

Increasing the production and improving the accessibility of diverse wholegrains would be environmentally and nutritionally beneficial, however, that depends largely on the enabling policies and actors in the grains network. Currently, there is only a marginal of diverse wholegrains produced, available and accessible. This paper explored and examined the policies and stakeholders' influence on wholegrain farmers' behaviour towards sustainable development priorities and aspirations. Equally, focused on identifying how policies and actors in emerging wholegrains economies hinder or help the increased production of non-staple wholegrains in a way that may go against environmental, nutritional and equity objectives. Primary data was collected employing semi-structured interviews with 25 respondents through snowballing sampling. As part of the data analysis, thematic content analysis, graph theory and Venn diagram was utilised. The influence of policies and stakeholders was tracked against these extension carousel elements.

This part of the study revealed that non-staple wholegrains are continuously underutilised because of the overarching agricultural paradigm that rewards the maximisation of yield and proceeds at the expense of crucial sustainable development objectives. At the centre of this, is the influence investors have on financers and equally the financers on farmers. Other concerning relations include the farmers and marketing agents, extension agents, land owners, and input suppliers. Policies with influence include Marketing, Financing and Land acquisition policies. The study found a poor connection between processors and farmers, also found few Africans (in general) in the industry and none were women. Policy reforms and amendments are recommended to facilitate the participation of the stakeholders in the sense that the environment would enable increased production, availability and affordability of the non-staple wholegrains.

Keywords: Policies, Stakeholders, Non-staple wholegrains and ENE objectives

4.1 Introduction

A diverse wholegrains production and consumption is a major step towards sustainable agriculture and sustainable development. Sustainability is helpful in striking a balance between the pressing call for sufficient food production and the conservation of environmental ecosystems (Das *et al.* 2020). Observing the need to feed the ever-growing global population while mitigating climate change effects, sustainable agriculture can play a vital role (Maryville University 2021). It has been noted that in South Africa, the agricultural sector is a significant driver towards biodiversity loss, irresponsible water usage and environmental degradation through high reliance on the over-use of chemicals and artificial fertilizers to increase productivity and control pests, weeds and diseases (WWF 2017). On the other side, World Bank conveyed that agriculture is a major driver of global greenhouse gas emissions, contributing up to 30% (Maryville University 2021).

In addition to that figure, FAO (2017) estimated that by 2050 the world population would have increased to 9.6 billion. To meet the ideal daily calorie intake of that population size, more than 70% more food will be required compared to one currently being produced. Clearly, there is a need to consider sustainable practices in reducing agriculture's impact on the environment while increasing productivity to provide for the growing world population (Maryville University 2021). UC Davis (2021) described sustainable agriculture as a system that considers integrating trio core objectives, a healthy natural environment, profitability and economic and social equity. In short, the application of methods that are environmentally friendly, minimizing wastage and strengthening the economy. Each and every actor in the food system has to play in promoting sustainable food and agricultural system. The actors include, researchers, policymakers, extension officers, unions, input suppliers, producers, processors, transporters, retailers, consumers and many more (Liliane 2020). Beyond the application of the aforementioned practices by these different actors, it must be noted that in the process there is a contestation of power to influence.

It is a push and pulls between the opposing interests of an individual actor and/or other actors involved as they strive to meet their business objectives. At the centre of the food system is the interaction of the above-mentioned actors with different and often conflicting goals. As the dynamics change in politics, technologies, economics and social wise, the relationship and power relations too, shift among these stakeholders. Again, government policies play a role and often impede the targets of sustainability (Feenstra *et al*. 2021). What is critical is the

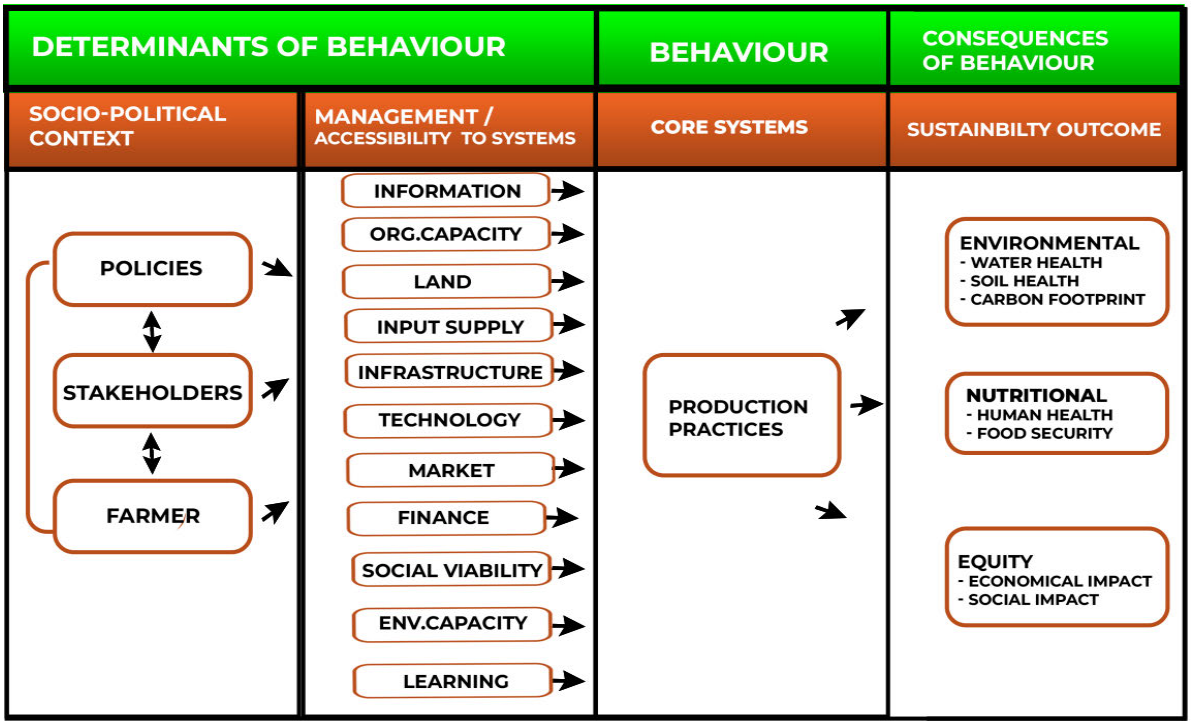
evaluation of, to what extent and how these actors' participation leads to the adoption or resistance to sustainable practices (Sarkar *et al.* 2022).

Against this background, this study explored the participation of actors that are growing, processing, and marketing the non-staple wholegrains as well the role policies play in impacting the production of crops and pressurising or incentivising actors in the emerging wholegrains economies that directly or indirectly lead farmers to behave in a certain way that may go against environmental, nutritional and equity (ENE) objectives.

4.2 The conceptual framework for exploring relationships involved in policies and stakeholders' influence towards sustainability

The study incorporates components of Sustainable Food Systems, Extension Learning Carousel and Behaviour analysis. This paper then discusses frameworks as a basis for crafting a framework for exploring the policies and stakeholders' influence on farmers' behaviour which may undermine sustainability targets. Based on the mentioned models, the conceptual framework below was developed, to show inter-relationship and major factors influencing the behaviour of actors and impact.

Elements connected in the wholegrain production system.



Sustainable Food Systems

Food systems comprise various actors (input suppliers, producers, food-chain actors and product consumers) interlinked and involved in the food value-chain activities (from input

supply, production, processing, transportation, retailing, consumption and disposal) and their orientation in terms of social, political, economic and natural environments. This mostly covers the triplet industries, agriculture, fisheries and forestry (FAO, 2018). IFPRI (2022) highlighted that the food system ought to encompass the enabling policy environment, above cultural norms, and consider environmental sustainability, nutrition security, inclusivity, productivity and efficiency (affordability enhanced). That is where the concept of 'Sustainable Food Systems' sprung up, that the ideal food system would make provision for equitable access to sustainable nutritious diets in economic, social and environmental sustainability (FAO,2018).

This approach is situated at the centre of the United Nations SDGs. SGDs suggest intense shifts in agriculture and food systems and that at least by the year 2030, secure sustainable food production systems, improve nutrition, apply resilient agricultural practices that proliferate production and productivity, maintain ecosystems, improve capacity for adaptation to climate change, natural hazards and other disasters and successively strengthen land and soil quality (FAO 2015). Apart from trends, the conduct of various actors is used to measure the performance of the food system in terms of sustainability. This is through economic, social and environmental dimensions. On the economic aspect, positive results reflect the viability of actors' activities, equity in the distribution of economic benefits in relation to income (wages), profits for entities and taxes. On the social aspect, positive results reflect the social value and economic profits, enhancement of human health, nutrition, cultural norms and working conditions for all disadvantaged groups. On the environmental aspect, positive results reflect the actors' activities positively impacting the natural resources and biodiversity (FAO 2013).

The framework takes into account, all the systems interrelated, interconnected and interdependent. The theory of change, which is the foundation of a sustainable food system was utilised to prove that change in one system influence change in other systems of the food system. Equally, food-chain actors influence one another's capacities and incentives. In this case, the interest lies in actors intendedly and unintendedly influencing one each and the impact of that influence on the production (FAO 2018). Food value chain activities are subsystems of food systems. Out of all subsystems of the food systems, this study elected a farming system since the focus is on the production of whole grains. To demystify the concept, the farming system is defined as a set of interrelated farming components and practices executed with resources at the farmer's disposal in pursuit of maximizing productivity and farm income. While a farmer's decision-making, control and choices are the centres of the system, to some

extent the influence is exerted by social, political, institutional, and economic forces. The subsystems of the farming system include input supply, land, labour and capital, to mention a few (Kareem 2021).

This framework (sustainable food systems) categorically covers components namely natural elements, societal elements, core systems, the behaviour of diverse actors and sustainability performance. Arguably, the framework does not explicitly express the structures and systems that influence each actor's capacity. Factors important for modern agriculture, such as the capacity to engage information, technology, infrastructure and learning. On sustainability performance, above and beyond the impact of farming and other activities, it is important to observe the role, actors ought to perform in promoting sustainability.

Extension Learning Carousel

As a way of improving extension in relation to the welfare of the under-resourced smallholder producers, the Agriflection model was put forward. This model is attached to Facilitated Learning Agenda, it was brought as an improvement measure to the extension facilitation approaches. The model draws attention to the element of learning in extension engagement, building agricultural actors' capacity through an ongoing process of investigation, application and sharing feedback with actors. The model proposes that actors (farmers, extension officers, policymakers and researchers) should engage in equal partnership for the purpose of continuous improvements and learning (Worth 2006). Given that Facilitated Learning Agenda in Agriflection was not explicitly detailed to cover its components, the idea to design an approach that will unequivocally express the content of the learning agenda was conceived-that framework was named extension carousel (Worth 2014).

The extension carousel encompasses three major aspects namely, i) management, ii) production and iii) economics. Management elements include managing information and organisational capacity; production elements include managing land, input supply, infrastructure and technology and economics include managing finance and market(ing). In addition, social viability, environmental sustainability, and the learning process include innovation, systems thinking and development paradigm (Worth 2014). Arguably, important elements such as policy engagement and application, and management of labour are not immediately visible in this framework.

Behaviour analysis

At the centre of this study, is policy and actors' behaviour which influences other actors' behaviour in relation to increasing wholegrain production in breach of the sustainability targets. The behaviour analysis model is used to show the relationship between determinants of behaviour (variables), behaviour and consequence of behaviour in agricultural development. This model helps to understand and predict complex human behaviour (Duvel 1991). This study points out the policies and food chain stakeholders and the access to agricultural systems as determinants of farmers' behaviour. Production practices as the behaviour and sustainability outcomes as the consequence of behaviour.

4.3 Results presentation through Extension Carousel

Findings from the data set

The 25 participants shared their insights about grain production. Results are presented through the extension carousel. Table 12 shows the profile of the respondents (farmers, market agents, government and NPO), where their level of education is located, and placements in terms of age, gender, race and land ownership. One can observe that the majority of smallholder wholegrain actors are literate, elderly, male and Coloured. The leased land is too small for grain production.

Table 12: ***Background of respondents***

Type of stakeholders	Farmers 12/25	Market agents 4/25	Gov/NPO 9/25
Level of education	Primary/Sec.=91,7% (11) Tertiary=8,3% (1)	Primary/Sec.=0 Tertiary=100%(4)	Primary/Sec.=0 Tertiary=100% (9)
Age	35-50=58,3 (7) 51-65=41,7 (5)	35-50=75% (3) 51-65=25% (1)	35-50=77,8%(7) 51-65=22.2% (2)
Gender	Male=100 (12) Female=0% (0)	Male=75% (3) Female= 25% (1)	Male=55,5% (5) Female=44,5% (4)
Race	African= 8,3% (1) Coloured=66,7 (8) White=25,03% (3)	African=25% (1) Coloured=50% (2) White=25% (1)	African=55,6% (5) Coloured=22,2%(2) White=22,2% (2)
Ha leased	1-99ha=8,3% (1) 100-500ha=50% (6)		

	501-1k ha=16,7%(2) 1001-3000ha=0
Ha owned	1-1000ha= 16,7% (2) 1k -3k ha=16,7% (2)

Presentation tool and analysis of results

Extension Carousel of learning diagnostic tool would be employed to present the findings of this study. Carousel comprises three major aspects management, production and economics. Management elements include managing information and organisational capacity; production elements include managing land, input supply, infrastructure and technology and economics include managing finance and market(ing) (Worth 2014). The criteria are that for each element, one explores the dynamics (situation outlook), policies-related issues and stakeholders involved (how their participation make farmers behave in a certain way that might be either curtailing production or working against ENE objectives.

Management

i) Information

The concept of information for this work refers to farmers' ability to collect information, process and apply that information for their farm operations, interpret and utilize that information to make decisions, reflect on processes and share newly generated information. Farmers must be able to consult, gather and compare the information they would have acquired. Information is critical for every farm aspect, production, management and economics as per the carousel of learning (Worth 2014).

In this case, for market information, the market agents supply farmers with market information on future market prices, market supply and demand for the grains. Farmers use this information to determine how much to plant each season e.g wheat is in demand prices and prices are good, so farmers would plant more wheat than barley. Sometimes the market information on commodity supply and demand mismatches the farmers' crop rotation plan. The majority of the farmers said that striking a balance between the demand and the initial plan is difficult (if not impossible) because farmers need more profit for them to be able to run their operations. The main stakeholders involved in the dissemination of information, are SAFEX, GrainSA,

NAMC, Unigrain, Farmsol., Overberg Agri. and DALRRD. These institutions have agricultural extension officers, agricultural economists and market activists.

Most smallholder farmers are surrounded by commercial farmers, with whom they enjoy no relationship. They only meet once in a long while, through farmer's day programs or on Dept. invitations to discuss issues at hand. Otherwise, other stakeholders deliver the information to each farmer, registered with them. Noticeably, farmers have little to no opportunity to investigate on their own, to command what information is relevant to their situation, instead are sensitized to the production and market(ing) aspects in terms of systems and structures to adopt.

ii) Organisational Capacity

Here we refer to farmers' ability to engage, command and manage all the farm operations with the least support from external actors. Timing of processes (when to buy inputs, plant, maintain the plants and harvest) and managing structures and systems is fundamental for farming. The concept further explains farmers' ability to organise, plan, implement, monitor, and reflect on management operations (Worth 2014).

Grain farmers engaged show a fair understanding of the conditions they are growing crops and the resources at one's disposal. The crop requirements in terms of soil, climate conditions, and water (availability, need for supplements). They set timeframes for all important processes of their operations. Stakeholders such as the Dept. of Agriculture help with extension services (skills training, knowledge), a few commercial farmers have volunteered to mentor smallholder farmers in many aspects incl. the selection of vendors and clients, and other market agents such as Overberg Agri. and FARMSOL Holdings help them with knowledge. Part of the challenge is that the resources ordered, are not delivered on time, which delays the processes. Another element is that the grains industry is enclosed and well-coordinated, this implies that farmers enjoy a limited command over the marketing system. There are fewer buyers, a farmer needs to secure a contract before planting.

Production

i) Land

In this context, the land is referred to as a field on which grain product is grown. Farmers' capability to manage the dynamics associated with land, from sourcing to appropriate usage of it. Other aspects include land availability, land size, productivity, suitability and property

ownership. The stakeholders' involvement in facilitating farmers' access and in ensuring productive use of land (Worth 2014).

Access to land is a major challenge for a majority of respondents. Small-scale farmers could only lease as little as 20ha to 700ha piece of land and few are in ownership of 620ha to 2700ha piece of land. Municipalities prefer to give large pieces of land to livestock farmers than grain farmers. Grain farmers have access to small-sized land (too small to expand production with the cultivars they are using) and make fewer returns. The Dept. of Agriculture argues that state-owned land is outnumbered by privately owned hence farmers are given 50-80ha.

Once the land leasing contract lapses, the land is taken back to the market and the farmer must bid again, so the land tenure maximum period is short for long-term aspirant farmers and not guaranteed a second chance to work that same land. Farmers then are not motivated to invest in sustainably utilizing the land. Even if a farmer happens to secure a contract again, the rent would have gone up. Smallholder farmers compete for land than for the market. Commercial farmers have vast land, left fallow. Sometimes land leased, is not conducive to grain production. Many farmers said that leasing is too expensive, figures range from R3000 per ha for each year so in case a farmer leases 620ha that would mean, a farmer spent approximately R1,860,000. *Trends*: In inland provinces (Gauteng the most), white farmers are relocating to the Western Cape and are willing to purchase the piece of land at any given value.

ii) Input supply

Inputs include grain seeds, fertilizers, pesticides and fuel and machinery. Here one explored the farmers' aptitude to access, select, and evaluate the input important to their farm enterprise as well as to share the reflections with other stakeholders for further input improvement. The focus was located on dynamics and stakeholders' involvement that shape farmers to respond in a particular way that impacts production (Worth 2014).

Input cost is a major concern for all respondents. Prices are unreasonably and increasing unprecedentedly. One farmer argues that diesel eight of five litres was R7800 (in Sept. 2021) which has gone up by 60%. Repairs and maintenance costs are high. The average estimation is that 25% of the input cost is for land leasing; 50% for fertilizer, diesel, seeds and pesticides; 25% for machinery. On input availability, most of the inputs are imported, due to the demand,

in most cases, international suppliers have limited options for fertilizers, seeds, and spraying chemicals and due to this limit farmers would have fewer options but take what is available and later that affects the soils. The other thing, ports are congested, no trains to transport inputs. With poor road infrastructure, transporting the products (estimated at two million tons of fertilizers) over long distances is extremely difficult.

iii) Infrastructure

For the functioning of the farm enterprise, there are essential facilities, systems and services needed to be put in place. Of interest is farmers' ability to manage those facilities, systems and services, making decisions about selection, requirements, improvement and evaluation. Further, access to infrastructure, quality of infrastructure and stakeholders' involvement shape farmers' responses in a particular way that impacts production (Worth 2014).

Most smallholder farmers do not invest much in infrastructure since they are not owning land property. They are leasing for nine years, and eleven months. However, they need a small office to keep all records and a workshop or shelter where tractors, sprayers, planters and harvesters are housed. On-road infrastructure can be attributed to rural roads with soft surfaces, dirt and narrow widths and low-lying bridges. Transportation of inputs and products is difficult. Most farmers rely on privately owned silos which are very expensive. It is better to plant the least so you can sell all at once.

iv) Technology

Technology includes equipment, methods and systems employed to produce grain crops. Farmers' capability to select, operate/utilize technology systems and evaluate their efficiency, and effectiveness. The concept captures the availability, accessibility, affordability and suitability of technology systems relevant to farm operations (Worth 2014).

A significant number of farmers have been assisted by the Dept. of Agriculture through financial assistance programs to purchase machinery. On the other hand, several farmers still depend on renting machinery from contractors. Grain farmers are sourcing material and equipment from organisations such as FARMSOL Holdings, and Overberg Agri. These organisations also loan grain farmers to purchase, service and maintain planting and harvesting technology. This is another major cost area for grain farmers, however, there is a commitment to keep on investing in technology. The challenge is that machinery is imported and is not

always available, and that pushes farmers to place an order a year in advance. Machinery is sometimes delivered late and that delays planting and/or harvesting. Farmers from inland provinces, plant under summer rainfall conditions, hence they utilize irrigation. The irrigation schedule is disturbed by power cuts (load-shedding). Power suppliers are overcharging farmers.

Economics

i) Market(ing)

This concept refers to farmers' capability to access the market, produce marketable products and comprehends imperative elements of their markets and opportunities to command systems and structures associated with their market. Ability to engage with market agents and take informed decisions (Worth 2014).

On profit leader, a slight shift from barley to wheat has been noted. Barley is mostly purchased for brewing by SAB/AB InBev whereas wheat is mostly used for human consumption. On the other side, the profit loser is oats since it has a small market. One producer stated that out of 1500ha, only 65ha is allocated for oats (precisely 4%). Farmers claim it is risky to grow grains hence they seek backup enterprises such as livestock (beef cattle) to boost cash flow. Those with livestock, allocate 45- 55% piece of the land for livestock and 40-50% for grains. Pricing of grains and marketing policies accord international markets to determine grain prices. Farmers are price takers of inputs and their products. Transport differential prices, make buyers prefer imports over purchasing from local producers.

ii) Finance

This concept refers to farmers' capability to source financial resources, acknowledge the needs of the enterprise and make budget allocations per those needs and be accountable for each cent the enterprise spent. Ability to where (institution) and how (the process) to seek funds, where (expenditure) and when (season) to spend and the profitability (Worth 2014).

Access to finance is the single most challenge, farmers lack collateral/ security to secure loans. Those who can access loans allege that development banks (Land Bank) operate exactly like commercial banks, in terms of eligibility criteria, interest rates and repayment plans (terms and conditions). Land Bank claims that they are funded by private investors that impose their terms and conditions, however, farmers are given flexible collateral options. On government support,

no subsidies and constant investment, however, there are programs to financially support farmers for 3 to 5 years. The government does not support farmers buying the property and generally takes a long time to approve funds (too much information is required). Delivery of inputs clashes with farmers' timeframes (planting seasons). Government officials make empty promises during crises (drought, floods or COVID). Dept. of Agriculture claims that farmers lack self-reliance and keep on seeking funds. Other, mentors are not giving smallholder farmers enough support. The government is accused of appointing inexperienced assignees for quality assurance and food safety and overcharging farmers (appointee: LEAF SERVICE)

Social viability

Social viability refers to matters related to cultural heritage, promotion of social cohesion, equity and observation of labour laws. In the context of the study, the researcher explored the extent to which the farm enterprise or farm operations strengthen the social fabric, reducing poverty or inequality and whether or not, they are viable and acceptable in the local traditions and promote social cohesion. Another concern marked is whether a farmer can manage the matters regarding social context and extension role in that regard (Worth 2014)

The key stakeholders identified are market agents, extension workers and farmers that contribute to social viability. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information work. The majority of the farmers indicated that although it is culturally accepted to grow grains in the communities of South Africa, the fact that a) grains cannot be consumed as fresh produce b) local people cannot process grains with resources at their disposal such as maize grinding machine c) local people have little information on how they can utilise grains to their advantage d) and most of the grains are not associated with any modern African traditions except sorghum used for traditional beer (*umqombothi*), makes it hard for non-staple grains to assume their rightful place in South Africa. Farmers observe labour laws but are unsatisfied with labour productivity. The market and extension agents are of the view that the grain industry is slow regarding transformation and social cohesion. The industry is still White-Male dominated, from farmer to retailer. Of the sampled participants, only one was African and none were women. On the other hand, commercial farmers act as mentors to smallholder farmers but to an extent, smallholder farmers feel like these mentors are not providing adequate aid as they are seen as future competitors.

Environmental Sustainability

The concept of environmental sustainability here is referred to as the farmers' willingness and ability to ensure compliance with environmental legislation and manage the conversation of natural resources at their disposal. Another important area is the role of extension in ensuring the protection of natural resources and being of service to improve farmers' capacity (Worth 2014).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to environmental sustainability. Policymakers make laws for environmental protection. Market agents and extension workers are involved in searching and sharing information with the farmers on conserving the environment and all the natural resources at one's disposal. The farmers are involved in making that information work. Most farmers stated that it is close to impossible to apply all sustainable agricultural measures (such as minimum tillage, organic fertilisers, and little or no agricultural chemicals) unless you are practising subsistence farming. The grains need big machinery from production to processing. The short land tenure makes farmers apply more fertilizers to maximize the yields so that by the time tenure ends, the farmers would have made fairly enough profit. The shortage of fertilizer supply from international suppliers, makes farmers have fewer options on what to put on the ground. The demand and supply of grains compromise the crop rotation plan. So environmental sustainability is compromised in this context. However, the extension officers from the Dept. of Agriculture from time to time hold sessions with farmers to engage about matters related to the subject. Climate change poses a threat, some seasons are either too wet or too dry. Cultivars that can produce high yields on small-sized are scarce. Educating about environmental legislation and other means to secure the same profits, when applying sustainable agriculture is necessary.

Learning

In this context, we refer to learning as the farmers' willingness and ability to continue with the ongoing process of learning from their experience and the outsiders, the adoption of newly discovered practises and technologies. Under the umbrella of learning, other processes namely innovation, systems thinking, and development paradigm are observed. This element also put focus on stakeholder-to-stakeholder learning (Worth 20214).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to the learning process. Policymakers make laws that guide the working environment and production. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information work and share feedback with the market/extension agents (whether the information has worked). From the responses of many different stakeholders, the sharing of information or feedback process is linear. The policymaking institutions share new information with extension officers, then they share it with farmers. Farmers are seen as end-users or consumers of information with little or no space to share feedback or their own experiences. Ordinarily, farmers have little time to spend with extension officers, besides given formal qualifications of the outsiders, there is the mentality that they know more than the farmers. The building capacity of farmers has not been adequately delivered. Farmers' capacity to innovate is linked to the advice given by the extension workers. In problem-solving, they rely on their expertise. In decision-making, they rely on the information given by extension workers. There is a need to work on developing farmers' capacity.

4.4 Analysis

Thematic analysis

Key Codes	Key Themes
➢ Farmer and market agents ➢ Farmer and extension (gov) ➢ Farmer and landowner ➢ Farmer and financers ➢ Financers and investors ➢ Farmer and input suppliers	Stakeholders' relationships of interest
➢ Marketing of Agricultural Products Policy ➢ Land (ownership/lease) Policy ➢ Agricultural Businesses Financing Policy	Policies related to issues flagged

Connection of Stakeholders

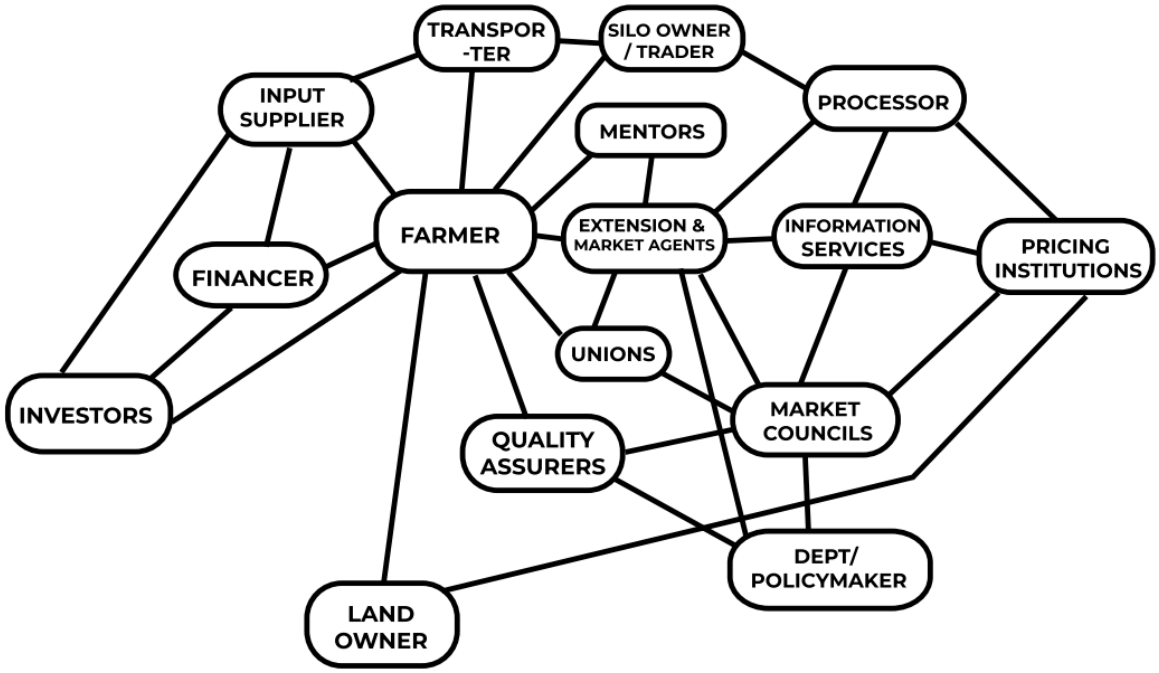


Figure 14: Graph theory showing the connection of non-staple wholegrain actors.

This figure portrays how actors in the wider whole grains system are connected. Their connection means that there is a degree to which one actor influences the other. At the centre of the diagram is the farmer and how the connection of all other stakeholders ending up affecting the farmer. The status quo and behaviour of each stakeholder influence the other stakeholder. That chain of influences ends up influencing the management of production.

Venn diagram

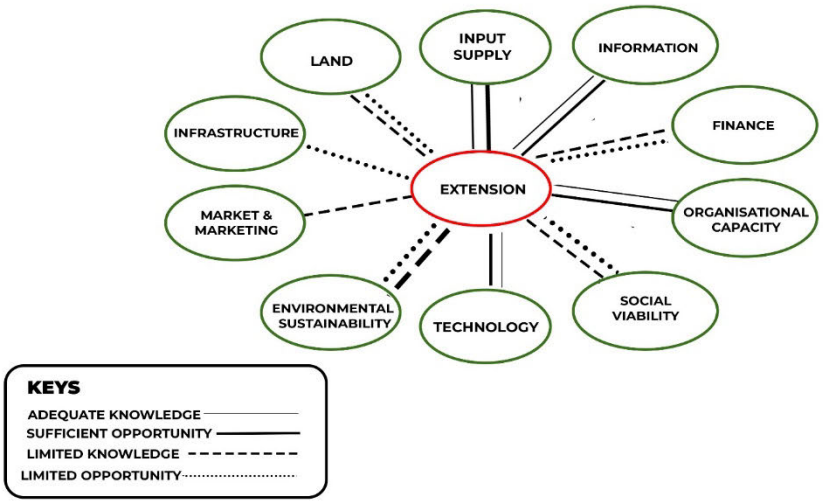


Figure 15: Venn diagram developed from engagements with Overberg co-ops.

Diagram demonstrates the access to and role of extension to Overberg wholegrains coops, the focus is drawn to technology, organisational capacity, information and input supply. While these are important areas, significant in providing information and some kind of practical learning, however, it must be noted that extension puts fewer efforts into improving access to land and finance beyond grants and knowledge about environmental sustainability and social viability. Infrastructure and market(ing) elements are placed at a distance because the extension role is minimal in that regard.

4.5 Discussions

Actors' influence on other actors (stakeholders on farmers)

-Market agents on farmers: Findings analysis indicate that farmers are influenced on the production aspects and market intelligence by the market agents. Through market information on future prices, market supply and demands of the grains, market agents sensitize farmers to determine which grains to plant, how much to plant and to whom should one sell. To exemplify this, if wheat is in demand and prices are good, farmers would plant more wheat than barley, and the chain goes on. Again, in line with sustainable farming, farmers utilise a crop rotation system. In many cases, the market information mismatches the crop rotation plan, which is in

direct conflict with environmental protection, crop diversity and nutrient density. De-prioritisation of the objectives is inevitable since farmers need more income to run their operations.

This approach in extension is identified as a market-led extension. It is demand-driven, introduces export-orientated products, emphasises efficiency, and productivity and focuses on high returns to the farmer (Sondarva 2016). Extension agents determine what to produce, how much to produce when to produce, where to sell the products and at what price (Kumar 2012). Now, this is operating in direct conflict with sustainability goals (indicators) which are to promote diversity (of crops and diet), adequacy, food availability, accessibility and equity (Ambikapathi 2022). Above proposing policies for enforcing sustainable agriculture, change in social values would be pivotal. This would include re-aligning the competing interests of concerned actors towards a common goal, purpose and economic priorities. Along with accountability in terms of the management of natural resources and inputs by each actor.

-Input suppliers on farmers: Findings suggest that the limited availability of inputs means that farmers purchase and utilize (put on the ground) what is at their disposal. South African inputs industry depends largely on the importation of the product, due to international demand, the international suppliers have limited types of fertilizers, seeds, herbicides and pesticides. This is embedded with domestic transportation difficulties (congested ports, lack of rail transport/service and poor road infrastructure). Consequently, farmers are sensitized to disregard the rotation systems and associated factors, including residual periods, overuse and resistance. This is directly inconsistent with environmental conservation objectives. De-prioritisation of the objectives is warranted by the farmers' need to make enough returns (profit) to sustain the business.

What complicates this subject is that the issue is not only the manufacturing and demand of inputs but access to and distribution of inputs is also challenging. Insignificant attention has been given to the input supply sector, especially in developing countries (Anglade 2021). What has set African countries back, is the dependence on inputs importation (Langyintuo 2020). It is without a doubt that the importation and distribution of inputs (seeds, fertilizers and machinery) are highly costly (FAO 1999). As things stand, more than 90% of the fertilisers utilised are manufactured outside the confines of Africa (Langyintuo 2020). If we were to succeed, conversations on strengthening the manufacturing and reproduction of fertilizers would be important. Morris (2011) proposed a process of negotiation for bulk purchases and

bulk shipments of nutrient ingredients in order to minimize costs. Jovanovic (2014) stakeholders like the government must take the lead in developing a railway infrastructure maintenance management system and infrastructure modernization and reconstruction for easy transportation of goods.

-Landowners on farmers: Data showed that the state is the main landowner in South Africa. The different institutions of the state lease the land to smallholder farmers. These institutions are guided by the policies on land tenure systems, distribution and the land market. Even though the communication between farmers and these institutions is limited, the fact is the farmers witness their influence through the application of policies and high lease payments. The grain farmers are given small pieces of land while prioritizing the livestock farmers. Given the status quo, one is convinced that the least can be done to control the interaction between the two actors. The revisions should centre on the land policies in shaping the nature of relationships, tenure systems and distributions.

-Investor on financer and financer on the farmer: Results reveal that farmers' access to adequate funding remains a challenge. Farmers normally source funding from the government through DALRRD grants and development finance institutions like the Land Bank. The challenge is that Land Bank is structured and operating like commercial banks in terms of eligibility criteria, interest rates and repayment plans (terms and conditions). Appears to be catering for well-established commercial farmers than emerging economies. Private investors' imposition of terms and conditions threatens Land Bank's developmental mandate fulfilment. Government grants are not adequate for technology-intensive businesses like wholegrains and do not cover property purchasing while too much information is required.

The core mandate of development banks such as the Land Bank is to provide finance to previously disadvantaged smallholder and emerging farmers in support of equitable land ownership, distribution and reform (Mtombeni 2019). What is clear here, is that there is a goal conflict (conflicting interests) between the investor, financer and farmer. The cooperation of these actors can only be enforced through a funding framework that is grounded on transformation.

Policies' influence on actors (farmers)

- Land lease/use policy on farmers: Results point out that most farmers are leasing from the state institutions (DALRRD, Public Works and local municipalities). Farmers decried that once the land leasing contract lapses (nine years, eleven months), the land is taken back to the market and farmers must apply again since there is no option to elect renewal or extension of the contract. Small-scale farmers compete for state-owned land which is small compared to private-owned land. Fascinatingly, this is contradictory with the state land lease and disposal policy, which guarantees the maximum period for all leases should be thirty years, which may be a renewal for twenty years. Inconsistencies in policies, insecure tenure and short land tenure maximum periods influence farmers to strive to maximize profits by all means, which is a process that deprioritizes responsible land use commitments. Farmers tend to overuse inorganic fertilizers and chemicals in pursuit of high returns.

Land scarcity as a consequence of the land skewed distribution is becoming a heated debate in many African countries (Holden 2008). The increase in smallholder farmer landlessness and demand for land signifies the weakness of tenure systems and land policies (Deininger 2014). It must be noted inadequate access to land is linked with the escalation of poverty since land is perceived as a source of income (Anwar 2004). The private sector has vast amounts of land that was obtained unjustly, and the willing buyer and willing seller framework have not worked for previously disadvantaged farmers. Holden (2020) proposed comprehensive land use planning and equitable tenure reforms as a significant manner to manage the scarcity. While Feenstra (2021) proposed careful new policies to protect soils, regulate the use of inorganic fertilizers and chemicals and adopt sustainable farming practices.

- Marketing of grains policy on farmers: Results reflect that there is a challenge with the pricing of grains. Marketing policies left prices to be determined by the international markets based on international demand/ supply and exchange rates. These prices are associated with high volatility and government intervention is limited. Farmers are price takers of their products. The national policy in operation is the Marketing of Agricultural Products Act No 47 of 1996. This policy leaves farmers vulnerable to market offers, international conflicts and fluctuations in supply and demand. It is unfair that all these conditions determine the value of agricultural commodities excessively. This policy influences farmers to take decisions on how much to plant based on seasons' international dynamics and developments.

The global marketplace determines the prices of agricultural crops, often without considering profitability and in-country season developments such as skyrocketing inputs bills, losses and damages. Farmers take retail prices for fertilizers, chemicals, machinery, seeds and even for the products they are producing (Stiers 2020). The farmers need to be protected against fluctuations in yield, price and revenues through incentives and subsidies (Maluleke 2019) . To enhance the farmers' economic position, the government would need to develop enabling legislation. Abbott (2015) in his review of agricultural marketing boards in developing countries, describes Marketing Boards as an important system for stabilizing prices inside the country, expanding government control over developments within the sector, protecting consumers and for the careful development of agricultural production. Equally, South Africa would need to visit the conversation of reconsidering the reinstitution of Marketing Boards as they were abolished in 1997.

-Labour policy on farmers: Results indicate that minimum wages increase every year, yet labour productivity is not satisfactory. Farmers end up doing all the work by themselves due to high labour costs. The national legislation in operation is the National Minimum Wage Act No. 9 of 2018. The policy imposes the exact amount which is adjusted on annual basis. It also imposes fines and penalties if the event of non-compliant with the terms of the policy. While this policy protects the farm workers from exploitation and unfair wages, it leaves the farmers incapable of absorbing all production costs.

The blind spot here is that farmers are not subsidized in South Africa when purchasing inputs. Again, farmers are housing their workers and paying for their electricity, water and transport bills. On top of that, Stiers (2020) argued that farmers take retail prices for fertilizers, chemicals, machinery, seeds and even for the products they are producing. Although this does not justify low wages, it lays the ground that farmers need to be met halfway in terms of production costs. To prove the influence this policy has on farmers, Cradock District Farmers' Union (2022) stated, "*The price increase on top of other costs escalations and decreasing purchasing power of our consumer is presenting challenges and resulting in further pressure on farmers to investigate all possibilities and options to make sure we stay in the game*". This implies that farmers would make whatever it takes to improve their economic position. This then poses a threat to farm workers' job security, fair wages, crop diversity, nutrient density, sustainability in general and the country's progress.

4.6 Conclusion

This paper focused on identifying how policies and actors in emerging wholegrains economies hinder or help the increased production of non-staple wholegrains in a way that may go against environmental, nutritional and equity objectives. It is clear from the results that there is a dominance of other actors over farmers; inconveniences and there are goal incompatibility and competing interests among the farmers and other actors within the wholegrains network. The research found some policy issues that are complex and the likelihood that the behaviour of the farmers may be attributed to existing policies. Although it is not entirely clear what is driving their contradictions except individual actor interests, the existence of the policy matters found indicates poor governance and accountability. In order to overcome these challenges, there would need to be a change in policy guiding the cooperation and contestation between actors, the policy that would enforce agricultural sustainability and transformation. The study concludes that landowners, investors, market agents, and financers influence farmers' decision to grow non-staple wholegrain.

4.7 Recommendations

It is recommended that the actors concerned need to facilitate a coordinated approach to promoting sustainable development and cooperation. It is recommended that actors revise, adjust, re-align and integrate their goals into one common sustainable, inclusive and transformative goal. This would arrest negative influence between stakeholders. It is recommended that the food sector actors redesign the indicators of the food system in a way that would intensify and accommodate crop diversity, nutrient density, equity and other sustainability measures. All these efforts would contribute to the prioritisation of non-staple wholegrains' resiliency and nutritional quality in general. It is also recommended that some regulations are needed to be amended to improve the situation, such as Land acquisition, ownership and lease policy, marketing of agricultural products and empowerment policies.

Here are recommendations for further studies:

- The biasness of market extension and its consequences need further investigation as it tempers with sustainability targets.

-Given the background of the participants, it will be important to investigate the progress of the transformation in the agricultural sector (grain industry in particular) in support of black and women empowerment.

-The production costs are too high. The researcher would recommend government intervention through subsidies, prices and incentive policies.

-Exploring the long-term environmental effects of land leasing in South Africa would be fascinating.

-The reflection on the impact of the deregulation of control boards would help to measure the progress.

-The researcher would also recommend that more investigation is done on the appointment of assignees, their effectiveness and their impact.

References

Abbott, J.C., 2015, 'Agricultural Marketing Boards in the Development Countries', *Oxford University Press*, Vol.49, No.3, pp 705-722 from https://www.jstor.org/stable/1236903

Ambikapathi, R., Schneider, K.R., Davis, B., Herrero, M., Winters, P., & Fanzo, J.C, 2022, 'Global food systems traditions have enabled affordable diets but have less favourable outcomes for nutrition, environmental health, inclusion and equity', from https://www.nature.com/articles/s43016-022-00588-7.

Anderson, R., 2007, 'Thematic Content Analysis (TCA) Descriptive Presentation of Qualitative Data', *Institute of Transpersonal Psychology* from https://rosemarieanderson.com/wp-content/uploads/2014/08/ThematicContentAnalysis.pdf

Anglade, B., Swisher, M.E., & Koenig R., 2021, 'The Formal Agricultural Input Sector: A Missing Asset in Developing Nations?', *MDPI*, from https://www.mdpi.com/2071-1050/13/19/10697/htm

Anwar, T., 2004, 'Landlessness and rural poverty in Pakistan', Pakistan Development Review, 855-874 from https://www.jstor.org/stable/41261030

Cradock District Farmers' Union, 2022, 'Minimum wage: Farmers concerned about extra cost', *The News24*, viewed November 2022, from https://www.snews24.com/news24/community-newspaper/komani-karoo/minimum-wage-farmers-concerned-about-extra-cost-20220216

Das, S., Mahanty, S., Sahu, G., & Sarkar, S, 2020, 'Sustainable agriculture: a path towards better future', food and scientific reports, from https://www.researchgate.net/publication/344138243_Sustainable_agriculture_a_path_towards_better_future

Dept. Agriculture, 1997, 'Marketing of Agricultural Products Act', from https://www.gov.za/sites/default/files/gcis_document/201409/act47of1996.pdf

Dept. Agriculture Western Cape, 2010, 'AgriBEE', Western Cape Government, from https://www.elsenburg.com/agribee/#:~:text=AgriBEE%20as%20empowerment%20is%20defined,economy%2C%20as%20well%20as%20a

Dept. Employment and Labour, 2022, 'The National Minimum Wage', from https://www.labour.gov.za/DocumentCenter/Sectoral%20determinations/National%20Minimum%20Wage/National%20Minimum%20Wage%20Act.pdfF

Deininger, 2014, 'Identifying and addressing land governance constraints to support intensification and land market operation: Evidence from 10 African countries. Food Policy, 48, 76-78

Duvel, G.H., 1991, 'Towards a model for the promotion of complex innovations through programmed extension', South African Journal of Agricultural Extension. 20: 70—86

FAO, 1999, 'Chapter 9: Input and equipment supply and crop marketing services' from https://www.fao.org/3/Y2006E/y2006e0d.htm.

FAO, 2013, 'The State of Food and Agriculture 2013. Food systems for better nutrition', Rome.

FAO, 2015, 'Sustainable Development Goals, Indicator- Zero Hunger', Food & Agriculture Organization of the United Nations from https://www.fao.org/sustainable-development-goals/indicators/241/en/

FAO, 2017, 'The future of food and agriculture- Trends and challenges', Annual Report.

FAO, 2018, 'Sustainable Food Systems', from https://www.fao.org/3/ca2079en/CA2079EN.pdf

Feenstra, G., Ingels, C., & Campbell, D., 2021, 'Sustainable Agriculture Research and Education', UC Agriculture and Natural Resources, from https://sarep.ucdavis.edu/sustainable-ag

Holden, S.T., & Bezabih, M., 2008, 'Gender and land productivity on rented land in Ethiopia', Holden, K.O., F. Place (Eds.), The emergence of land markets in Africa: Assessing the impacts on poverty, equity and efficiency (pp. 179-98)

Hemming, D.J., Chirwa, E.W., Dorward, A., Ruffhead, H.J., Hill, R., Osborn, J., Langer, L., Herman, L., Asaoka, H., Coffey,C., & Phillips, D., 2018, 'Agricultural input subsidies for improving productivity, farm income, consumer welfare and wider growth in low and lower-middle-income countries: a systematic review' from https://onlinelibrary.wiley.com/doi/full/10.4073/csr.2018.4#:~:text='Agricultural%20input%20subsidies'%20were%20defined,providing%20it%20free%20of%20charge

IFPRI, 2022, 'Food systems', *International Food Policy Research Institute* from https://www.ifpri.org/topic/food-systems

Jovanovic S., & Bozovic, D., 2014, 'Railway infrastructure maintenance management system concept in Serbia within the process of the planned railway (re)construction & modernization', International conference contemporary Achievements in Civil Engineering, from https://www.researchgate.net/publication/292962074_Railway_infrastructure_maintenance_management_system_concept_in_Serbia_within_the_process_of_planned_railway_reconstruction_modernization

Kareem, M.A., 2021, 'Farming Systems Approach', from https://www.manage.gov.in/studymaterial/FSA-E.pdf

Kumar, R., Singh, B.P., & Kaswan, S., 2012, 'Production driven to market-driven extension approach', University of Pretoria, from https://www.aesanetwork.org/wp-content/uploads/2018/02/Production-Driven-To-Market-Driven-Extension-Approach.pdf

Langyintuo, A., 2020, 'Smallholder Farmers' Access to Inputs & Finance in Africa', The Role of Smaller farms in food & Nutrition Security. *Springer, Cham*, from https://link.springer.com/chapter/10.1007/978-3-030-42148-9_7

Liliane, T.N., & Charles, M.S., 2020, 'Factors affecting the yield of crops', from https://www.intechopen.com/chapters/70658

Maluleke, I., 2019, 'USA farm subsidies: lessons to be learnt', GrainSA, from https://www.grainsa.co.za/usa-farm-subsidies-lessons-to-be-learnt.

Maryville University, 2021, 'Importance and Future of Sustainable Agriculture', from https://online.maryville.edu/blog/importance-and-future-of-sustainable-agriculture/

Morris, M., Ronchi, R., & Rohrbach, D., 2011, 'Building sustainable fertilizer markets in Africa. In *Proceedings of International Conference on Priority Actions toward Market Development for African Farmers*. Nairobi Kenya: International Livestock Research Institute

Mtombeni, S., Bove, D., &Thibane, T., 2019, 'An analysis of finance as a barrier to entry and expansion for emerging farmers', from https://www.compcom.co.za/wp-content/uploads/2019/09/CC201901-Mtombeni-S-Bove-D-Thibane-T-An-analysis-of-finance-as-a-barrier-to-entry-for-emerging-farmers.pdf

Sarkar, A., Wang, H., Rahman, A., & Qian, L., 2022, 'Evaluating the roles of the farmer's cooperative for fostering environmentally friendly production technologies- a case of kiwi fruit

farmers in Meixian, China', Elsevier Vol.301, 1 January 2022, from https://www.sciencedirect.com/science/article/pii/S0301479721019204

Sondarva, A., 2016, 'Market-led Extension', *IARI* from https://www.slideshare.net/yagneshsondarva/market-led-extension-60904581

Stiers, J., 2020, 'Farmers are largely price takers, not price makers', *Illinois Farm Bureau Partners* from https://ilfbpartners.com/farm/farmers-are-largely-price-takers-not-price-makers/

UC Davis, 2021, 2021, 'Sustainable Agriculture Research and Education', *UC Agriculture and Natural Resource*s from https://sarep.ucdavis.edu/sustainable-ag

Worth, S.H., 2006, 'Agriflection: A Learning Model for Agricultural Extension in South Africa', from https://www.researchgate.net/publication/249036172_Agriflection_A_Learning_Model_for_Agricultural_Extension_in_South_Africa

Worth, S. H., 2014, 'The facilitated Learning Agenda and Extension Carousel.' Supplement to the Journal of International Agricultural and Extension Education, 21(2), 90-93

Presented at the Annual Conference of the Association for International Agricultural and Extension Education, Miami, FL, USA, May 2014.

WWF, 2017, 'Sustainable Agriculture', *World Wide Fund* from https://www.wwf.org.za/our_work/initiatives/sustainable_agriculture/

CHAPTER 5

AREAS WHERE THE POTENTIAL FOR THE PROLIFERATION OF EMERGING WHOLEGRAINS MAY BE POSSIBLY CURTAILED

Abstract

Shifting production and consumption away from staple grains towards diverse wholegrains would contribute meaningfully to sustainable targets in terms of nutritional quality, ideal environmental and economic outcomes. The fact that only a marginal amount of grains are currently produced, signifies that there might be trouble spots in the multiple interconnections of the wholegrains network. The objective of this paper is to identify the pressure points in the wholegrains network, between actors and policies, in terms of the nature of the relationship, interaction and influence. This paper focuses on assessing outline specific points of tension and barriers within grains networks where the potential for the proliferation of emerging wholegrains economies is curtailed and what hinders or helps the increased production of non-staple wholegrains in a way that may be in violation of sustainability objectives. Primary data was collected employing semi-structured interviews with 25 respondents through snowballing sampling. As part of the data analysis, thematic content analysis and an influence diagram was utilised.

This part of the study revealed that there are barriers to the sustainable expansion of whole grains. Findings pointed to market-led extension as a threat to crop diversity and nutrient density. Lack of subsidies, funding framework, access to land, market intelligence, small market, and support for grain producers, profit-orientated enterprises, input costs and infrastructure, climatic conditions, coordination, communication and transformation, and assignees' appointment as barriers. The conviction is that it is these elements that exert pressure on farmers to make decisions that may be in breach of environmental, nutritional and equity objectives. This paper recommended incentives and subsidies for sustainable farming as an ideal way to increase production responsibly. It is recommended that actors adjust and integrate their goals into one common sustainable goal. This is within the scope of the second goal of the United Nations Sustainable Development Goals as it stresses putting an end to poverty, ensuring food security inversely promoting sustainable agriculture.

Keywords: Pressure points, Non-staple wholegrains and ENE objectives

5.1. Introduction

Agricultural production is fundamental since an increase in agricultural production translates to an increase in yields which is associated with the reduction of poverty. Statistics demonstrated that the increase in agricultural yields correlates with a decrease in food insecurity in the world (Liliane 2020). However, it must be noted that the success of agricultural production is determined by economic, political, social, environmental and climatic factors, knowledge and technologies. Management and availability of systems like labour, capital, natural resources (water, soil/land), and inputs (seeds, fertilizers, pesticides, machinery and fuel) as well (Brussaard 2006). Beyond direct sales and farm business strategies, units like incentives, subsidies, product prices and immigration policies are economic factors that affect farming.

Conversations about the distribution of scarce resources and government policies are political factors that affect farming (GCSE Resources 2018). The amount of water, rainfall, wind, light, temperature and humidity are climatic factors affecting farming. Soil fertility, water quality, topography and climate are known are environmental aspects that influence farming (Baker & Capel 2011). Given the evolution of the agricultural industry, there are various techniques have become important such as fencing, irrigation, transportation facilities, disasters, conservation practices, and access to land, capital and market (FAO 2010). All these factors constitute a significant threat, if they are not well managed and monitored, or if there are competing interests and toxic contestations between concerned actors (Liliane 2020). The actors often include farmers, millers, researchers, policymakers, advisors, unions, retailers and consumers. Interactions and relationships between these actors shift irregularly upon political, economic and social changes and the emergence of new technologies. Their direct and indirect influence on one another affects the whole value chain (Feenstra 2021).

Considering the pressure to feed the growing worldwide population and the estimations that by 2050, the population will have reached 9 billion, thus food production will be required to have increased by 70% (Maryville University 2021). The pressure to expand crop production has been mounting, even though it has had significant costs. This includes the intensification of the utilisation of irrigation, inorganic inputs like fertilizers, and chemicals for controlling unwanted vegetation, pests and diseases. This has resulted in to decline in food quality, contamination of groundwater, increasing soil erosion, and degradation of water quality and soil properties (Wang 2014; Liliane 2020). Taking into account all these modern agriculture effects, there has

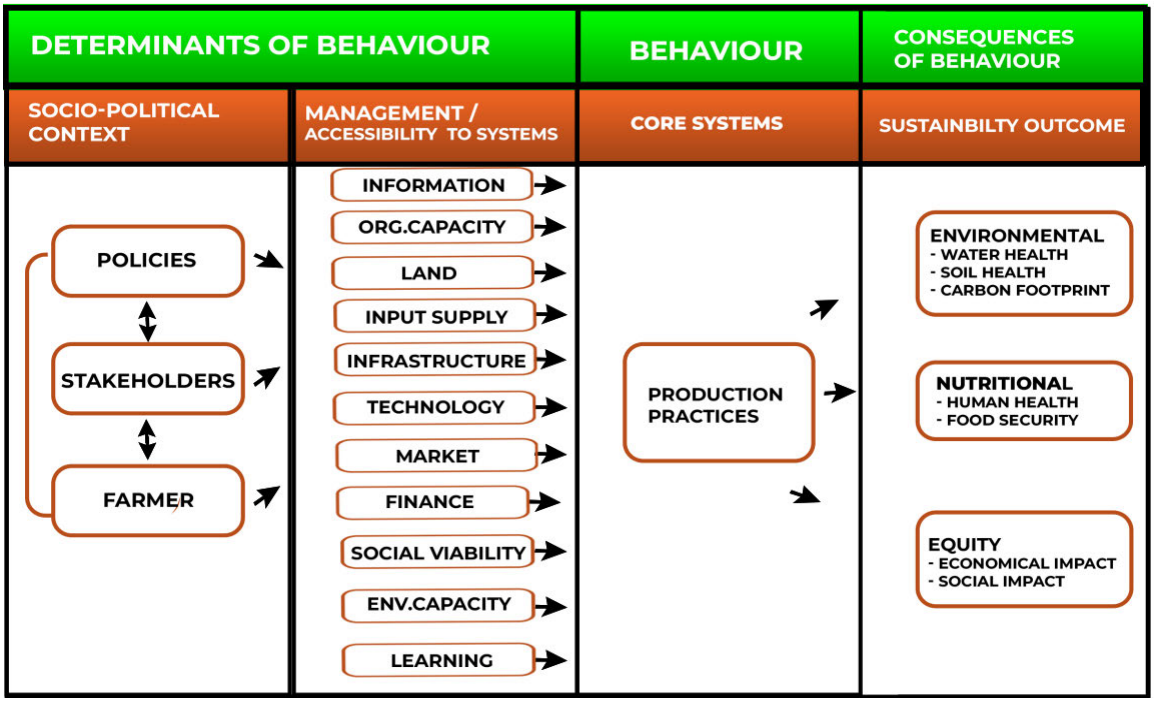
been an emerging call of promoting sustainable agriculture and a sustainable food system as a remedial step to address the environmental, nutritional and social concerns. Sustainability principles consider sustainable production methods which include diversification of crops, responsible use of inputs and protection of natural resources (UC Davis 2021).

A shift from the promotion of staple grains towards the promotion of diverse wholegrains would contribute have a positive impact on creating a sustainable food system. It is for that reason that it would be important to explore barriers to making diverse wholegrains both available and affordable to entire populations, so they can deliver fully on their potential nutritional, environmental and social benefits. Insights contribute to understanding the points of tension and pressure that actors within grains networks face and where potential leverage points may lie for creating a supportive operating environment.

5.2. The conceptual framework for exploring relationships involved in policies and stakeholders' influence towards sustainability

The study incorporates components of Sustainable Food Systems, Extension Learning Carousel and Behaviour analysis. This paper then discusses frameworks as a basis for crafting a framework for exploring the policies and stakeholders' influence on farmers' behaviour which may undermine sustainability targets. Based on the mentioned models, the conceptual framework below was developed, to show inter-relationship and major factors influencing the behaviour of actors and impact.

Elements connected in wholegrain production system.



Sustainable Food Systems

Food systems comprise various actors (input suppliers, producers, food-chain actors and product consumers) interlinked and involved in the food value-chain activities (from input supply, production, processing, transportation, retailing, consumption and disposal) and their orientation in terms of social, political, economic and natural environments. This mostly covers the triplet industries, agriculture, fisheries and forestry (FAO, 2018). IFPRI (2022) highlighted that the food system ought to encompass the enabling policy environment, above cultural norms, and consider environmental sustainability, nutrition security, inclusivity, productivity and efficiency (affordability enhanced). That is where the concept of 'Sustainable Food Systems' sprung up, that the ideal food system would make provision for equitable access to sustainable nutritious diets in economic, social and environmental sustainability (FAO,2018).

This approach is situated at the centre of the United Nations SDGs. SGDs suggest intense shifts in agriculture and food systems and that at least by the year 2030, secure sustainable food production systems, improve nutrition, apply resilient agricultural practices that proliferate production and productivity, maintain ecosystems, improve capacity for adaptation to climate change, natural hazards and other disasters and successively strengthen land and soil quality (FAO 2015). Apart from trends, the conduct of various actors is used to measure the performance of the food system in terms of sustainability. This is through economic, social and environmental dimensions. On the economic aspect, positive results reflect the viability of actors' activities, equity in the distribution of economic benefits in relation to income (wages), profits for entities and taxes. On the social aspect, positive results reflect the social value and economic profits, enhancement of human health, nutrition, cultural norms and working conditions for all disadvantaged groups. On the environmental aspect, positive results reflect the actors' activities positively impacting the natural resources and biodiversity (FAO 2013).

The framework takes into account, all the systems interrelated, interconnected and interdependent. The theory of change, which is the foundation of a sustainable food system was utilised to prove that change in one system influence change in other systems of the food system. Equally, food-chain actors influence one another's capacities and incentives. In this case, the interest lies in actors intendedly and unintendedly influencing one each and the impact of that influence on the production (FAO 2018). Food value chain activities are subsystems of food systems. Out of all subsystems of the food systems, this study elected a farming system

since the focus is on the production of whole grains. To demystify the concept, the farming system is defined as a set of interrelated farming components and practices executed with resources at the farmer's disposal in pursuit of maximizing productivity and farm income. While a farmer's decision-making, control and choices are the centres of the system, to some extent the influence is exerted by social, political, institutional, and economic forces. The subsystems of the farming system include input supply, land, labour and capital, to mention a few (Kareem 2021).

This framework (sustainable food systems) categorically covers components namely natural elements, societal elements, core systems, the behaviour of diverse actors and sustainability performance. Arguably, the framework does not explicitly express the structures and systems that influence each actor's capacity. Factors important for modern agriculture, such as the capacity to engage information, technology, infrastructure and learning. On sustainability performance, above and beyond the impact of farming and other activities, it is important to observe the role, actors ought to perform in promoting sustainability.

Extension Learning Carousel

As a way of improving extension in relation to the welfare of the under-resourced smallholder producers, the Agriflection model was put forward. This model is attached to Facilitated Learning Agenda, it was brought as an improvement measure to the extension facilitation approaches. The model draws attention to the element of learning in extension engagement, building agricultural actors' capacity through an ongoing process of investigation, application and sharing feedback with actors. The model proposes that actors (farmers, extension officers, policymakers and researchers) should engage in equal partnership for the purpose of continuous improvements and learning (Worth 2006). Given that Facilitated Learning Agenda in Agriflection was not explicitly detailed to cover its components, the idea to design an approach that will unequivocally express the content of the learning agenda was conceived-that framework was named extension carousel (Worth 2014).

The extension carousel encompasses three major aspects namely, i) management, ii) production and iii) economics. Management elements include managing information and organisational capacity; production elements include managing land, input supply, infrastructure and technology and economics include managing finance and market(ing). In addition, social viability, environmental sustainability, and the learning process include innovation, systems thinking and development paradigm (Worth 2014). Arguably, important elements such as

policy engagement and application, and management of labour are not immediately visible in this framework.

Behaviour analysis

At the centre of this study, is policy and actors' behaviour which influences other actors' behaviour in relation to increasing wholegrain production in breach of the sustainability targets. The behaviour analysis model is used to show the relationship between determinants of behaviour (variables), behaviour and consequence of behaviour in agricultural development. This model helps to understand and predict complex human behaviour (Duvel 1991). This study points out the policies and food chain stakeholders and the access to agricultural systems as determinants of farmers' behaviour. Production practices as the behaviour and sustainability outcomes as the consequence of behaviour.

5.3. Results

Management

i) Information

The concept of information for this work refers to farmers' ability to collect information, process and apply that information for their farm operations, interpret and utilize that information to make decisions, reflect on processes and share newly generated information. Farmers must be able to consult, gather and compare the information they would have acquired. Information is critical for every farm aspect, production, management and economics as per the carousel of learning (Worth 2014).

In this case, for market information, the market agents supply farmers with market information on future market prices, market supply and demand for the grains. Farmers use this information to determine how much to plant each season e.g wheat is in demand prices and prices are good, farmers would plant more wheat than barley. Sometimes the market information on commodity supply and demand mismatches the farmers' crop rotation plan. The majority of farmers said that striking a balance between the demand and the initial plan is difficult (if not impossible) because farmers need more profit for them to be able to run their operations. The main stakeholders involved in the dissemination of information are SAFEX, GrainSA, NAMC, Unigrain, Farmsol., Overberg Agri. and DALRRD. These institutions have agricultural extension officers, agricultural economists and market activists.

Most of the smallholder farmers are surrounded by commercial farmers, whom they enjoy no relationship with. They only meet once in a long while, through farmer's day programs or on Dept. invitations to discuss issues at hand. Otherwise, other stakeholders deliver the information to each farmer, registered with them. Noticeably, farmers have little to no opportunity to investigate on their own, to command what information is relevant to their situation, instead are sensitized to the production and market(ing) aspects in terms of systems and structures to adopt.

ii) Organisational Capacity

Here we refer to farmers' ability to engage, command and manage all the farm operations with the least support from external actors. Timing of processes (when to buy inputs, plant, maintain the plants and harvest) and managing structures and systems is fundamental for farming. The concept further explains farmers' ability to organise, plan, implement, monitor, and reflect on management operations (Worth 2014).

Grain farmers engaged show a fair understanding of the conditions they are growing crops and the resources at one's disposal. The crop requirements in terms of soil, climate conditions, and water (availability, need for supplements). They set timeframes for all important processes of their operations. Stakeholders such as the Dept. of Agriculture help with extension services (skills training, knowledge), a few commercial farmers have volunteered to mentor smallholder farmers in many aspects incl. the selection of vendors and clients, and other market agents such as Overberg Agri. and FARMSOL Holdings help them with knowledge. Part of the challenge is that the resources ordered, are not delivered on time, which delays the processes. Another element is that the grains industry is enclosed and well-coordinated, this implies that farmers enjoy a limited command over the marketing system. There are fewer buyers, one needs to secure a contract before planting.

Production

i) Land

In this context, the land is referred to as a field on which grain product is grown. Farmers' capability to manage the dynamics associated with land, from sourcing to appropriate usage of it. Other aspects include land availability, land size, productivity, suitability and property ownership. The stakeholders' involvement in facilitating farmers' access and in ensuring productive use of land (Worth 2014).

Access to land is a major challenge for a majority of respondents. Small-scale farmers could only lease as little as 20ha to 700ha piece of land and few are in ownership of 620ha to 2700ha piece of land. Municipalities prefer to give large pieces of land to livestock farmers than grain farmers. Grain farmers have access to small-sized land (too small to expand production with the cultivars they are using) and make fewer returns. The Dept. of Agriculture argues that state-owned land is outnumbered by privately owned hence farmers are given 50-80ha.

Once the land leasing contract lapses, the land is taken back to the market and the farmer must bid again, so the land tenure maximum period is short for long-term aspirant farmers and not guaranteed a second chance to work that same land. Farmers then are not motivated to invest in sustainably utilizing the land. Even if a farmer happens to secure a contract again, the rent would have gone up. Smallholder farmers compete for land than for the market. Commercial farmers have vast land, left fallow. Sometimes land leased, is not conducive to grain production. Many farmers said leasing is too expensive, figures given R3000 per ha for each year so in case a farmer leases 620ha that would mean, a farmer spent approximately R1,860,000. *Trends*: In inland provinces (Gauteng the most), white farmers are relocating to the Western Cape and are willing to purchase the piece of land at any given value.

ii) Input supply

Inputs include grain seeds, fertilizers, pesticides and fuel and machinery. Here one explored the farmers' aptitude to access, select, and evaluate the input important to their farm enterprise as well as to share the reflections with other stakeholders for further input improvement. The focus was located on dynamics and stakeholders' involvement that shape farmers to respond in a particular way that impacts production (Worth 2014).

Input cost is a major concern for all respondents. Prices are unreasonably high and increasing unprecedentedly. One farmer argues that diesel eight of five litres was R7800 (in Sept. 2021) which has gone up by 60%. Repairs and maintenance costs are high. The average estimation is that 25% of the input cost is for land leasing; 50% for fertilizer, diesel, seeds and pesticides; 25% for machinery. On input availability, most of the inputs are imported, due to the demand, in most cases, international suppliers have limited options for fertilizers, seeds, and spraying chemicals and due to this limit farmers would have fewer options but take what is available

and later that affects the soils. The other thing, ports are congested, no trains to transport inputs. With poor road infrastructure, transporting the products (estimated at two million tons of fertilizers) over long distances is extremely difficult.

iii) Infrastructure

For the functioning of the farm enterprise, there are essential facilities, systems and services needed to be put in place. Of interest is farmers' ability to manage those facilities, systems and services, making decisions about selection, requirements, improvement and evaluation. Further, access to infrastructure, quality of infrastructure and stakeholders' involvement shape farmers' responses in a particular way that impacts production (Worth 2014).

Most smallholder farmers do not invest much in infrastructure since they are not owning land property. They are leasing for nine years, and eleven months. However, they need a small office to keep all records and a workshop or shelter where tractors, sprayers, planters and harvesters are housed. On-road infrastructure can be attributed to rural roads with soft surfaces, dirt and narrow widths. Transportation of inputs and products is difficult. Most farmers rely on privately owned silos which are very expensive. It is better to plant the least so you can sell all at once.

iv) Technology

Technology includes equipment, methods and systems employed to produce grain crops. Farmers' capability to select, operate/utilize technology systems and evaluate their efficiency, and effectiveness. The concept captures the availability, accessibility, affordability and suitability of technology systems relevant to farm operations (Worth 2014).

A significant number of farmers have been assisted by the Dept. of Agriculture through financial assistance programs to purchase machinery. On the other hand, several farmers still depend on renting machinery from contractors. Grain farmers are sourcing material and equipment from organisations such as FARMSOL Holdings, and Overberg Agri. These organisations also loan grain farmers to purchase, service and maintain planting and harvesting technology. This is another major cost area for grain farmers, however, there is a commitment to keep on investing in technology. The challenge is that machinery is imported and is not always available, and that pushes farmers to place an order a year in advance. Machinery is sometimes delivered late and that delays planting and/or harvesting. Farmers from inland

provinces, plant under summer rainfall conditions, hence they utilize irrigation. The irrigation schedule is disturbed by power cuts (load-shedding). Power suppliers are overcharging farmers.

Economics

i) Market(ing)

This concept refers to farmers' capability to access the market, produce marketable products and comprehends imperative elements of their markets and opportunities to command systems and structures associated with their market. Ability to engage with market agents and take informed decisions (Worth 2014).

On profit leader, a slight shift from barley to wheat has been noted. Barley is mostly purchased for brewing by SAB/AB InBev whereas wheat is mostly used for human consumption. On the other side, the profit loser is oats since it has a small market. One producer stated that out of 1500ha, only 65ha is allocated for oats (precisely 4%). Farmers claim it is risky to grow grains hence they seek backup enterprises such as livestock (beef cattle) to boost cash flow. Those with livestock, allocate 45- 55% piece of the land for livestock and 40-50% for grains. Pricing of grains and marketing policies accord international markets to determine grain prices. Farmers are price takers of inputs and their products. Transport differential prices, make buyers prefer imports over purchasing from local producers.

ii) Finance

This concept refers to farmers' capability to source financial resources, acknowledge the needs of the enterprise and make budget allocations per those needs and be accountable for each cent the enterprise spent. Ability to where (institution) and how (the process) to seek funds, where (expenditure) and when (season) to spend and the profitability (Worth 2014).

Access to finance is the single most challenge, farmers lack collateral/ security to secure loans. Those who can access loans allege that development banks (Land Bank) operate exactly like commercial banks, in terms of eligibility criteria, interest rates and repayment plans (terms and conditions). Land Bank claims that they are funded by private investors that impose their terms and conditions, however, farmers are given flexible collateral options. On government support, no subsidies and constant investment, however, there are programs to financially support farmers for 3 to 5 years. The government does not support farmers buying the property and takes a long time to approve funds (too much information is required). Delivery of inputs

clashes with farmers' time frames (planting seasons). Government officials make empty promises during crises (drought, floods or COVID). Dept. of Agriculture claims that farmers lack self-reliance and keep on seeking funds. Other, mentors are not giving smallholder farmers enough support. The government is accused of appointing inexperienced assignees for quality assurance and food safety and overcharging farmers (appointee: LEAF SERVICE)

Social viability

Social viability refers to matters related to cultural heritage, promotion of social cohesion, equity and observation of labour laws. In the context of the study, the researcher explored the extent to which the farm enterprise or farm operations strengthen the social fabric, reducing poverty or inequality and whether or not, they are viable and acceptable in the local traditions and promote social cohesion. Another concern marked is whether a farmer can manage the matters regarding social context and extension role in that regard (Worth 2014)

The key stakeholders identified are market agents, extension workers and farmers that contribute to social viability. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information work. The majority of the farmers indicated that although it is culturally accepted to grow grains in the communities of South Africa, the fact that a) grains cannot be consumed as fresh produce b) local people cannot process grains with resources at their disposal such as maize grinding machine c) local people have little information on how they can utilise grains to their advantage d) and most of the grains are not associated with any modern African traditions except sorghum used for traditional beer (*umqombothi*), makes it hard for non-staple grains to assume their rightful place in South Africa. Farmers observe labour laws but are unsatisfied with labour productivity. The market and extension agents are of the view that the grain industry is slow regarding transformation and social cohesion. The industry is still White-Male dominated, from farmer to retailer. Of the sampled participants, only one was African and none were women. On the other hand, commercial farmers act as mentors to smallholder farmers but to an extent, smallholder farmers feel like these mentors are not providing adequate aid as they are seen as future competitors.

Environmental Sustainability

The concept of environmental sustainability here is referred to as the farmers' willingness and ability to ensure compliance with environmental legislation and manage the conversation of natural resources at their disposal. Another important area is the role of extension in ensuring

the protection of natural resources and being of service to improve farmers' capacity (Worth 2014).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to environmental sustainability. Policymakers make laws for environmental protection. Market agents and extension workers are involved in searching and sharing information with the farmers on conserving the environment and all the natural resources at one's disposal. The farmers are involved in making that information work. Most farmers stated that it is close to impossible to apply all sustainable agricultural measures (such as minimum tillage, organic fertilisers, and little or no agricultural chemicals) unless you are practising subsistence farming. The grains need big machinery from production to processing. The short land tenure makes farmers apply more fertilizers to maximize the yields so that by the time tenure ends, the farmers would have made fairly enough profit. The shortage of fertilizer supply from international suppliers, makes farmers have fewer options on what to put on the ground. The demand and supply of grains compromise the crop rotation plan. So environmental sustainability is compromised in this context. However, the extension officers from the Dept. of Agriculture from time to time hold sessions with farmers to engage about matters related to the subject. Climate change poses a threat, some seasons are either too wet or too dry. Cultivars that can produce high yields on small-sized are scarce. Educating about environmental legislation and other means to secure the same profits, when applying sustainable agriculture is necessary.

Learning

In this context, we refer to learning as the farmers' willingness and ability to continue with the ongoing process of learning from their experience and the outsiders, the adoption of newly discovered practises and technologies. Under the umbrella of learning, other processes namely innovation, systems thinking, and development paradigm are observed. This element also put focus on stakeholder-to-stakeholder learning (Worth 2014).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to the learning process. Policymakers make laws that guide the working environment and production. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information

work and share feedback with the market/extension agents (whether the information has worked). From the responses of many different stakeholders, the sharing of information or feedback process is linear. The policymaking institutions share new information with extension officers, then they share it with farmers. Farmers are seen as end-users or consumers of information with little or no space to share feedback or their own experiences. Ordinarily, farmers have little time to spend with extension officers, besides given formal qualifications of the outsiders, there is the mentality that they know more than the farmers. The building capacity of farmers has not been adequately delivered. Farmers' capacity to innovate is linked to the advice given by the extension workers. In problem-solving, they rely on their expertise. In decision-making, they rely on the information given by extension workers. There is a need to work on developing farmers' capacity.

5.4. Analysis

Thematic analysis

Key Codes	Key Themes
➢ Market information (intelligence) ➢ Access to finance ➢ Access to land ➢ Pricing of grains ➢ Climatic conditions (risks)	Barriers to the expansion of grains production

Influence diagram

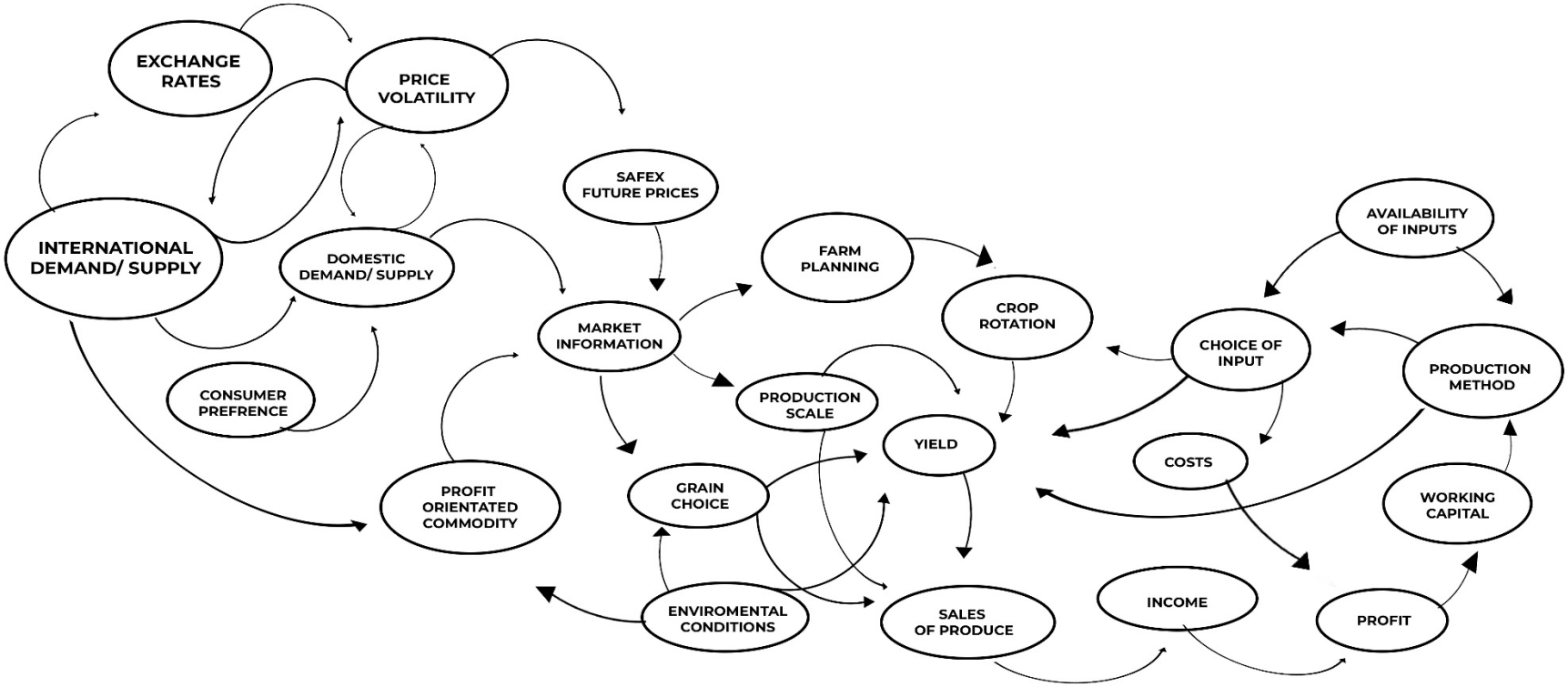


Figure 16: Influence diagram showing non-staple wholegrain production system.

This diagnostic tool revealed interconnections in the situation of non-staple wholegrain production, at least in South Africa. The tool was used to spot the leverage points by illustrating exactly what influences what. From the right margin, international demand/supply influences the exchange rates, which then influence price volatility. Price volatility indirectly influences international demand/supply, which also influences price volatility and profit-orientated commodities. Domestic demand/supply is influenced by price volatility, consumer preference and international demand/supply. Price volatility influences SAFEX's future prices. The market information (intelligence) is influenced by the SAFEX future prices, domestic demand/supply and profit-orientated commodities. Fascinatingly, the market information influences farmers' grain choice, production scale (how much is planted) and farm planning. Farm planning influences crop rotation plans. Yield is influenced by crop rotation plan, production scale, grain choice, environmental conditions, choice of inputs and production method. Sales of produce are influenced by grain choice, production scale and yield. Sales of produce are influencing profit-orientated commodities and income. Profit is influenced by income and costs. Profit influences the working capital, which is then the production method. The production method influences the choice of inputs. Availability of inputs/land influences the choice of inputs and production methods. The choice of inputs influences the crop rotation, yield and costs.

Loops identified: 1) start from 'international demand/supply' to 'exchange rates' to 'price volatility' back to 'international demand/supply'; 2) start from 'profit-orientated commodities' to 'market information' to 'grain choice' to 'sales of produce (products)' back to 'profit-orientated commodities and 3) start from 'choice of inputs' to 'costs' to 'profit' to 'working capital' to 'production method' back to 'choice of inputs'.

5.5 Discussions

-Small (niche) market: Findings manifest that 'oats' is major loser grain, have a small market (fewer buyers), it is processed for the least reasons and rarely does it get in demand. That makes farmers reluctant to produce the products that will be taken to expensive silos. The market agents instruct them on what to plant and how much to plant. Evidently, the allocation of land for this grain is less than five percent (%), and farmers seek backup enterprises (livestock) to boost working capital.

This is a consequence of market-driven extension. Through market information on future prices, market supply and demands of the grains, market agents sensitize farmers to determine which grains to plant and how much to plant. Thereafter farmers are advised to plant fewer grains like oats. This indicates that market-led extension is a threat to crop diversity and nutrient density. It also signals that the South African whole grains market is not organized in a manner that would enable producers to take advantage of the increased demand for nutritional foods and export surplus wholegrain products. Brainy Insights (2022) showed that oats' global market position is shifting and is anticipated to grow further given the increased demand for nutritious diets and benefits connected with wholegrain consumption. Increased levels of health consciousness and the need for food safety generate the growing demand for wholegrain consumption and oats-based products. To address this, there will be a change in policy regulating market development and a change in how crops are traded to allow international millers to directly purchase from farmers (Fafchamps 2006).

-Support for grain producers (farmers): Findings show that farmers have access to public and private (market-led) extensions. While there are programs in place to aid farmers during a certain period (in areas such as financial, training, marketing, technology and information), however, currently there is no specific system for subsidies, incentives and or constant capital investment. Mentors (commercial farmers) are not perceiving emerging farmers as equal partners and do not give sufficient support. Appointment of inexperienced assignees for quality assurance, food safety and overcharging farmers.

Maluleke (2019) noted that in South Africa agricultural support has been minimal and decreasing gradually but there are opportunities. The farmers need to be protected against fluctuations in yield, price and revenues through incentives and subsidies (GrainSA 2019). The introduction of subsidies and incentives will need a change in policy regulating the marketing of agricultural commodities.

-Funding framework: Results reveal that farmers' access to finance remains a stumbling block, the funding institution, the development bank (Land Bank) is structured and operating like the commercial banks in terms of eligibility criteria, interest rates and repayment plans (terms and conditions). Appears to be catering for well-established commercial farmers than emerging economies. Private investors' imposition of terms and conditions threatens Land Bank's

developmental mandate fulfilment. Government grants are not adequate for technology-intensive businesses like wholegrains and do not cover property purchasing while too much information is required.

Against this status quo, Mtombeni (2019) concurs that there is a need for a policy that will improve developmental funding mechanisms and foster the operations of small farms. The policy must also cover interest-free loans for smallholder farmers. On government intervention, the policy must extend the government control over state development banks to control the undue pressure from private investors. On the collateral, the policy must compel development banks to allow farmers to select a type of collateral of their choice (conventional and non-conventional collateral). Sagbo (2019) proposed that the loans taken for agricultural purposes if they are below a certain defined amount, should not require collateral in developing countries. These are policy recommendations that need to be considered to overcome funding problems.

-Access to land: Results indicate that leasing is expensive. Farmers of different enterprises compete for pieces of land. The state institutions like municipalities prefer and prioritize livestock farmers over grain farmers. Grain farmers have access to small-sized land. Another important matter found is no provision limits the size of land one private landowner can own. Communal lands are not fenced, and animals graze grains.

Equitable access to land needs more than legislation, the dialogues that involve all stakeholders working on the land in that particular area in pursuit of protecting vulnerable groups, diversity, gender equality and promoting equity (Taylor 2009). There is no way farmers can expand their production on land with tenure insecurity. To address this, the land tenure policy will need to be changed in terms of tenure length and promote automatic renewal without reapplication given the career of the tenant farmer (Adenuga *et al.* 2021).

-Profit- and export-orientated production: Results displayed that after grain farmers experienced hardships tend to shift from producing grains towards focusing more on export-orientated commodities (staple grains, fruits and livestock), in pursuit of maximizing profit. From the sales of grains, the revenue is inadequate to run all business operations. For many farmers, the cost of production and debts are higher than the income. The displacement of

grains can be attributed to consumer preference (shift from soybeans to wheat, and sorghum to maize).

Farmers' behaviour can be attributed to market intelligence from market agents and minimal support from the government. Maluleke (2019) noted that in South Africa agricultural support has been minimal and decreasing gradually. While farmers are encouraged to have different enterprises, however, that should not be a threat to grain production. GrainSA (2019) stressed that farmers need to be protected against fluctuations in yield, price and revenues through incentives and subsidies. To turn around the situation, wholegrain farmers need to be given subsidies and incentives for practising crop diversification, minimal usage of chemical fertilizers and adopting sustainable farming practices.

-Input costs and infrastructure: Findings show that inputs are high and increasing unprecedentedly. This includes machinery, fuel, equipment, fertilizer, seeds, pesticides, and herbicides. There is no comprehensive support system like incentives and subsidies. Apart from input costs, the input availability embedded with domestic transportation difficulties (congested ports, lack of rail transport and poor road infrastructure) is equally a challenge. This situation calls for intervention and cooperation of all stakeholders concerned to minimize the impact of high input costs on farmers, and institute agricultural input subsidies to boost productivity, yields and farm income (Hemming 2018). Anglade (2021) argued that government must consider road improvements for input in-country transportation. Government must re-develop a railway infrastructure for easy transportation of goods (Jovanovic 2014).

-Crises situation: Climate change poses a threat i.e., too wet and too dry season. Unsatisfactory efforts are done to develop new drought-resistant cultivars, cultivars suitable for the local climate and that can produce balanced optimum yields and quality on a small-sized land. Load-shedding is disturbing irrigation scheduling and lacks a solar power system.

Plant breeders need to be supported to develop cultivars best suited for local conditions. For a power system, there must be credit or incentives when installing solar energy equipment. For mitigating and adapting to climate change, it would be important that the government craft a climate policy that would outline farmers' responses, climate-friendly practices and other solutions to the situation (NASA 2021).

-Coordination, communication and transformation: Results have shown that the industry (the value chain) is well coordinated from the producer to the market, small-scale producers are mentored but the industry has not been able to transform, it is still a white male-dominated industry. Of the participants, none were female (let alone African). Although actors involved communicate, it seems they have different goals, and misalignments of expectations (e.g., between investors, financers and farmers), what is common is that they all lean toward maximizing profits, efficiency gains and productivity and care less about environmental responsibility, crop diversity, empowerment and fair wages. The aforementioned points confirm these indications. To overcome this, the protection and empowerment of new entrants from vulnerable groups should be a priority through policies such as AgriBEE and other equity schemes. There should be continuous monitoring and evaluation of the implementation of the empowerment policy (Dept. Agriculture Western Cape 2010).

-Assignees appointment: Findings have shown that the government appointed inexperienced assignees for quality assurance. Assignees are overcharging farmers, in some cases, farmers are no longer utilizing their services. Brunette (2021) argued that systems of appointment and removals in the public service and of agents assign politicians with too much power. This calls for reforming public administration in order to improve professionalism and implementation of policies.

5.6 Conclusion

This paper focused on assessing outline specific points of tension and barriers within grains networks where the potential for the proliferation of emerging wholegrains economies is curtailed. The study found that the systems in place are not geared to uplift the emerging wholegrain economies and promote sustainability. This includes a market-led extension as a threat to crop diversity and nutrient density. The competing interest of investors, developmental banks and farmers. In the interest to address these points, there will be a need to employ a more holistic approach that will consider all other elements and realignment of actors' goals towards a common sustainable goal. This should integrate intensive cooperation of stakeholders and changes in policies (planned objectives and decisions through which the actors orientate themselves) and practices. The bottlenecks in the non-staple whole grain value chain were lack of support for non-staple grain farmers, limited market access, unfavourable terms and

conditions of available funding opportunities, limited access to land, ill-structured coordination, communication, and transformation.

5.7 Recommendations

It is recommended that the rural grain farming is given the similar attention as the urban farming. The production costs are too high. The researcher would recommend government intervention through subsidies, prices and incentive policies. Other policies should include, consistent application and amendment of Land acquisition, ownership and lease policy, Tax incentive policy, Resource-poor agriculture policy, Funding framework, and Crop-neutral agriculture policy.

Here are recommendations for further studies:

-Considering the in-country input (fertilizers the most) difficulties, a study into how destroying railway networks has impacted agriculture would be important.

-Looking at *oats* as the most loser grain, the study into what can be done to expand its market would be great.

-Exploring the long-term environmental effects of land leasing in South Africa would be fascinating.

-The researcher would also recommend that more investigation is done on the appointment of assignees, their effectiveness and their impact.

References

Adenuga, H.A., Jack, C., McCarry, R., 2021, 'The Case for Long-Term Land Leasing: Review of the Empirical Literature', *Economic Research Branch, Agri-Food & Biosciences Institute,* from https://www.mdpi.com/2073-445X/10/3/238

Anglade, B., Swisher, M.E., & Koenig R., 2021, 'The Formal Agricultural Input Sector: A Missing Asset in Developing Nations?', *MDPI*, from https://www.mdpi.com/2071-1050/13/19/10697/htm

Baker, N.T., & Capel, P.D., 2011, 'Environmental factors that influence the local of crop agriculture in the conterminous United States', from https://pubs.usgs.gov/sir/2011/5108/pdf/SIR2011_5108.pdf

Brainy Insights, 2022, 'Oats market to reach USD 8,86 Billion By 2030; Increased Demand for Nutritional Foods', from https://www.globenewswire.com/en/news-release/2022/10/28/2543942/0/en/Oats-Market-to-Reach-USD-8-86-Billion-By-2030-Increased-Demand-for-Nutritional-Foods-Changing-Consumer-Dietary-Preferences-Will-Favour-Growth-The-Brainy-Insights.html

Brunette, R., 2021, 'Appointment and Removal in the Public Service and in Municipalities.' In J Klaaren (Ed) Reforming Public Administration in South Africa: A Path to Professionalisation. Cape Town: Siber Ink, 2021 from https://47zhcvti0ul2ftip9rxo9fj9-wpengine.netdna-ssl.com/wp-content/uploads/2022/05/Klaaren-Reforming-Public-Administration-in-South-Africa-chapter-1-only.pdf

Brussaard, L., de Ruiter P.C., & Brown, G.G., 2006, 'Soil biodiversity for agricultural sustainability', from https://www.sciencedirect.com/science/article/abs/pii/S0167880906004476

Dept. Agriculture Western Cape, 2010, 'AgriBEE', *Western Cape Government*, from https://www.elsenburg.com/agribee/#:~:text=AgriBEE%20as%20empowerment%20is%20defined,economy%2C%20as%20well%20as%20a

Duvel, G.H., 1991, 'Towards a model for the promotion of complex innovations through programmed extension', South African Journal of Agricultural Extension. 20: 70—86

Fafchamps, M., Vargas-Hill, R. & Minten M., 2016, '10 Quality Control & Marketing of Non-staple Crops in India', from https://web.stanford.edu/~fafchamp/supplychain.pdf

FAO, 2010, 'Annex 11: Factors affecting agricultural production', from https://www.fao.org/3/i0515e/i0515e18.pdf.

FAO, 2013, 'The State of Food and Agriculture 2013. Food systems for better nutrition', Rome.

FAO, 2015, 'Sustainable Development Goals, Indicator- Zero Hunger', Food & Agriculture Organization of the United Nations from https://www.fao.org/sustainable-development-goals/indicators/241/en/

FAO, 2018, 'Sustainable Food Systems', from https://www.fao.org/3/ca2079en/CA2079EN.pdf

GCSE Resources, 2018, 'Factors Affecting Farming', from https://geography-revision.co.uk/gcse/agriculture/factors-affecting-farming/

GrainSA, 2021, 'Input costs pose a threat to profitability', from https://sagrainmag.co.za/2021/12/02/input-costs-pose-a-threat-to-profitability/

Hemming, D.J., Chirwa, E.W., Dorward, A., Ruffhead, H.J., Hill, R., Osborn, J., Langer, L., Herman, L., Asaoka, H., Coffey,C., & Phillips, D., 2018, 'Agricultural input subsidies for improving productivity, farm income, consumer welfare and wider growth in low and lower-middle-income countries: a systematic review'

IFPRI, 2022, 'Food systems', International Food Policy Research Institute, from https://www.ifpri.org/topic/food-systems

Jovanovic S., & Bozovic, D., 2014, 'Railway infrastructure maintenance management system concept in Serbia within the process of planned railway (re)construction & modernization', International conference contemporary Achievements in Civil Engineering, from https://www.researchgate.net/publication/292962074_Railway_infrastructure_maintenance_management_system_concept_in_Serbia_within_the_process_of_planned_railway_reconstruction_modernization

Kareem, M.A., 2021, 'Farming Systems Approach', from https://www.manage.gov.in/studymaterial/FSA-E.pdf

Liliane, T.N., & Charles, M.S., 2020, 'Factors affecting yield of crops', from https://www.intechopen.com/chapters/70658

Maluleke, I., 2019, 'USA farm subsidies: lessons to be learnt', GrainSA, from https://www.grainsa.co.za/usa-farm-subsidies-lessons-to-be-learnt

Marshall, M., 2019, 'The hidden hunger affecting billions', *BBC* from https://www.bbc.com/future/bespoke/follow-the-food/the-hidden-hunger-affecting-billions/

Mtombeni, S., Bove, D., &Thibane, T., 2019, 'An analysis of finance as a barrier to entry and expansion for emerging farmers' from https://www.compcom.co.za/wp-content/uploads/2019/09/CC201901-Mtombeni-S-Bove-D-Thibane-T-An-analysis-of-finance-as-a-barrier-to-entry-for-emerging-farmers.pdf

NASA, 2021, 'Responding to Climatic Change', NASA- US Federal Government, from https://climate.nasa.gov/solutions/adaptation-mitigation/

Sagbo, N.S.M., 2019, 'Effects of agricultural loans in developing countries- Benin case study', University of Kentucky, from https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1079&context=agecon_etds

Taylor, M., 2009, 'Providing access to land: challenges and solutions', International Land Coalition, from https://sustainabledevelopment.un.org/content/dsd/dsd_aofw_wat/wat_pdfs/meetings/ws0109/4_2_Taylor.pdf

UC Davis, 2021, 2021, 'Sustainable Agriculture Research and Education', UC Agriculture and Natural Resources, from https://sarep.ucdavis.edu/sustainable-ag

Wang, C. H., 2014, 'Farming methods effects on the soil fertility and crop production under a rice, vegetables cropping sequences', Journal of Plant Nutrition. 2014;37:1498-1513, from 10.1080/01904167.2014.881876

Worth, S.H., 2006, 'Agriflection: A Learning Model for Agricultural Extension in South Africa', from https://www.researchgate.net/publication/249036172_Agriflection_A_Learning_Model_for_Agricultural_Extension_in_South_Africa

Worth, S. H., 2014, ‘The facilitated Learning Agenda and Extension Carousel.’ Supplement to the Journal of International Agricultural and Extension Education, 21(2), 90-93

Presented at the Annual Conference of the Association for International Agricultural and Extension Education, Miami, FL, USA, May 2014.

CHAPTER 6

POLICIES THAT CAN ENABLE THE PROLIFERATION OF NEW WHOLEGRAIN ECONOMIES IN CONSONANCE WITH ENVIRONMENTAL, NUTRITIONAL AND EQUITY OBJECTIVES

Abstract

South Africa will require the creation of a supportive operating environment for non-staple wholegrains networks, so they can deliver on their full potential. Presently, only a marginal of non-staple wholegrains are produced and affordable. Thus, this paper identified and proposed a package of enabling policies and market incentives that are within the scope of sustainable development priorities and aspirations. In an effort to improve the proliferation of new wholegrain economies and their ability to successfully increase production and access in a way that ensures environmental, nutritional and equity objectives are met. Primary data was collected employing semi-structured interviews with 25 respondents through snowballing sampling. As part of the data analysis, thematic content analysis and a graph theory (policy map) were utilised.

This part of the study revealed that the strategies currently in place do not frankly cater for underutilised and indigenous crops. That they outsource too much power to the private sector without ingraining a sense of accountability in terms of sustainability. This, then, breeds fertile ground for the maximization of productivity, profits, exploitation of natural resources and efficiency gains. The paper also revealed some inconsistencies in the application of some policies. Again, farmers are not aware of incentive programs in place. Farmers are not protected from fluctuations in prices and a fragile country's economy. It is befitting then, that this paper identified and proposed a new set of policies and incentives that are needed to enable emerging wholegrain networks to increase the production of non-staple whole grains and make them available and affordable while observing ENE objectives. Recommended policies include farm, tax incentives, land leasing and funding framework. Some existing policies are good; however, little extensions were proposed to further improve the situation.

Keywords: Policies, Stakeholders, Non-staple wholegrains and ENE objectives

6.1. Introduction

Agriculture has evolved drastically, from the era of colonisation, World War II and Apartheid to the current political-economic setup (Rahaman 2017). During these eras, there has been the introduction of new technologies, increased use of mechanization, chemical and changes in agricultural policies that were biased to maximise of production of staple food, profits and GDP (Cheema 2008). The debris of these changes' manifests in modern agricultural techniques, farmers' modus operandi and other legacies. Here we can mention the farmers using technologies and chemicals to produce a preponderance of food with reduced labour. A few of the effects are groundwater contamination, soil degradation, increasing production costs, the decline of labour demand, negligence of working/living conditions for farm labourers and disconnection between the farm as an institution and the community in which it is situated (Feestra 2021).

Transition in dietary practices, dependence on low-quality staple food imports and climate variables (Cheema 2008). Climate change poses a threat as it can undo years of agricultural development achievements in the developing world. As it increases soil erosion, the decline in soil fertility, fluctuating water availability and rising warm temperature, thus severely pose threat to crop productivity (Zamasiya 2017). Given these concerns, conversations have been going on, seeking sustainable farming systems for ensuring resources' long-term productivity. From those dialogues, the popular view is the application of sustainable agriculture techniques and the creation of a sustainable food system. Since that system addresses environmental, nutritional, and social concerns while ensuring the economic viability of different stakeholders (Maryville University 2021). Strategies to safeguard natural resources and control the application of production practices can be in place, however, without the appropriate policies, changing economic priorities and social values, the whole process becomes a fruitless exercise (UC Davis 2021).

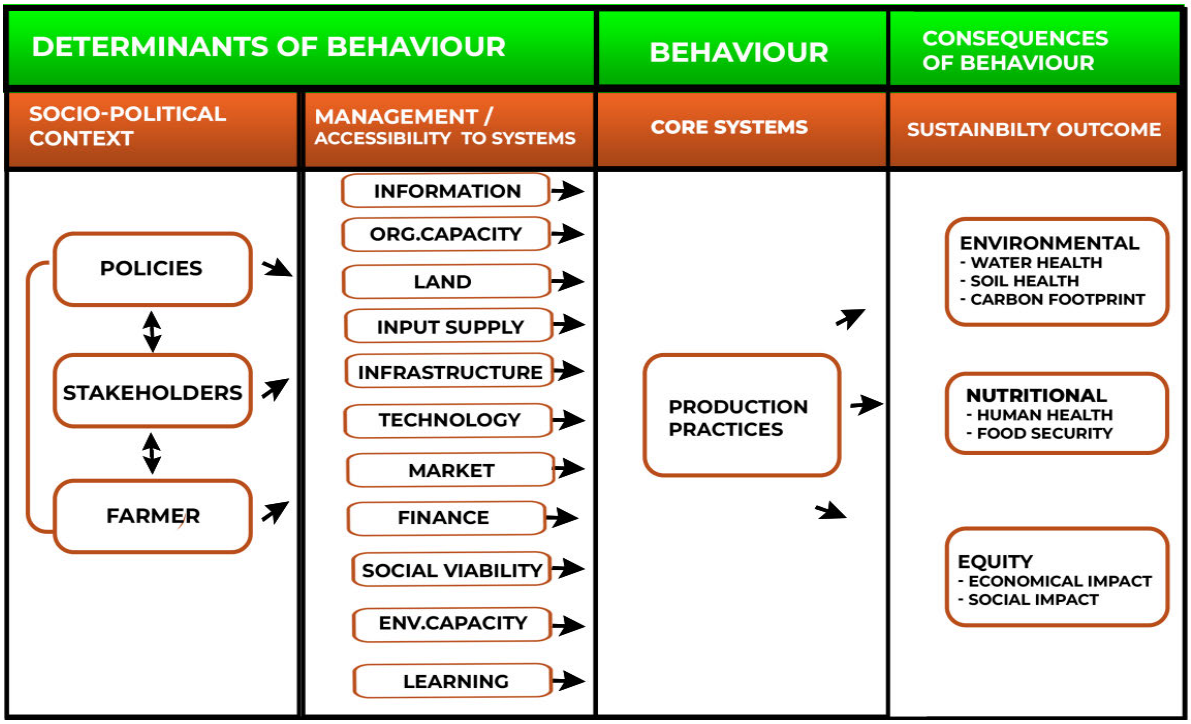
Numerous studies noted that existing government policies are mostly ill-suited and often inhibit the goals of sustainable farming practices. Policies that observe and promote environmental conservation, human health, social and economic equity together with economic profitability. (Feenstra 2021). Policies that would prioritise the protection of soil and water quality, responsible use of inputs and diversity of crops (Khwidzhili & Worth 2018). It is for that reason that this study would identify the policies that can enable the proliferation of new

wholegrain economies and their ability to successfully increase production and access in a way that ensures environmental, nutritional and equity objectives are met.

6.2. The conceptual framework for exploring relationships involved in policies and stakeholders' influence towards sustainability

The study incorporates components of Sustainable Food Systems, Extension Learning Carousel and Behaviour analysis. This paper then discusses frameworks as a basis for crafting a framework for exploring the policies and stakeholders' influence on farmers' behaviour which may undermine sustainability targets. Based on the mentioned models, the conceptual framework below was developed, to show inter-relationship and major factors influencing the behaviour of actors and impact.

Elements connected in wholegrain production system.



Sustainable Food Systems

Food systems comprise various actors (input suppliers, producers, food-chain actors and product consumers) interlinked and involved in the food value-chain activities (from input supply, production, processing, transportation, retailing, consumption and disposal) and their orientation in terms of social, political, economic and natural environments. This mostly covers the triplet industries, agriculture, fisheries and forestry (FAO, 2018). IFPRI (2022) highlighted

that the food system ought to encompass the enabling policy environment, above cultural norms, and consider environmental sustainability, nutrition security, inclusivity, productivity and efficiency (affordability enhanced). That is where the concept of 'Sustainable Food Systems' sprung up, that the ideal food system would make provision for equitable access to sustainable nutritious diets in economic, social and environmental sustainability (FAO,2018).

This approach is situated at the centre of the United Nations SDGs. SGDs suggest intense shifts in agriculture and food systems and that at least by the year 2030, secure sustainable food production systems, improve nutrition, apply resilient agricultural practices that proliferate production and productivity, maintain ecosystems, improve capacity for adaptation to climate change, natural hazards and other disasters and successively strengthen land and soil quality (FAO 2015). Apart from trends, the conduct of various actors is used to measure the performance of the food system in terms of sustainability. This is through economic, social and environmental dimensions. On the economic aspect, positive results reflect the viability of actors' activities, equity in the distribution of economic benefits in relation to income (wages), profits for entities and taxes. On the social aspect, positive results reflect the social value and economic profits, enhancement of human health, nutrition, cultural norms and working conditions for all disadvantaged groups. On the environmental aspect, positive results reflect the actors' activities positively impacting the natural resources and biodiversity (FAO 2013).

The framework takes into account, all the systems interrelated, interconnected and interdependent. The theory of change, which is the foundation of a sustainable food system was utilised to prove that change in one system influence change in other systems of the food system. Equally, food-chain actors influence one another's capacities and incentives. In this case, the interest lies in actors intendedly and unintendedly influencing one each and the impact of that influence on the production (FAO 2018). Food value chain activities are subsystems of food systems. Out of all subsystems of the food systems, this study elected a farming system since the focus is on the production of whole grains. To demystify the concept, the farming system is defined as a set of interrelated farming components and practices executed with resources at the farmer's disposal in pursuit of maximizing productivity and farm income. While a farmer's decision-making, control and choices are the centres of the system, to some extent the influence is exerted by social, political, institutional, and economic forces. The

subsystems of the farming system include input supply, land, labour and capital, to mention a few (Kareem 2021).

This framework (sustainable food systems) categorically covers components namely natural elements, societal elements, core systems, the behaviour of diverse actors and sustainability performance. Arguably, the framework does not explicitly express the structures and systems that influence each actor's capacity. Factors important for modern agriculture, such as the capacity to engage information, technology, infrastructure and learning. On sustainability performance, above and beyond the impact of farming and other activities, it is important to observe the role, actors ought to perform in promoting sustainability.

Extension Learning Carousel

As a way of improving extension in relation to the welfare of the under-resourced smallholder producers, the Agriflection model was put forward. This model is attached to Facilitated Learning Agenda, it was brought as an improvement measure to the extension facilitation approaches. The model draws attention to the element of learning in extension engagement, building agricultural actors' capacity through an ongoing process of investigation, application and sharing feedback with actors. The model proposes that actors (farmers, extension officers, policymakers and researchers) should engage in equal partnership for the purpose of continuous improvements and learning (Worth 2006). Given that Facilitated Learning Agenda in Agriflection was not explicitly detailed to cover its components, the idea to design an approach that will unequivocally express the content of the learning agenda was conceived-that framework was named extension carousel (Worth 2014).

The extension carousel encompasses three major aspects namely, i) management, ii) production and iii) economics. Management elements include managing information and organisational capacity; production elements include managing land, input supply, infrastructure and technology and economics include managing finance and market(ing). In addition, social viability, environmental sustainability, and the learning process include innovation, systems thinking and development paradigm (Worth 2014). Arguably, important elements such as policy engagement and application, and management of labour are not immediately visible in this framework.

Behaviour analysis

At the centre of this study, is policy and actors' behaviour which influences other actors' behaviour in relation to increasing wholegrain production in breach of the sustainability targets. The behaviour analysis model is used to show the relationship between determinants of behaviour (variables), behaviour and consequence of behaviour in agricultural development. This model helps to understand and predict complex human behaviour (Duvel 1991). This study points out the policies and food chain stakeholders and the access to agricultural systems as determinants of farmers' behaviour. Production practices as the behaviour and sustainability outcomes as the consequence of behaviour.

6.3 Results

Management

i) Information

The concept of information for this work refers to farmers' ability to collect information, process and apply that information for their farm operations, interpret and utilize that information to make decisions, reflect on processes and share newly generated information. Farmers must be able to consult, gather and compare the information they would have acquired. Information is critical for every farm aspect, production, management and economics as per the carousel of learning (Worth 2014).

In this case, for market information, the market agents supply farmers with market information on future market prices, market supply and demand for the grains. Farmers said that they use this information to determine how much to plant each season e.g wheat is in demand prices and prices are good, farmers would plant more wheat than barley. Sometimes the market information on commodity supply and demand mismatches the farmers' crop rotation plan. The majority of farmers said that striking a balance between the demand and the initial plan is difficult (if not impossible) because farmers need more profit for them to be able to run their operations. The main stakeholders involved in the dissemination of information, are SAFEX, GrainSA, NAMC, Unigrain, Farmsol, Overberg Agri and DALRRD. These institutions have agricultural extension officers, agricultural economists and market activists.

Most of the smallholder farmers are surrounded by commercial farmers, whom they enjoy no relationship with. They only meet once in a long while, through farmer's day programs or on

Dept. invitations to discuss issues at hand. Otherwise, other stakeholders deliver the information to each farmer, registered with them. Noticeably, farmers have little to no opportunity to investigate on their own, to command what information is relevant to their situation, instead are sensitized to the production and market(ing) aspects in terms of systems and structures to adopt.

ii) Organisational Capacity

Here we refer to farmers' ability to engage, command and manage all the farm operations with the least support from external actors. Timing of processes (when to buy inputs, plant, maintain the plants and harvest) and managing structures and systems is fundamental for farming. The concept further explains farmers' ability to organise, plan, implement, monitor, and reflect on management operations (Worth 2014).

Grain farmers engaged show a fair understanding of the conditions they are growing crops and the resources at one's disposal. The crop requirements in terms of soil, climate conditions, and water (availability, need for supplements). They set timeframes for all important processes of their operations. Stakeholders such as the Dept. of Agriculture help with extension services (skills training, knowledge), a few commercial farmers have volunteered to mentor smallholder farmers in many aspects incl. the selection of vendors and clients, and other market agents such as Overberg Agri. and FARMSOL Holdings help them with knowledge. Part of the challenge is that the resources ordered, are not delivered on time, which delays the processes. Another element is that the grains industry is enclosed and well-coordinated, this implies that farmers enjoy a limited command over the marketing system. There are fewer buyers, one needs to secure a contract before planting.

Production

i) Land

In this context, the land is referred to as a field on which grain product is grown. Farmers' capability to manage the dynamics associated with land, from sourcing to appropriate usage of it. Other aspects include land availability, land size, productivity, suitability and property ownership. The stakeholders' involvement in facilitating farmers' access and in ensuring productive use of land (Worth 2014).

Access to land is a major challenge for a majority of respondents. Small-scale farmers could only lease as little as 20ha to 700ha piece of land and few are in ownership of 620ha to 2700ha piece of land. Municipalities prefer to give large pieces of land to livestock farmers than grain farmers. Grain farmers have access to small-sized land (too small to expand production with the cultivars they are using) and make fewer returns. The Dept. of Agriculture argues that state-owned land is outnumbered by privately owned hence farmers are given 50-80ha.

Once the land leasing contract lapses, the land is taken back to the market and the farmer must bid again, so the land tenure maximum period is short for long-term aspirant farmers and not guaranteed a second chance to work that same land. Farmers then are not motivated to invest in sustainably utilizing the land. Even if a farmer happens to secure a contract again, the rent would have gone up. Smallholder farmers compete for land than for the market. Commercial farmers have vast land, left fallow. Sometimes land leased, is not conducive to grain production. Many farmers said that leasing is too expensive, figures given R3000 per ha for each year so in case a farmer leases 620ha that would mean, a farmer spent approximately R1,860,000. *Trends*: In inland provinces (Gauteng the most), white farmers are relocating to the Western Cape and are willing to purchase the piece of land at any given value.

ii) Input supply

Inputs include grain seeds, fertilizers, pesticides and fuel and machinery. Here one explored the farmers' aptitude to access, select, and evaluate the input important to their farm enterprise as well as to share the reflections with other stakeholders for further input improvement. The focus was located on dynamics and stakeholders' involvement that shape farmers to respond in a particular way that impacts production (Worth 2014).

Input cost is a major concern for all respondents. Prices are unreasonably and increasing unprecedentedly. One farmer argues that diesel eight of five litres was R7800 (in Sept. 2021) which has gone up by 60%. Repairs and maintenance costs are high. The average estimation is that 25% of the input cost is for land leasing; 50% for fertilizer, diesel, seeds and pesticides; 25% for machinery. On input availability, most of the inputs are imported, due to the demand, in most cases, international suppliers have limited options for fertilizers, seeds, and spraying chemicals and due to this limit farmers would have fewer options but take what is available and later that affects the soils. The other thing, ports are congested, no trains to transport inputs.

With poor road infrastructure, transporting the products (estimated at two million tons of fertilizers) over long distances is extremely difficult.

iii) Infrastructure

For the functioning of the farm enterprise, there are essential facilities, systems and services needed to be put in place. Of interest is farmers' ability to manage those facilities, systems and services, making decisions about selection, requirements, improvement and evaluation. Further, access to infrastructure, quality of infrastructure and stakeholders' involvement shape farmers' responses in a particular way that impacts production (Worth 2014).

Most smallholder farmers do not invest much in infrastructure since they are not owning land property. They are leasing for nine years, and eleven months. However, they need a small office to keep all records and a workshop or shelter where tractors, sprayers, planters and harvesters are housed. On-road infrastructure can be attributed to rural roads with soft surfaces, dirt and narrow widths. Transportation of inputs and products is difficult. Most farmers rely on privately owned silos which are very expensive. It is better to plant the least so you can sell all at once.

iv) Technology

Technology includes equipment, methods and systems employed to produce grain crops. Farmers' capability to select, operate/utilize technology systems and evaluate their efficiency, and effectiveness. The concept captures the availability, accessibility, affordability and suitability of technology systems relevant to farm operations (Worth 2014).

A significant number of farmers have been assisted by the Dept. of Agriculture through financial assistance programs to purchase machinery. On the other hand, several farmers still depend on renting machinery from contractors. Grain farmers are sourcing material and equipment from organisations such as FARMSOL Holdings, and Overberg Agri. These organisations also loan grain farmers to purchase, service and maintain planting and harvesting technology. This is another major cost area for grain farmers, however, there is a commitment to keep on investing in technology. The challenge is that machinery is imported and is not always available, and that pushes farmers to place an order a year in advance. Machinery is sometimes delivered late and that delays planting and/or harvesting. Farmers from inland provinces, plant under summer rainfall conditions, hence they utilize irrigation. The irrigation schedule is disturbed by power cuts (load-shedding). Power suppliers are overcharging farmers.

Economics

i) Market(ing)

This concept refers to farmers' capability to access the market, produce marketable products and comprehends imperative elements of their markets and opportunities to command systems and structures associated with their market. Ability to engage with market agents and take informed decisions (Worth 2014).

On profit leader, a slight shift from barley to wheat has been noted. Barley is mostly purchased for brewing by SAB/AB InBev whereas wheat is mostly used for human consumption. On the other side, the profit loser is oats since it has a small market. One producer stated that out of 1500ha, only 65ha is allocated for oats (precisely 4%). Farmers claim it is risky to grow grains hence they seek backup enterprises such as livestock (beef cattle) to boost cash flow. Those with livestock, allocate 45- 55% piece of the land for livestock and 40-50% for grains. Pricing of grains and marketing policies accord international markets to determine grain prices. Farmers are price takers of inputs and their products. Transport differential prices, make buyers prefer imports over purchasing from local producers.

ii) Finance

This concept refers to farmers' capability to source financial resources, acknowledge the needs of the enterprise and make budget allocations per those needs and be accountable for each cent the enterprise spent. Ability to where (institution) and how (the process) to seek funds, where (expenditure) and when (season) to spend and the profitability (Worth 2014).

Access to finance is the single most challenge, farmers lack collateral/ security to secure loans. Those who can access loans allege that development banks (Land Bank) operate exactly like commercial banks, in terms of eligibility criteria, interest rates and repayment plans (terms and conditions). Land Bank claims that they are funded by private investors that impose their terms and conditions, however, farmers are given flexible collateral options. On government support, no subsidies and constant investment, however, there are programs to financially support farmers for 3 to 5 years. The government does not support farmers buying the property and generally takes a long time to approve funds (too much information is required). Delivery of inputs clashes with farmers' timeframes (planting seasons). Government officials make empty

promises during crises (drought, floods or COVID). Dept. of Agriculture claims that farmers lack self-reliance and keep on seeking funds. Other, mentors are not giving smallholder farmers enough support. The government is accused of appointing inexperienced assignees for quality assurance and food safety and overcharging farmers (appointee: LEAF SERVICE)

Social viability

Social viability refers to matters related to cultural heritage, promotion of social cohesion, equity and observation of labour laws. In the context of the study, the researcher explored the extent to which the farm enterprise or farm operations strengthen the social fabric, reducing poverty or inequality and whether or not, they are viable and acceptable in the local traditions and promote social cohesion. Another concern marked is whether a farmer can manage the matters regarding social context and extension role in that regard (Worth 2014)

The key stakeholders identified are market agents, extension workers and farmers that contribute to social viability. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information work. The majority of the farmers indicated that although it is culturally accepted to grow grains in the communities of South Africa, the fact that a) grains cannot be consumed as fresh produce b) local people cannot process grains with resources at their disposal such as maize grinding machine c) local people have little information on how they can utilise grains to their advantage d) and most of the grains are not associated with any modern African traditions except sorghum used for traditional beer (*umqombothi*), makes it hard for non-staple grains to assume their rightful place in South Africa. Farmers observe labour laws but are unsatisfied with labour productivity. The market and extension agents are of the view that the grain industry is slow regarding transformation and social cohesion. The industry is still White-Male dominated, from farmer to retailer. Of the sampled participants, only one was African and none were women. On the other hand, commercial farmers act as mentors to smallholder farmers but to an extent, smallholder farmers feel like these mentors are not providing adequate aid as they are seen as future competitors.

Environmental Sustainability

The concept of environmental sustainability here is referred to as the farmers' willingness and ability to ensure compliance with environmental legislation and manage the conversation of natural resources at their disposal. Another important area is the role of extension in ensuring

the protection of natural resources and being of service to improve farmers' capacity (Worth 2014).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to environmental sustainability. Policymakers make laws for environmental protection. Market agents and extension workers are involved in searching and sharing information with the farmers on conserving the environment and all the natural resources at one's disposal. The farmers are involved in making that information work. Most farmers stated that it is close to impossible to apply all sustainable agricultural measures (such as minimum tillage, organic fertilisers, and little or no agricultural chemicals) unless you are practising subsistence farming. The grains need big machinery from production to processing. The short land tenure makes farmers apply more fertilizers to maximize the yields so that by the time tenure ends, the farmers would have made fairly enough profit. The shortage of fertilizer supply from international suppliers, makes farmers have fewer options on what to put on the ground. The demand and supply of grains compromise the crop rotation plan. So environmental sustainability is compromised in this context. However, the extension officers from the Dept. of Agriculture from time to time hold sessions with farmers to engage about matters related to the subject. Climate change poses a threat, some seasons are either too wet or too dry. Cultivars that can produce high yields on small-sized are scarce. Educating about environmental legislation and other means to secure the same profits, when applying sustainable agriculture is necessary.

Learning

In this context, we refer to learning as the farmers' willingness and ability to continue with the ongoing process of learning from their experience and the outsiders, the adoption of newly discovered practises and technologies. Under the umbrella of learning, other processes namely innovation, systems thinking, and development paradigm are observed. This element also put focus on stakeholder-to-stakeholder learning (Worth 2014).

The key stakeholders identified are policymakers, market agents, extension workers and farmers that contribute to the learning process. Policymakers make laws that guide the working environment and production. Market agents and extension workers are involved in searching and sharing information with the farmers. The farmers are involved in making that information work and share feedback with the market/extension agents (whether the information has

worked). From the responses of many different stakeholders, the sharing of information or feedback process is linear. The policymaking institutions share new information with extension officers, then they share it with farmers. Farmers are seen as end-users or consumers of information with little or no space to share feedback or their own experiences. Ordinarily, farmers have little time to spend with extension officers, besides given formal qualifications of the outsiders, there is the mentality that they know more than the farmers. The building capacity of farmers has not been adequately delivered. Farmers' capacity to innovate is linked to the advice given by the extension workers. In problem-solving, they rely on their expertise. In decision-making, they rely on the information given by extension workers. There is a need to work on developing farmers' capacity.

6.4 Analysis

Thematic analysis

Key Codes	Key Theme
➢ Marketing of Agricultural Products Policy ➢ Land (ownership/lease) Policy ➢ Environmental Management Policy ➢ Agricultural Businesses Financing Policy ➢ Labour wages Policy ➢ Subsidies and Incentives Policy	Policies related to issues flagged

Policy map through graph theory

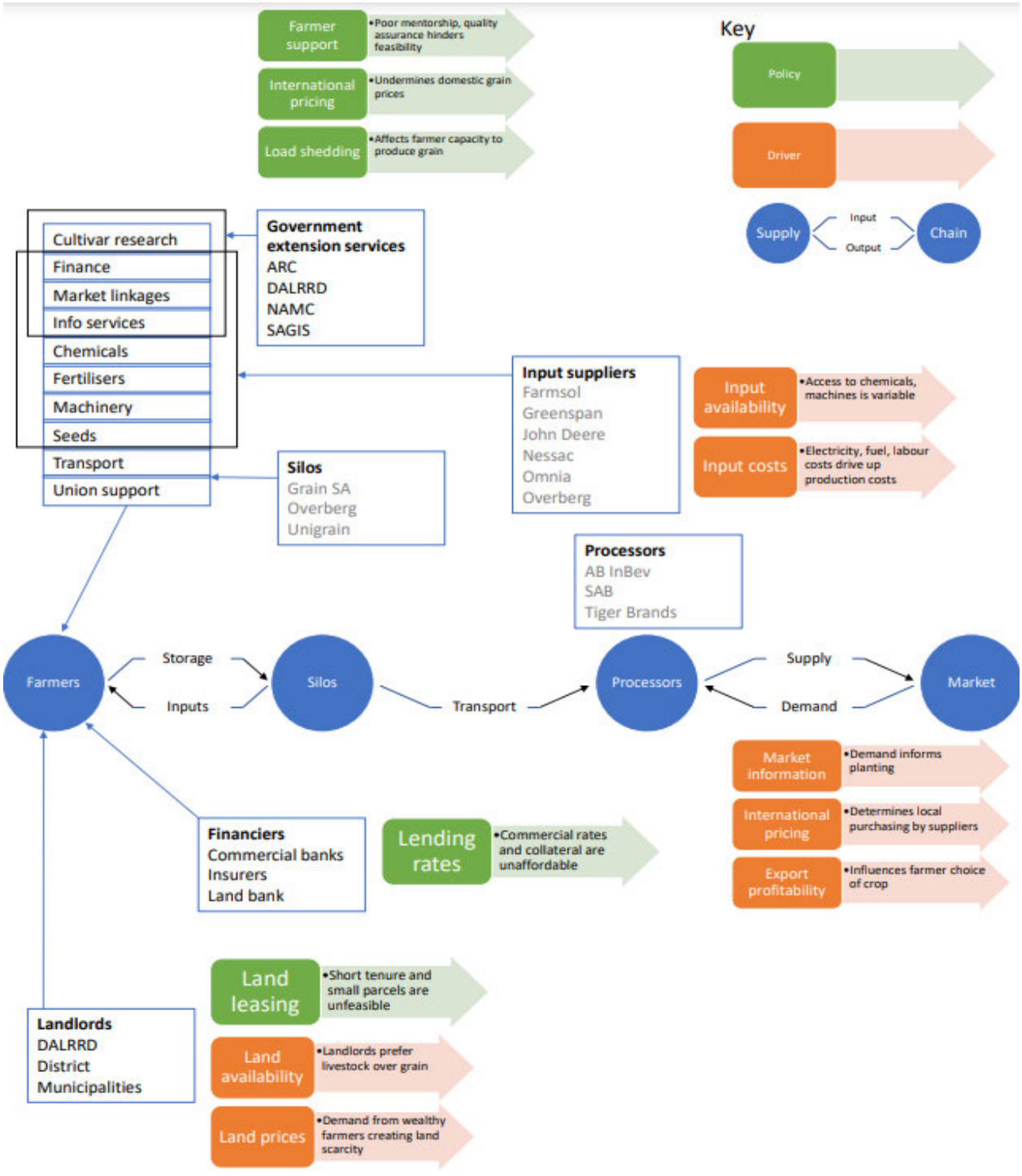


Figure 17: Wholegrains Policy Map

6.5 Discussions

It must be noted that Johnson (1995) argued that identifying the proper role of the enabler (government) balanced with the proper role of the market in policies in a way that agricultural development is not compromised is a challenge. However, considering the findings and the related literature, the following policies have been identified:

- Sustainable agriculture policy (and/or Responsible land use policy): Findings illustrated that sustainable agriculture practices (such as crop rotation) are compromised due to price change and other market opportunities. Against this exploitation, South Africa would need to establish a framework that will enforce the protection of natural resources and improve compliance with certain sustainable practices. This would assist in minimizing the further exploitation of the natural environment while promoting pillars of sustainable agriculture which include biological productivity, protection of natural resources, reduced levels of risk, economic viability and social acceptance (Khwidzhili & Worth 2018). Again, just like in the sugarcane industry (Tongaat Hulett 2020) at the micro-business level, each grain company would need to formulate a responsible natural resources utilisation framework i) to guide all the entity's operations in terms of managing land leased in an environmentally sustainable manner, b) to ensure that entity's impacts are fair to the environment, local community, workers and other stakeholders and c) to ensure that the company's agricultural practices are in accordance with ten principles of the United Nations Global Compact and Sustainable Development Goals. This policy can help the grain sector to proliferate production while promoting the ENE objectives.

- Land acquisition, ownership and lease policy: It is clear from the findings that grain smallholder farmers find it frustrating to acquire and lease land in South Africa. Farmers are pointing at the government; the government is pointing at the historical injustice and the private sector. Commercial farmers are accused of owning big hectares and leaving them in fallow. In line with these views, Opperman *et al.* (2020) argue that currently, no provision stipulates the amount of agricultural land that can be owned by a South African farmer and a foreign national. Hence the commercial farmers own as much as they can afford and that leaves small pieces of land to the state. South Africa would need to establish restrictions on the amount of agricultural land one can own.

For land leasing, it is clear from the findings that the farmers have to apply again after the contract lapses and that there is a non-alignment and lack of awareness of newer national government policies. The landlords still apply the Subdivision of Agricultural Land Act No. 70 of 1970 which states that the lease period for agricultural land cannot exceed 10 years, whereas the newer policies (State Land Lease and Disposal Policy of 2013) state that the land lease period for '*all'* leases shall be 30 years, which is a fair minimum lease term length. Just like in Belgium, a strict land rental policy is needed in guiding the support of smallholder farmers for long-term land leasing and controlling the land market. A proposed policy that would cover a) pre-emption of rights (pre-emptive right to buy), b) automatic renewal without reapplication given the career of the tenant farmer and c) transferability- with an option that upon retirement, serious health problem or death, a farmer may transfer the rental agreement to a family member in case they would wish to continue (Adenuga *et al.* 2021). This policy can help to increase access to agricultural land.

- Farm subsidies policy: The majority of the farmers decried that input costs are high and increasing from time to time. Now, beyond the international trade agreements and various agricultural programs, government intervention (policy) is needed given the increased costs of new technologies and other inputs, among other things caused by international politics and increased transportation costs because farmers are far away from the input suppliers. O'Kelly (1988) argued that the absence of subsidies creates a 'classical Von Thunen model' of African economics. The theory explains economic geography and spatial economics (Altaweel 2020). Maluleke (2019) noted that in South Africa agricultural support has been minimal and decreasing gradually but there are opportunities. Referencing the United States of America (the world's leader in grain production), where farm businesses receive subsidies. With the intention to protect the farmers from fluctuations in prices, revenues or yields. Subsidies include agricultural risk coverage, crop insurance, price-loss coverage, disaster aid, marketing loans, marketing, conservation program, research and support. This is to ensure farm income is higher than the production costs while surviving in the struggling local economy (Maluleke 2019). Given the climate variability (too wet or too dry seasons), subsiding farmers on input costs and crop insurance will work for food security. Although South

Africa is budget-constrained, this policy can help the grain sector to proliferate production while promoting the ENE objectives.

- Tax incentive policy: Results indicated that farmers are neither aware nor benefitting from the tax incentives currently in place. Opperman *et al.* (2020) reported that the South African government supports environmental sustainability through Section 37C of the Income Tax Act (deductions) which provides for proper environmental management and conservation. Expenditure made to conserve natural resources is deemed to be tax-deductible. Cooperative Incentive Scheme is also in place to improve the viability and competitiveness of primary agricultural cooperative enterprises. Learning from the United States' incentive model (Dept. Taxation & Finance 2021) which provides credits, deductions and exemptions for farming operations of all sizes. With the objective to help farmers improve and expand their farming businesses. Solar energy systems equipment credit (when purchasing/leasing solar power systems) and Tax incentives for small farms (known as beginning farmer Tax credits) include credit amounts like a percentage of rent payment. In the interest of equity, adopting such a framework would be important (CCH ARM Editorial 2022).

- Resource-poor agriculture policy: Responses of inland rural smallholder farmers have shown that their predicaments are different from largely urban provinces. In the same manner that the dynamics of summer rainfall areas are different from one of winter rainfall areas. Opperman *et al.* (2020) noted that there is no provision for disadvantaged geographical areas. Now, in the interest of equity objectives, there is a need to put in place appropriate policies to cater for such areas and cover elements such as reliable water supply, fencing, intensive support services, infrastructure and electrification or solar power installation. Infrastructures like boreholes, water storage (rainwater harvesting system), irrigation system, power source, buildings, grains storage and other farm equipment. In most cases, the loans do not cover these elements since most farmers are leasing the land. The national policy in operation is the National Water Act No.36 of 1998, a resource-poor farmer financial assistance. This policy guarantees qualifying farmers financial assistance for improving water supply and assistance in making water use licence applications (Breede-Gouritz 2019). The challenge is that this framework only covers one aspect, water supply. Therefore, there is a need for a policy

that would consider the need for equity and cover financial assistance for poor resource farmers when securing the infrastructure to increase their production.

- Funding framework: it is obvious from the findings that access to funding is a challenge for smallholder farmers given the funding criteria, interest rates and assessment of funding applications timeframes. The financial assistance is not sufficient to make a farm sustainable and is provided for a short period. The financial initiatives and development institutions are pressurised by investors, and in the end, they fail to fulfil their mandates. Against this status quo, Mtombeni (2019) concurs that there is a need for a policy that will improve developmental funding mechanisms and foster the operations of small farms. The policy must also cover interest-free loans for smallholder farmers. On government intervention, the policy must extend the government control over state development banks to control the undue pressure from private investors. On the collateral, the policy must compel development banks to allow farmers to select a type of collateral of their choice (conventional and non-conventional collateral). Sagbo (2019) proposed that the loans taken for agricultural purposes if they are below a certain defined amount, should not require collateral in developing countries. Therefore, to advance economic development, this policy must provide exceptions for collateral-free funding, given that the loan is below a certain stated amount, given the need for equity and the financial position of a farmer. Funding applications and applicant screening should be in line with cultivation timeframes.

- Crop-neutral agricultural policy (marketing policy): Findings revealed that oats are a major loser grain (have a small market and are produced in small quantities). Farmers are given market information to determine how much to farm per season. Therefore, if South Africa needs the least oats at least the remaining must be exported. This places a need for a policy that would promote crop diversity and particularly protect loser grain against staple grains and leader grain is needed. In agreement with this view, Pingali (2015) proposed a crop-neutral agricultural policy that would create a level business arena for all crops, which would permit farmers to respond to domestic/international market signals rather than one that is biased towards a particular set of staple crops (or leader grains). Findings also revealed that there is a price high volatility of grains. This policy must also cover price risk management. The Government of Madhya Pradesh-

India (2022) introduced incentive schemes for crop diversification, as an attempt to reduce the mass production of wheat and paddy. Thus, this policy must cover incentive schemes for farmers practising crop diversification, minimal usage of chemical fertilizers and adopting sustainable farming practices.

- Equity Policy: It is clear from the results that the gender and racial profile of the South African grain sector has not significantly changed post-apartheid. Precisely, the Blacks, Africans in general, and women, in particular, owning and managing grain farms are still in insignificant numbers. Although the government put in place policies such as Employment Equity and Agricultural Broad-Based Black Economic Empowerment (AgriBEE), mainly to promote the empowerment of the groups that were previously disadvantaged by the previous regime and support entrepreneurial initiatives (Labour Guide 2022). The constitutionality of these policies is often questioned and, in the end, are not well implemented. There is a necessity to enforce these policies in an effort to protect and create an enabling environment for new entrants (and previously disadvantaged groups).

6.6 Conclusion

This paper aimed to identify and propose a package of enabling policies and market incentives that are within the scope of sustainable development priorities and aspirations to help increase the wholegrains sustainably. It was revealed that farmers are not protected from fluctuations in prices, a fragile country's economy, interest rates, or collateral. The study identified the policies to foster sustainable farming, sustainable food system, equity and transformation of the agricultural sector. The study identified policies to further strengthen the support for the non-staple wholegrains producers in terms of access to land, access to finance, equitable access to business opportunities and rural development. The study concludes that landowners, investors, market agents, and financers influence farmers' decision to grow non-staple wholegrain. The bottlenecks in the non-staple whole grain value chain were lack of support for non-staple grain farmers, limited market access, unfavourable terms and conditions of available funding opportunities, limited access to land, ill-structured coordination, communication, and transformation. Some policies that could strengthen the participation of non-staple whole grain farmers in the value include land policy, farm subsidy policy, tax incentive policy, funding framework, and equity policy. There is a need to realign and synergize the goals of the different

actors to favour all grains equally. More attention needs to be given to neglected non-staple grains. Food-related policies need to be reviewed to reflect the importance of non-staple wholegrain.

6.7 Recommendations

The researcher is satisfied that necessary regulations are needed to be put in place to improve the situation. The itemised 6.5 points covered those key policies namely a) Sustainable agriculture (Responsible land-use) policy, b) Land acquisition, ownership and lease policy, c) Farm subsidies policy, d) Tax incentive policy, e) Resource-poor agriculture policy, f) Funding framework, g) Crop-neutral agriculture policy, h) Equity policy. Above this, it is recommended that the actors concerned need to facilitate a coordinated approach to promoting sustainable development and cooperation. It is recommended that actors revise, adjust, re-align and integrate their goals into one common sustainable, inclusive and transformative goal. This would arrest negative influence between stakeholders. It is recommended that the food sector actors redesign the indicators of the food system in a way that would intensify and accommodate crop diversity, nutrient density, equity and other sustainability measures. All these efforts would contribute to the prioritisation of non-staple wholegrains' resiliency and nutritional quality in general.

Here are recommendations for further studies:

-The information about the grains found in South Africa is not well documented and published or readily available. The researcher would recommend that another investigation is conducted to record their taxonomy, morphology, history, nutritional value, utilisation and climate change adaptability.

-Given the background of the participants, it will be important to investigate the progress of the transformation in the agricultural sector (grain industry in particular) in support of black and women empowerment.

-Considering the in-country input (fertilizers the most) difficulties, a study into how destroying railway networks has impacted agriculture would be important.

-Taking into account the area differential, the study to examine its role in weakening the grain industry would be important.

-Looking at *oats* as the most loser grain, the study into what can be done to expand its market would be great.

-The production costs are too high. The researcher would recommend government intervention through subsidies, prices and incentive policies.

-Exploring the long-term environmental effects of land leasing in South Africa would be fascinating.

-The reflection on the impact of the deregulation of control boards would help to measure the progress.

-The researcher would also recommend that more investigation is done on the appointment of assignees, their effectiveness and their impact.

References

Altaweel, M., 2020, 'Von Thunen Model of Agricultural Land Use', *Geography Realm* from https://www.geographyrealm.com/von-thunen-model-of-agricultural-land-use/

Breede-Gouritz, 2019, 'The Farmer Support Package', Water Research Commission, South Africa, from https://www.breedegouritzcma.co.za/EFSP/assets/Farmer_Information_Package_English.pdf

CCH ARM Editorial, 2022, 'State Tax Incentives for Small Farms', from https://www.wolterskluwer.com/en/expert-insights/state-family-farm-incentives

Cheema, V., & Cheema, B., 2008, 'Colonisation, the New World Order, and the eradication of traditional food habits in East Africa: Historical Perspective on the Nutrition Transition', from https://www.cambridge.org/core/journals/public-health-nutrition/article/colonisation-the-new-world-order-and-the-eradication-of-traditional-food-habits-in-east-africa-historical-perspective-on-the-nutrition-transition/7E4F12DD78EAB11652D516D63607C404

DAFF, 2013 'State Land Lease and Disposal Policy', Rural Development & Land Reform, from http://www.griquas.com/landact.pdfminim

Dept. Agriculture, 1997, 'Marketing of Agricultural Products Act', from https://www.gov.za/sites/default/files/gcis_document/201409/act47of1996.pdf

Dept. of Taxation & Finance, 2021, 'Tax Basics: Farmers', *United Stated America- New York State*, from https://www.tax.ny.gov/help/taxpayer-education/tax-basics-farmers.htm

Duvel, G.H., 1991, 'Towards a model for the promotion of complex innovations through programmed extension', South African Journal of Agricultural Extension. 20: 70—86

FAO, 2013, 'The State of Food and Agriculture 2013. Food systems for better nutrition', Rome.

FAO, 2015, 'Sustainable Development Goals, Indicator- Zero Hunger', FOOD & Agriculture Organization of the United Nations from https://www.fao.org/sustainable-development-goals/indicators/241/en/

FAO, 2018, 'Sustainable Food Systems', from https://www.fao.org/3/ca2079en/CA2079EN.pdf

Feenstra, G., Ingels, C., & Campbell, D., 2021, 'Sustainable Agriculture Research and Education', UC Agriculture and Natural Resources, from https://sarep.ucdavis.edu/sustainable-ag

Government of Madhya Pradesh- India, 2022, 'Incentive Scheme for MP Crop Diversification', Madhya Pradesh India, from https://www.dailypioneer.com/2022/state-editions/incentive-scheme-for-mp-crop-diversification.html

IFPRI, 2022, 'Food systems', International Food Policy Research Institute, from https://www.ifpri.org/topic/food-systems

Johnson, D.G., 1995, 'Elmhirst Memorial lecture: The limited but essential role of government in agriculture and rural life.' In Agrekon Volume 37, Number 4 published in December 1998.

Kareem, M.A., 2021, 'Farming Systems Approach', from https://www.manage.gov.in/studymaterial/FSA-E.pdf

Khwidzhili R.H. & Worth, S., 2018, 'Evaluation of policies promoting sustainable agriculture in South Africa', from https://www.ajol.info/index.php/sajae/article/view/167350

Labour Guide, 2022, 'Employment Equity/ B-BBEE', from https://www.labourguide.co.za/employment-equit/776-employment-equity18

Maluleke, I., 2019, 'USA farm subsidies: lessons to be learnt', GrainSA, from https://www.grainsa.co.za/usa-farm-subsidies-lessons-to-be-learnt.

Maryville University, 2021, 'Importance and Future of Sustainable Agriculture', from https://online.maryville.edu/blog/importance-and-future-of-sustainable-agriculture/

Mtombeni, S., Bove, D., & Thibane, T., 2019, 'An analysis of finance as a barrier to entry and expansion for emerging farmers' from https://www.compcom.co.za/wp-content/uploads/2019/09/CC201901-Mtombeni-S-Bove-D-Thibane-T-An-analysis-of-finance-as-a-barrier-to-entry-for-emerging-farmers.pdf

O'Kelly M.E., 1988, Aggregate rent and surplus measurement in Von Thunen model. *Geographical Analysis*, 20(3): 187-197

Opperman, A., Roux, S., Van Der Merwe, P., Badenhorst, H., Delport, A., Vadelka, M., Mahomed, A., 2020, 'Agricultural Law in South Africa: Overview', *Thomson Reuters*

Practical Law, from https://uk.practicallaw.thomsonreuters.com/6-622-8796?transitionType=Default&contextData=(sc.Default)&firstPage=true

Pingali, P.L, 2015, 'Agricultural policies and nutrition outcomes- getting beyond the preoccupation with staple grains', *ResearchGate,* from

https://www.researchgate.net/publication/276410296_Agricultural_policy_and_nutrition_outcomes_-_getting_beyond_the_preoccupation_with_staple_grains

Rahaman, M.S., & Mahmud, R., 2017, 'The untold history of neo-colonialism in Africa (1960-2011)', from http://www.eajournals.org/wp-content/uploads/The-Untold-History-of-Neocolonialism-in-Africa-1960-2011.pdf

Sagbo, N.S.M., 2019, 'Effects of agricultural loans in developing countries- Benin case study', University of Kentucky, from https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1079&context=agecon_etds

Tongaat Hulett, 2020, 'Responsible Land Use Policy', from https://www.tongaat.com/wp-content/uploads/2020/12/Responsible-Land-Use-Policy.pdf

UC Davis, 2021, 2021, 'Sustainable Agriculture Research and Education', UC Agriculture and Natural Resources, from https://sarep.ucdavis.edu/sustainable-ag

Worth, S.H., 2006, 'Agriflection: A Learning Model for Agricultural Extension in South Africa', from https://www.researchgate.net/publication/249036172_Agriflection_A_Learning_Model_for_Agricultural_Extension_in_South_Africa

Worth, S. H., 2014, 'The facilitated Learning Agenda and Extension Carousel.' Supplement to the Journal of International Agricultural and Extension Education, 21(2), 90-93

Presented at the Annual Conference of the Association for International Agricultural and Extension Education, Miami, FL, USA, May 2014.

Zamasiya, B., Nyikahadzoi, K., & Billiard, M., 2017, 'Factors influencing smallholder farmer's behavioural interaction towards adaption to climate change in transitional climate zones: A case study of Hwedza District in Zimbabwe', ScienceDirect- Elsevier, Vol 198, Part 1, 1 August 2017, Pages 283-239, from https://www.sciencedirect.com/science/article/pii/S030147971730421

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

The research aimed to identify how policy and market mechanisms influence the ability to emerge wholegrain networks to increase production and improve the accessibility of non-staple wholegrains while meeting environmental, health and equity objectives. It is clear from the findings that there are considerable barriers to making diverse wholegrains both available and affordable. The study findings confirmed that indeed only marginal amounts of diverse grains are produced, and oats are the major loser grain. That given the risk of growing grains, the farmers are shifting towards export-orientated commodities (fruits and livestock).

The research found that there is some kind of non-alignment of application of the policies between the national and local governments and a lack of awareness of newer national government policies. The stakeholders, programmes and institutions are not structurally and operationally organized in a way that would uplift the smallholder farmers in a long term. That is manifested in land lease policy, non-fulfilment of developmental banks mandates, access and insufficient funding, volatility of prices, price formulation and lack of subsidies and incentives. Other barriers related to price high volatility which temper farmers' planning. The study also confirmed the non-alignment of actors' goals towards sustainable development. Provided the aforementioned points, one is convinced that policies and actors indirectly and directly influence the farmers to behave in ways that may be in breach of the sustainable targets.

Although a holistic approach that employs an integrated range of interventions is needed to alleviate the situation, however, this research only focused on finding a new set of policies that can help increase production. In this regard, policies flagged as important in supporting farmers are a) Sustainable agriculture (Responsibility land-use) policy, b) Land acquisition, ownership and lease policy, c) Farm subsidies policy, d) Tax incentive policy, e) Resource-poor agriculture policy, f) Funding framework, g) Crop-neutral agriculture policy, h) Equity policy.

7.2 Study De-limitations and Limitations

The study was premised on investigating policies and actors' influence on the whole grains network. Troubleshooting where a problem may lie and what makes it difficult to proliferate the non-staple whole grains. The research deliberately took no interest in grains such as maize, wheat (*Triticum aestivum*) and rice (Asian). The aforesaid grains are considered to be stapled in communities of South Africa since are constituting the majority of the daily diet. Although canola is a non-staple grain, however, is trimmed out because of not classified as a whole grain given that not all its essential parts can be processed.

Issues with recruitment; and selection led to an insufficient sample size. Due to COVID-19 government restrictions and POPI ACT, one could not reach all the important stakeholders as anticipated, not to mention the inability to physically meet participants. Agricultural institutions and past studies have least investigated the non-staple wholegrains, the industry is preoccupied with staple wholegrains. The information is not sufficient, less information has been published relating to the study. Hence the literature contents might not be recent information. The language was the barrier between the researcher and the participants (dominantly Afrikaans speakers). The participants were not fully aware of the policies that impact their daily operations and were not willing to participate given that many researchers would come but nothing ever changed.

7.3 Trends

Here are developments found, that might be interesting to understand:

-Farmers focus more on export-orientated commodities (fruits and livestock) and neglect other commodities.

-Inland provinces, white farmers are relocating to Western Cape and are willing to purchase the land at any given value. The under-resourced local farmers compete with these farmers for land.

APPENDICES

Appendix A: Email Invitation

REC reference number:
ETH2021-1587, v1
30 March 2021

From Niche to Mainstream: Creating a policy environment for the proliferation of non-staple wholegrains

Email invitation:

Dear <name>,

I hope this email finds you well. I am writing to see if you might be open to participating in research we are conducting into non-staple wholegrain businesses at the Centre for Food Policy and the University of Kwa-Zulu Natal.

As part of the Wellcome Trust-funded SHEFs programme, we are studying how the prevailing policy and market environment helps or hinders their ability to increase the sustainable production and accessibility of non-staple wholegrains. We are hoping to work with key people who either own or manage a business/organisation that is involved in non-staple wholegrains production.

We are aware of your work with <name of business> and would be grateful to learn more about your organisation. I've attached an information sheet with more details on the project as well as what would be involved.

Please let me know if you have any questions or if you might be interested in joining in the study – we would welcome your participation.

Thank you,

Thalente Ndebele
University of KwaZulu-Natal

Stephanie Walton
Centre for Food Policy, City, University of London

Centre for Food Policy

Appendix B: Consent Form

REC reference number:
ETH2021-1587, v1
19 April 2021

Title of study: From Niche to Mainstream: Creating a policy environment for the proliferation of non-staple wholegrains

		Please tick or initial box
1	I confirm that I have read and understood the participant information dated 21 June for the above study. I have had the opportunity to consider the information and ask questions which have been answered satisfactorily.	
2.	I understand that my participation is voluntary and that I am free to withdraw without giving a reason without being penalised or disadvantaged.	
3.	I understand this project will involve me taking part in two interviews and one group session over three months and the sharing of potentially sensitive business information.	
4.	I understand that I will be able to withdraw my data up to the time of publication.	
5.	I agree to have interview material shared with co-researchers at partner institutions.	
6.	PLEASE CHOOSE ONE: *(see information sheet for further details)* a. Specific details on my business/enterprise, its operations, goals, metrics, performance and finances can be anonymised and quoted in the study. b. General details on my business/enterprise, its operations, etc. can be anonymised and quoted but with no specific numbers, rates, etc. c. Information I share on my business/enterprise, its operations, etc. can only be used in the identification of high-level themes in the research but should not be referenced in any way in any public work	
7.	I agree to City or the University of Kwa-Zulu Natal audio and video recording the virtual interview and processing information about me.	
8.	I understand that interview recordings will be stored on a UK data server and jointly accessible by researchers from City and the University of Kwa-Zulu Natal.	
9.	I understand that this information will be used only for the purpose(s) explained in the participant information and my consent is conditional on City complying with its duties and obligations under the General Data Protection Regulation (GDPR).	
10.	I would like to be informed of the results of this study once complete and understand that my contact details will be retained for this purpose.	
11.	I agree to take part in the above study.	

_____ _____ _____

Name of Participant Signature Date

Centre for Food Policy

Appendix C: Interview Guide

REC reference number:
ETH2021-1587, v1
30 March 2020

From Niche to Mainstream: Creating a policy environment for the proliferation of non-staple wholegrains

Interview Guide

Interview #1: Business/Organisation objectives, operations, partners and customers
(1/2 day, 4 hours)

To send to participant prior to interview:
Dear <participant>,
Thank you for your willingness to participate in our study. We are looking forward to learning more about you and <name of business/enterprise>.

Attached is an overview of the topics we will discuss tomorrow and below is a list of documents that, if you have available, would be helpful in guiding the discussion. As mentioned in the information sheet, we recognise that much of this information is proprietary and confidential. You are free to decline discussing any of these items or sharing the below information with us at any point. These questions and the information below are only so that we may gain highly specific insights into your businesses and the challenges it faces.

Possible documents to help guide discussion and ensure detail and specificity: *(You do not need to send these documents to us and we will not use them beyond the interview.)*

- **Strategic business documents**: Any documents you may have that outline business plans, mission statements, company objectives, the history of your enterprise, future priorities – anything that will introduce us to your business/organisation
- **Performance reports or dashboards**: Any monthly/annual reports or dashboards where you might track your performance against priority metrics
- **List of product lines/services**: If you have an extensive product/services range, a compiled list of these will help us become familiar with the specifics of your offering
- **List of inputs/materials for your products**: This could be a vendor list, recipe or anything else that may document what goes in to making your products
- **Financial or Profit & Loss statements**: Any spreadsheets or reports you might have that document cash in/cash out, where income is generated and where expenses go

The goal of our discussion is to gain a detailed understanding of your <name of business / enterprise> and its daily operations, as well as the considerations you face as its <owner / manager, etc.> We look forward learning more.

Thank you,
<signature>

Centre for Food Policy

Interview guide: (May be adapted for relevance to a specific business/organisation type)

0:00 – 1:00: Introduction to your business/organisation

- Overview:
  - In your own words, what does your business/organisation do?
  - How, where and when did your business/organisation start?
  - Who owns your business? (eg. you, employees, investors, etc.)
  - Where/how did you source the capital for starting your business?
  - Who are your customers?
  - How big is your organisation? How many staff do you employ?
  - What is the governance structure of your organisation? Do you have a board?
- Products and Services:
  - What are your specific products and/or services?
  - How have your products/services changed over time? Do you have products/services you used to sell but don't anymore?
- Materials and Inputs:
  - For each of the products you produce, what inputs do you require to produce your products/services? (eg. seeds and fertilizer, pre-milled flour, transportation bags)
  - On what schedule are these inputs delivered to you?
  - What technologies do you rely on in the production of your products/services? (eg. roller mill, commercial-sized oven, harvesting technology)

1:00 – 1:45: Objectives and measuring success

- Business/organizational objectives:
  - Do you have a specific set of objectives against which you are held accountable, either to investors, shareholders or stakeholders? What are they?
- Measuring performance and success:
  - What are the specific metrics you use to track your performance against these objectives?
  - How do you keep track of your performance? How frequently to you report on them?
  - How are you currently performing against the metrics?
  - What objectives have proven most difficult to achieve and why? What objectives ares consistently achieved?

1:45 – 2:15: Break

2:15 – 3:00: Operations, staff and production

- Operations and production
  - Where are your product(s) produced? What is the setting? (eg. urban centre, industrial estate, rural area, etc.)
  - What is the process of how your lead products are produced?
  - What is the timescale from the beginning of production of your product to its sale?
  - How many people are involved along the way? Who 'touches' the product in production?
  - How is your product transported from production to point of sale?
  - How do the objectives/metrics discussed earlier shape operations and productions? How might you do it otherwise if you didn't have these objectives/metrics?

- Staffing and labour
    - Are you able to hire all of the people that you need? Do you experience staff shortages?
    - Are there areas where you experience a labour shortage for a specific type of work?
    - How do the objectives/metrics discussed earlier inform your hiring and staffing decisions?

3:00 – 4:00: Finances, sales and investments

- What are your average profit margins on certain products?
- Which products are your profit leaders and losers?
- What are the specific major expenses of your business/organisation?
- What are the largest cost areas? (eg. labour, administrative, occupancy and utilities, materials, etc.)
- How much do you pay in rent? Has the cost gone up over time? If so, by how much?
- Which parts of your business/organisation do you prioritise if/when you have cash for investment?
- How much does your organisation/business pay in taxes? What percentage of your total income is this?
- Do you receive any government subsidies?
- Are there areas where meeting the metrics/objectives discussed above have a financial impact on your organisation?

Interview #2: Relationships with other enterprises and with government
(~3 hours)

To send to participant prior to interview:
Dear <participant>,
Thank you for again for participating in this research. We are looking forward to our next discussion. While our first session was about getting to know your organisation, this session is focused on how your organisation fits within the wider wholegrains network and the nature of your connections to other organisations in it.

As with our first interview, we have attached an overview of the topics we will discuss tomorrow and below is a list of documents that, if you have available, would be helpful in guiding the discussion. Again we recognise that much of this information is proprietary and confidential and you are free to decline discussing any of these items at any point.

Possible documents to help guide discussion and ensure detail and specificity: *(You do not need to send these documents to us and we will not use them beyond the interview.)*

- **Vendor list**: A list of the suppliers and vendors you work with to source materials for the production of your products
- **Client list:** A list of clients who buy your products/services
- **Results of regulatory risk assessments, audit or inspections**: If you have every had to conduct a risk assessment or the results of any audits/inspections your organisation has undergone

The goal of our discussion is for us to gain a detailed understanding of the businesses and people your organisation comes into contact with and the government departments, regulations and policies that impact your operations. We look forward learning more.

Thank you,
<signature>

Interview guide: (May be adapted for relevance to a specific business/organisation type and based on outcomes of Interview #1)

0:00 – 1:15: Partners, competitors and clients

- Partners, suppliers and landlords
    - From whom do you source the materials/inputs/technology for your products?
    - Who services the technology you use?
    - How do you select your vendors?
    - Are you pleased with each of your vendors? What is the nature of your relationship with them?
    - What is your invoicing/payment schedule to your vendors?
    - Who owns the land/property in which you operate? Do you have a landlord? What is the nature of your relationship with them?
    - What transportation services do you use for your products?

  - Do the partners, suppliers, landlords and other people we've spoken about share similar business/organisation obectives to the ones we discussed in our first session? Where do goals differ? Where are they the same?
- Competitors
  - Who are your major competitors?
  - What is their relative market share compared to yours?
  - What makes them so competitive?
  - Do these competitors share similar business/organisation obectives to the ones we discussed in our first session? Where do goals differ? Where are they the same?
- Clients
  - Who are your clients? Who are the biggest ones?
  - Where are your clients located?
  - What payment terms do you give your clients?
  - Do you offer additional services or benefits to your clients?
  - Do your clients share similar business/organisation obectives to the ones we discussed in our first session? Where do goals differ? Where are they the same?

1:15 – 1:45: Break

1:45 – 3:00: Government regulations, departments and programmes

- Departments and governmental bodies?
  - Do you or have you ever come into contact with specific government bodies in the operations of your business?
  - Have you ever been audited?
  - Have you ever had to undergo inspection?
- Programmes and benefits
  - Have you ever received funding from a government body? Which department gave the funding and what was it for?
  - Have you ever taken advantage of any government benefit schemes or incentive programmes?
  - Are there government programmes or incentive schemes you are aware of but for which you are not eligible to benefit?
- Regulations and laws
  - What are the major regulations you must adhere to in the operations of your business? (eg. food safety)
  - Do these regulations incur costs to your business/organisation?
  - Are there any business operations you would like to develop but are unable to because of regulations/laws?
  - Are there specific policies that you are aware of related to your business that impact its operations?

Interview #3: Defining policy priorities
(2 hours)

To send to participant prior to interview:
Dear <participant>,
Thank you for again for participating in this research and for being so generous with your time. We are looking forward to our final discussion.

While our first two sessions were for us to get to know your business and its operations, this discussion is for us to present to you the findings from our research so far and to get your input on potential policy outcomes and strategic priorities.

There is nothing for you to prepare for this interview. We look forward to showing you our findings and hearing your feedback and insights.

Thank you,
<signature>

Interview guide: (Will likely be adapted based on the outcomes of the prior two interviews and the results of the knowledge graph exercise.)

0:00 – 2:00: Presentation of knowledge graph and discussion on pressure points
< with a 15 minutes break at some point in the discussion >

- Other actors in the network
  - Based on our discussions with you and other people who work in non-staple wholegrains, this is the network of relationships that we have developed.
  - These are each of the other private-sector actors who we identified a connection to you.
  - These are the nature of the connections of these actors to you (eg. positive/negative, collaborative/competitive, etc.)
  - Do you agree with these connections and do you agree with their descriptions?
- Policies and government bodies
  - These are the connections we have identified between you and specific policies and government entities.
  - These are the nature of the connections of these policies/entities to you (eg. regulatory/incentivizing, enabling/disabling, etc.)
  - Do you agree with these connections and their descriptions?
- Pressure points and policy priorities
  - Based on our analysis of the network as a whole, we have identified these key pressure points.
  - Based on these pressure points, we have devised a series of targeted actions focused on these areas.
  - Do you agree with these pressure points? Do you agree with these targeted actions? Do you agree with the areas of focus?

- What have we missed? What would you like to see added? What policies would you like to see prioritized?

Appendix D: SHEFS Ethical clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

9 April 2018

Prof Rob Slotow
College of Agriculture, Engineering and Sciences
Pietermaritzburg Campus

Dear Prof Slotow

Protocol reference number: HSS0287/018
Project title: Sustainable and Healthy Food Systems (SHEFS)

Full Approval – Expedited Application

In response to your application received on 4 April 2018 the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

Professor Shenuka Singh (Chair)
Humanities & Social Sciences Research Ethics Committee

/pm

cc Supervisor/Project Leader : Prof Rob Slotow

Humanities & Social Sciences Research Ethics Committee
Professor Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za