

18th Annual Symposium

Feeding Namibia: Agricultural Productivity and Industrialisation

Bank of Namibia



Edited by the Research Department

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PREFACE

The Bank of Namibia held its 18th Annual Symposium at the Safari court hotel on the 21st of September 2017 under the theme: Feeding Namibia: Agricultural Productivity and Industrialisation. The theme was selected because there is a need for food security in the country, especially with the recent persistence of drought conditions which inadvertently inhibit productive agricultural practices.

The 18th Annual Symposium aimed to achieve the following objectives:

- a) How can Namibia increase agricultural productivity thereby increasing food security?
- b) How can Namibia upscale food production by looking at the number of population it will have by the year 2030?
- c) How can the different value chains be aligned to be able to become an industrialised country?
- d) What measures need to be undertaken to adequately utilize the scarce water in the country?
- e) What is the international experience and how can Namibia learn from it?
- f) What are the policy implications to consider for increased production?

These issues were addressed through presentations given by local and international speakers supplemented by the panel discussions comprising of representatives from the water, energy and agricultural sectors, as well as the Bank of Namibia.

This booklet contains the papers presented by the speakers at the symposium. It also includes a summary of the key policy issues emanating from the symposium and recommendations on the way forward.

Welcoming Remarks

by Mr lipumbu Shiimi, Governor of the Bank of Namibia

18th Annual Symposium

21st September 2017, Safari Court, Windhoek

Theme: Feeding Namibia: Agricultural Productivity and Industrialisation

Director of Ceremonies

Honourable Ministers and Members of Parliament, present

Members of the Diplomatic Corps

Board Members of the Bank of Namibia

Honourable Regional Governors and Councilors, present

Permanent Secretaries

Distinguished Speakers and Panelists

Captains of the Industry

Representatives of the Media

All invited guests

Ladies and Gentlemen;

1. **Good morning! It is a great honour for me to welcome you all to this 18th Edition of the Bank of Namibia Annual Symposium.** I wish to express my gratitude and appreciation to our invited guests and discussants for availing time to be with us on this occasion and share their views and knowledge on this important topic. I wish to extend a special welcome to our international speaker, Dr. Adeleke Salami - welcome to Namibia! I wish to encourage you to make time to experience our beautiful country and the warmth of its hospitality.
2. **This year's symposium theme is focusing on feeding Namibia, with a particular focus on agricultural productivity and industrialization.** Economic concerns about food security are long standing and have always been a subject of inquiry by economists. In 1798 Thomas Malthus examined this subject and famously predicted that gains in living standards would inevitably be undermined as human population growth outstripped food production, and thereby drive living standards back towards subsistence¹. This, according to Malthus, was a result of the tendency of population to grow geometrically, while food production would increase only arithmetically. As a result, any economy would be trapped in a situation where no sustained growth of per capita income can occur – “the Malthus trap”.
3. **Indeed, Malthus' supposition overlooked some key elements which resulted in his predictions not being realized.** Technological advancement has allowed productivity growth to keep pace with population growth. Similarly, demographic transition has moderated the population tendency towards

¹ Malthus T.R (1798) *An Essay on the Principle of Population*.

geometric growth. Despite the above, the potential for “the Malthus trap” still remains, especially at the individual country level. Therefore, we need to continue probing and inquiring this issue in order to avoid the “Malthus trap”.

4. **However, population growth may also be viewed as an opportunity, especially for small economies such as ours, if we can rise to the occasion and improve productivity.** According to the United Nation’s Department of Economic Affairs (2017) the World population is projected to reach 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in 2100 from the current 7.6 billion. The population growth represents an opportunity for increases in the production of goods and services to meet the growing demand accompanying such growth. Small economies such as Namibia need to exploit opportunities presented through such demand.
5. **In Namibia, the situation presents potential risks to fall into a “Malthus trap”.** Namibia’s current population of 2.28 million is projected to increase to 2.96 million in 2030, which is an increase of 30 percent. The share of the population living in urban areas is projected to increase from 47 percent in 2015 to 67 percent in 2041. When these dynamics are contrasted to food security in Namibia, it becomes clear that we have a challenge on our hands. There is a high reliance on imports of agricultural products. Namibia imports about 60 percent of its food requirements. Namibia consistently records production deficits in most crop categories. In 2015/16, production deficits were recorded for the following crops: horticulture - 49 860 tons; wheat - 95 190 tons; white maize - 120 659 ton and mahangu - 6 096 tons.
6. **Despite the agricultural sector being a priority sector in our National Development Plans (NDPs), progress in the sector has been limited.** The Harambee Prosperity Plan (HPP) under the pillar on social progression has set a goal to have zero death in Namibia accorded to lack of food. Equally NDP5 has agriculture as a priority sector and lists increasing productivity in agriculture as a game changer. The limited progress over the previous NDPs shows that achieving the level of productivity that is required is not easy. We have to acknowledge the complexities of development, which in the Namibian situation are compounded by erratic and hostile climatic conditions.
7. **The contribution of agriculture to GDP has been declining.** It declined from 4.0 percent in 2008 to 3.4 percent in 2016 and averaged only 4.2 percent over the same period. In terms of growth, the sector contracted by an average of 2.2 percent over the same period. Therefore, the need for improved agricultural productivity in Namibia cannot be over-emphasized.

8. **This symposium offers an opportunity for us to reflect and deliberate on this important topic, particularly the following questions, which I believe are crucial to transforming the agricultural sector and the Namibian economy at large, and converting the challenges into opportunities:**
 - a. **Can Namibia increase its meat production by increasing investment in animal health in the communal areas and shifting the cordon fence northwards and eastward?** There are opportunities for growth in the agriculture sector, such as the country meeting its beef quota to the EU by increasing the carrying capacity of the land through commercial solutions to de-bushing and taking advantage of the large markets around us such as Angola, Zambia, South Africa as well as the Democratic Republic of Congo. The population of these countries combined is estimated at around 180 million (DRC 81 million, RSA 57 million, Angola 29 million, and Zambia 17 million).
 - b. **Are the green scheme projects operating optimally, or can productivity still increase? And is there scope for more private sector operators through improving land tenure and financing?** Furthermore, can horticulture production be improved along the Kunene and Orange rivers? And will the administrative challenges delaying construction activities at the Neckartal Dam be overcome and how can progress be sped up?
 - c. **How can we grow our downstream industries that process agricultural produce further, adding more value and creating jobs and income?** The challenge is to do this through efficiency and the building of our own skills and competitive advantage, not through burdening the consumer with higher prices and the taxpayer with higher taxes in order to pay subsidies to those downstream industries.
 - d. **And finally, how can we improve water security, especially in the central parts and coastal areas?** At the heart of transforming the challenges into opportunities for the Namibian agricultural sector is water and other infrastructure including energy. Water is not only important to agriculture, but to other industries as well including mining. The availability of water is therefore important to productivity in these sectors. Improving water security should therefore be high on the agenda.
9. **In conclusion, I believe we have an opportunity to transform the agricultural sector and agro-processing industries, reduce food imports and increase exports, such as meat.** These would have established a strong foundation for economic growth, poverty reduction and improve our external balance. We have an opportunity to feed our nation and create shared prosperity for our children and grandchildren.

I look forward to discussions on possible solutions. I thank you for your attention and welcome you to this event!

Keynote address

*By: Honourable John Mutorwa (MP) Minister of Agriculture,
Water and Forestry (MAWF) on the occasion of the
18th Annual Symposium:
Feeding Namibia: Agricultural Productivity and Industrialisation
21st September 2017, Safari Hotel*

Director of Ceremonies;
Distinguished guests;
Distinguished speakers and discussants;
Members of the Media;
Ladies and Gentlemen.

10. Its my privilege as a Minister responsible for Agriculture, Water and Forestry, to have been afforded this opportunity, to deliver a keynote address at this very important occasion. This year's Bank of Namibia Annual Symposium theme, **"Feeding Namibia: Agricultural Productivity and Industrialisation"** is particularly relevant and important for various reasons. One of such reasons is the challenge of climate change and climate variability, that our country has and continue to experience, while we have to ensure food and water availability to all our citizens, at all times. This theme cuts across the core of our socio-economic development drive and seeks to answer the questions of how we could best ensure national food security, and how we could best create the much needed jobs through the agro-allied industries, which depend on agriculture for the raw-materials so as to operate successfully in the production of finished goods.
11. **We are at a point where our country is characterized by certain levels of poverty, high unemployment rate, low economic growth and increased population.** Economic prosperity is something that we all desire and collective efforts from all sectors of the economy is no longer a choice, but a necessity, as we strive to enhance the living standards of our people. Although the country is comprised of abundant land, water resources, and access to international markets, it remains with untapped potential in areas such as agro processing which can create new pathways towards greater economic development. In an effort to tap on existing opportunities, industrialization and value addition is most certainly, on top of the development agenda of our Government.

Director of Ceremonies
Ladies and gentlemen,

12. **Our Government is dedicated to increase manufacturing and agro-processing across the value chain.** In that connection, the agro-processing industry has the potential to boost income opportunities, create employment, enhance the quality and demand for agricultural products. Furthermore, it can

boost non-agricultural activities including handling, packaging, processing, transportation, marketing and distribution. Industries can not successfully operate without primary agriculture, the two are complementary to one another in such a way that: it is not possible to increase the growth of one sector without the improvement of the other. If agriculture is considered as the 'heart' of the country, then obviously industries must be considered as the 'brain' of the country.

13. **Agriculture plays a crucial role in alleviating poverty and ensuring food security, both at household and national levels.** About 70 percent of our population is dependent directly or indirectly on agriculture in terms of food, income and livelihood. It is for this reason that: at national level, the agriculture sector has been singled out as one of the priority sectors which should be harnessed, to bring about the much needed socio-economic development and improvement to the wellbeing of the majority of the Namibian people. Despite some challenges experienced in the sector, agriculture and forestry's contribution to the national GDP rose from N\$ 3, 6 billion in 2015 to N\$ 3,7 billion in 2016 representing 3.3 percent and 3.4 percent respectively.
14. **According to the 2016 National Labour Force Survey, the sector was identified as the highest employer in the country with about 135 832 people employed, which accounts for 20.1 percent of the entire labour force.** However, most of these jobs are at primary production. Namibia's agriculture is characterized by low levels of productivity, which can be attributed to poor rainfall, as a result of climate change, limited access to relevant technology, availability of credit and limited technical expertise among other factors. This is clearly manifested in the fact that Namibia imports about 70 percent of its food requirements. This, coupled with high levels of inflation call for appropriate interventions to ensure increased food production and availability of food on a sustainable basis.
15. **The African Union (AU) and its member states, have committed to allocate not less than 10 percent of their financial and other development resources to the agricultural sector, in order to eradicate poverty.** During the 2017/18 financial year, our Government has allocated about 4.8 percent of its national budget to agriculture. This needs to be improved, if the country is to fulfill the commitment, made at continental level and improve food security at national level.
16. **The GRN, through Ministry, is implementing irrigation projects, commonly or popularly known as Green Scheme Irrigation Projects, along the main perennial rivers and big dams.** These projects are: Sikondo and Musese in Kavango West Region, Shadikongoro, Uhvungu-Vungu, Ndonga Linena, Mashare and Shitemo Irrigation Projects in Kavango East Region, Etunda in

Omusati Region, Hardap Irrigation Scheme in Hardap Region, and Orange River Irrigation Project in the //Karas Region. With the completion of the Neckartal Dam, near Keetmanshoop, in the //Kharas Region, approximately FIVE THOUSAND (5000) hectares of fertile Agricultural land, will be put under irrigation. As outlined in the 5th National Development Plan, 2014 SWAPO Party Election Manifesto and the Harambee Prosperity Plan (HPP), (NDP5), the agriculture sector is expected to put 27 000 hectares under irrigation by the year 2030 through the implementation of the Green Scheme program. Currently a total of 11 500 hectares is under irrigation countrywide and the remaining 15 500 hectares need to be placed under irrigation over the next 13 years and this will cost the Government about N\$ 5.4 billion. We hereby invite the Private Sector to actively participate in the Agriculture Sector, using the Pulic-Private-Partnership (PPP) Policy and Law.

17. **Furthermore, the development of other irrigation projects, such as Katima/Liselo in Zambezi Region, Tandjeskoppe in //Kharas Region, and the expansion of Etunda Phases 7 and 8 in Omusati Region are well on track.** Such development are made with a view to increase the land under irrigation and subsequently increase food production.
18. **Government, through the Ministry of Agriculture, Water and Forestry has also constructed the Fresh Produce Business Hubs (cold storage facilities) at Rundu and Ongwediva, while the construction of the Windhoek Fresh Produce Business Hub is in progress.** Namibia's annual demand for horticultural products is about 74 000 tons, of which only 24 000 tons is currently produced locally and the difference of about 50 000 tons is imported. The program is therefore aimed at altering the substantial reliance of imports for Namibian fresh produce consumption and actively seeks to develop the internal capacity for production, marketing, distribution, processing and export. This program will facilitate collection, sorting, grading, packaging and distribution of perishable produce while perishable produce that is not good for packaging will be processed into other products.

Director of Ceremonies
Ladies and Gentlemen,

19. **The National Strategic Food Reserve is another key component of any national food security strategy.** In this regard, the Ministry has constructed Strategic Food Reserve Facilities (silos) with the purpose of guaranteeing food security through the procurement and storage of a defined quantity of staple food in the country. The overall objective is to ensure that at any given time, the country has enough food stock to feed its people.
20. **In addition to this, Strategic Food Reserves are also constructed with a view to intervene in the food market, in case of increase in food prices**

which may undermine access to food, especially by the lower income and vulnerable members of the society. The already constructed strategic food reserve facilities has a storage capacity of 22 900 metric tons and are available in the five (5) grain producing regions (Zambezi with a capacity 7 400 mt), Kavango East (4 000 mt), Ohangwena (4 500 mt), Oshikoto (4 000 mt) and Omusati (3 000 mt) Regions. This National Food storage capacity is enough to sustain Namibia for a period of 3 months only. By the year 2030, our Country is expected to have a national grain storage capacity of 67 000 metric tonnes which would be sufficient to sustain the nation for a period of 12 months. This entails that additional strategic facilities with the capacity of 44 100 metric tonnes still need to be constructed. An amount of about N\$ 178 million will be required to meet the national target in the remaining 13 years.

Director of Ceremonies
Ladies and Gentlemen,

21. **Namibia is renowned for her comparative advantage in the production of quality livestock and livestock products.** This has created a high demand for livestock and livestock products in countries, most notably neighboring countries, which aspire to develop their livestock and meat industries by sourcing livestock resources from Namibia for breeding and slaughtering purposes. The livestock subsector marketing system can be distinguished for the small-stock on one side and for cattle on the other, in both informal and formal marketing channels. In both cases, it consists of individuals buying livestock for different reasons which include slaughter, as an investment or for social functions such as funerals, customary celebrations, weddings and religious celebrations. Formal marketing consists of selling directly to butcheries, auctions and abattoirs. The role of agents and traders is observed to be prominent in this subsector.
22. **The cattle marketing system is further influenced by the Veterinary Cordon Fence (VCF).** The area North of the VCF is composed of the Foot and Mouth Disease (FMD)-protection zone, which practically covers the northern part of Kunene, Omusati, Oshana, Oshikoto, Ohangwena, Kavango East and Kavango West Regions and the FMD-infected zone which is composed of the Zambezi Region. The areas north of the VCF are commonly referred to as the Northern Communal Areas (NCAs). Because of the FMD status in these regions, cattle originating from these areas may not be marketed in the FMD-free zone, which is comprised of regions situated south of the veterinary cordon fence. This prohibition is aimed at protecting access of beef produced in the FMD-free zone to almost all markets in the world, including the lucrative European Union and Norway markets. Although cattle from the NCAs may not be marketed south of the VCF, beef produced in the NCAs may be marketed in FMD-free zone as well as to limited export markets in SADC, upon meeting certain conditions.

23. **Regarding small-stock, goats and sheep originating from anywhere in Namibia, may be marketed throughout the country.** However, NCA originating sheep and goats have to meet animal health requirements, before they can be marketed in the FMD-free zone. The major challenge in the small-stock industry has been the uncontrolled export of small stock from Namibia to neighbouring countries. This phenomenon has a potential to threaten the sustainable existence of the small-stock industry in our country. Producers attributed the trend of livestock exports to the low prices offered for their animals by the local abattoirs, relative to the prices they fetch in neighbouring countries, mainly South Africa.

Director of Ceremonies,
Ladies and Gentlemen,

24. **It should be recognised that agriculture operates in a very dynamic environment, where climate and market conditions vary from time to time.** Furthermore, it should be noted that producers and processors do share the position of Government in the drive to beneficiation through value addition, provided that the price they fetch for their livestock and livestock products will not be below their cost of production, in order to make their farming and value addition profitable and sustainable in the long-term.
25. **Agro-processing is the subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector.** Very few agro-processed products from Namibia are exported. The country is a net exporter of unprocessed agro-products, especially from the livestock subsector. The agro-processing offers significant potential to increase value addition, to create jobs, income and export opportunities, to enhance food security and reduce dependency on imports. Therefore, the Ministry of Agriculture, Water and Forestry emphasizes the importance of ensuring that the government's objective of increased primary production and value-addition in the agriculture sector and agro-industry in Namibia is achievable in line with the Growth at Home Strategy.
26. **In that connection, it is also important to recognise the disparity in the level of Namibia's economic development in relation to her major trading partners, if we are to make comparisons between profits in the Namibian market and foreign markets.** We should be mindful of the fact that developed countries were not developed overnight, and that they also applied trade measures to promote their own industrialization.

Director of Ceremonies
Ladies and Gentlemen,

27. **For the next five years, Namibia also intends to actively implement the Harambee Comprehensively Coordinated and Integrated Agricultural Development Programme (HACCIADEP), which is aimed at facilitating market access to small and medium scale agricultural producers and agro-processors, as a means of stimulating sustainable agricultural production and productivity.** The model further integrates agriculture, agro tourism and social safety net programmes to support infrastructure development and asset acquisition by small scale producers. It creates opportunities for small and medium scale producers to be organized and have access to affordable credit and loan products on a sustainable basis, thus lessening their dependence on government subsidies. The net effects of increased economic activities in the agricultural and agro tourism sectors will contribute to increased employment creation and stimulate industrial development in rural areas and to the reduction of income inequalities in Namibia. This Programme is envisaged to comprise a number of schemes such as;
28. **The floodwater harvesting and irrigation development which seek to expand the current irrigation programmes nationally to reduce the periodic damage caused by droughts and floods in various parts of the country, enhance the resilience of crop and livestock producers to climate change effects, and expand total land under irrigation.**
29. **The NCA beef, mutton, goat meat, horticulture, maize and mahangu, poultry and dairy value chain development schemes will be organised to ensure that the small and medium scale agricultural producers and agro-processors targeted have access to domestic market for products they can competitively produce for supply to Offices, Ministries and Agencies (OMAs).** It is expected that this initial market access will help develop these small and medium scale agricultural producers and agro-processors to be competitive enough to participate in the wider national and international markets.
30. **The De-bushing and Bush Value Chain Development Scheme will seek to develop the downstream industries of this sub-sector in the country by mobilising resources necessary for infrastructure and increased production and marketing.**
31. **Agricultural Mechanization Scheme will be focusing on modernisation and transformation of agricultural sector with a view to increasing production and productivity.**
32. **Seed System Development Scheme will focus on the development of public private partnerships for the sustainable production and supply of certified seeds especially of staple crops and vegetables.**

33. **This initiative will ensure that Namibian small holder farmers are brought in the mainstream of the economy.**

Director of Ceremonies

Ladies and gentlemen,

34. **Vision 2030 is for Namibia as a whole and not for Government alone. As such, our food security challenges call for a dialogue between public and private stakeholders for joint strategies aimed at addressing these challenges facing the agriculture sector.** It is imperative, therefore, that private stakeholders (producers, service industries, researchers, financial institutions, utilities companies and investors) play their respective roles in order to increase agricultural production and enhance productivity.
35. **One of the important policies that we need to take into consideration, in order to grow the agriculture sector is the Public Private Partnership (PPP) Policy and the PPP Law.** This Policy was approved by Government in order to increase and harness synergy between Government and Private Sector for investments in amongst other, agro-projects. This will allow the Private Sector to close the funding gap, especially during this time, when financial resources are scarce! This way, the Private Sector will also assist Government, in developing the sector across the value chain. The GRN would therefore like to strongly encourage the Private Sector to embrace this Policy, for us to collectively develop our country, towards the practical realization of the Country's Vision 2030 noble Goals.
36. **Let us continue working closely as a team and as always, our doors, GRN are open, for further engagement. Once again, I would like to express our appreciation, to the organizers of the Symposium, for providing a platform, to discuss the importance of agricultural productivity, for industrialization and sustained food security in the Namibian House.** I wish all of us an engaging, constructive, focussed, dedicated, empathetic, fruitful and successful discussions. We look forward to the Symposium's final Report's advice and recommendations.

With these remarks, I now declare this Bank of Namibia's 18th Annual Symposium officially opened!

I thank you all, most graciously.

FEEDING NAMIBIA: AN OVERVIEW OF AGRICULTURAL PRODUCTIVITY AND INDUSTRIALISATION

By Paul Smit, Dr. Bernie Zaaruka and Charlotte Tjeriko

Executive Summary

37. **Although Namibia's population is small, food insufficiency makes the country vulnerable to food insecurity, especially under erratic climatic conditions.** In terms of the Global Hunger Index, which measures the hunger levels with a score out of a 100 (100 denoting the most extreme levels of hunger), Namibia has an index score of 31.4. It is further estimated that about 27.8 percent of the Namibian population is food insecure. This situation is as a result of several factors that affect food production in the country, particularly that Namibia is largely an arid country with minimal annual rainfall and recurrent droughts and floods that impact agricultural production.
38. **Namibia does not meet its local demand for food and relies on imports to make up the shortfall.** This situation leaves Namibia exposed and requires interventions to ensure food security. Agriculture is thus an important sector not only in the context of food security, but also in terms of economic development in general. In terms of food security, while the livestock industry is relatively developed, the horticulture, and poultry sectors need to be developed. Livestock produce are mainly exported, while horticulture and poultry still lag behind in terms of meeting local demand.
39. **A large proportion of the Namibian population make their living directly or indirectly from agriculture.** It is estimated that about 70 percent of the Namibian population depend on agriculture for all or part of their livelihoods, with a significant proportion being smallholder farmers growing grain crops mainly for subsistence consumption.
40. **Namibia's development strategies emphasize agriculture as a pillar and key sector for structural change, economic transformation and to support food security.** It entails that Namibia has to find sustainable ways of ensuring food security and guaranteeing that the agricultural sector is developed within its unique circumstances. Among the areas that have been identified as holding potential is the expansion of the agro processing industry, which entails value addition to primary agricultural products. The lack of value chain linkages in the agriculture sector has hampered the development of the agricultural sector and contributed to the lack of critical mass for the agricultural sector production, which is dominated by the upstream agricultural activities.

41. **The policy framework in Namibia encompasses a range of policies that target the different aspects of the agricultural sector.** These policies range from import restrictions policies on poultry, meat, crop and horticulture produce to drought policies and industrial policies. However, some of this policies are outdated, while others hinder the progress of the role players involved.
42. **As an arid country with minimal annual rainfall, Namibia has to maximize on its access to perennial and ephemeral water resources.** Namibia receives only about 2.0 percent of rainfall as surface run-off water, with a mere 1.0 percent available as groundwater. Due to the perennial rivers being shared with several countries and access to the water being subject to negotiation, Namibia will have to make significant investment in water infrastructure to harvest rainfall water and increase internal water capacity that can sustain agricultural activities.
43. **Despite the agricultural sector and the agro processing industry in particular holding significant potential to create jobs, improve income and enhance food security, the sector faces significant challenges.** These include the persistent droughts, high input costs, lack of interest from local retailers to stock local products, and lack of adequate storage facilities. The skills required to have an effective agricultural and agro processing industry are scarce, which affect the speed at which the sector can develop.
44. **Several recommendations aimed at supporting and facilitating the development of the agricultural sector and agro processing industries are suggested.** These include the updating of policies and legal frameworks to bring them in line with current development realities; promotion of feedlots in the vicinity of green scheme projects that will help improve sustainability and quality of meat production; creation of conditions conducive to private investment in the sector; and improvements in water management.

1. INTRODUCTION

45. **A major proportion of Namibia's population derives their living directly or indirectly from agricultural production.** About 70 percent of the Namibian population depends on agriculture for all or part of their livelihoods, while 40 percent are smallholder farmers growing grain crops mainly for their own consumption (World Food Programme (WFP), 2017). The agriculture and forestry sector contributed on average 4.26 percent to the country's GDP over the last ten years (Namibia Statistics Agency (NSA), 2016).
46. **The agriculture, forestry and fishing sector remains the biggest employment sectors in Namibia.** According to the Labour Force Survey (LFS) of 2016, the agriculture, forestry and fishing sector provided 135,832 jobs (20.1 percent of the total labour force), making it the most labour intensive sector in the country (NSA, 2017). Agricultural employment plays a significant role in terms of food security and rural development.
47. **The high reliance on imports for agricultural produce leaves Namibia exposed to external price increases.** Namibia only produces about 40 percent of the food it consumes and is highly dependent on imports (WFP, 2017). The country is thus forced to import about 60 percent of its food requirements, which leaves it vulnerable to external price increases, with the poor having less ability to absorb such fluctuations. The need for improved agricultural productivity is important, as agricultural productivity growth is positively correlated with lower food prices, better nutritional intake and increased capital flows from agriculture (Timmer, 2002).
48. **Namibia has a serious food security challenge, which negatively influences economic performance.** The Global Hunger Index² 2016 indicates that Namibia has a 'serious food problem' with an estimated index value of 31.4 (with 100 denoting the most severe level of hunger). This is supported by the Namibia Zero Hunger Report (2016) which states that about 27.8 percent of Namibia's population is food insecure. Although, it is argued that food insecurity in Namibia is less a problem of availability and more a question of access and utilization. The Namibia Household Income and Expenditure Survey (NHIES) of 2016 depicts a downward trajectory in the food poverty line ratio, from 9.0 percent in 2003/04 to 5.8 percent in 2015/16.
49. **For many years the Government of Namibia has been providing food assistance to rural communities experiencing food shortage resulting from natural hazards.** In its efforts to combat hunger and poverty, the Namibian government, on average, provides food assistance to about 300 000 Namibians

² The Global Hunger Index is a measure of the hunger levels of the world countries out of a score of 100. A score of 100 denotes the most extreme levels of hunger.

annually, and this number may double in times of severe drought, as was seen in the years 2015 and 2016.

50. **The agricultural sector growth has been negatively impacted in recent years because of poor harvesting conditions, outbreaks of animal diseases and army worms.** The frequent droughts and outbreaks of animal diseases have negatively impacted growth in the sector during the last five years. In recent years, harvesting conditions have become generally poor due to erratic rainfalls and frequent floods and droughts. Moreover, the outbreaks of army worms in the northern and central parts of Namibia, left farmers watching helplessly as their crop fields were destroyed by the chemical-resistant pest.
51. **Agricultural productivity plays an increasingly important role in improving food supplies and food security.** Food security occurs when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, 2006). In Namibia, the agricultural sector can be divided into two distinct sub-sectors: the capital intensive, relatively well developed and export oriented commercial sub-sector; and the subsistence-based, high labour, low technology communal sub-sector. Increased agricultural productivity is important to all people as it improves livelihoods in the long run.
52. **As with any country, agricultural transformation is conditioned by a mixture of policy and investment in agriculture.** The agricultural sector and food security remain strategic to Namibia as reflected in various government initiatives and programmes since independence. Currently, the Fifth National Development Plan (NDP5) advocates the boosting of agricultural productivity for industrialisation and sustained food security. Amid the fall in mineral prices, advances in agricultural productivity and industrialisation can help Namibia realize growth in value addition and support the labour intensive sectors of the economy.
53. **The Harambee Prosperity Plan (HPP) tackles the country's hunger issues in one of its pillars, aimed at social progression.** One of the strategies outlined in the social progression pillar is the improvement in agricultural output especially in communal areas to support food security at household level. Other policies include among others, the Agricultural Policy and Green Scheme Policy outlined by the Ministry of Agriculture, Water and Forestry, the Namibian Industrial Policy and the Growth at Home Strategy of the Ministry of Industrialisation, Trade and SME Development (MITSMED). It should be noted that domestic agricultural policies and associated measures affect agricultural productivity, investment and agricultural practices through a variety of instruments, with different intended and unintended impacts on structural change, natural resource use and innovation.

54. Following this introductory section, the paper is arranged as follows: Section 2 details the significance of the agro-processing sector for development in Namibia. Section 3 reviews agricultural productivity and food security in Namibia; Section 4 outlines agro-processing sector by industry and current government initiatives, while Section 5 looks at the policy framework in Namibia. Lastly, Section 6 draws conclusions and makes recommendations arising from the study.

2. SIGNIFICANCE OF THE AGRO-PROCESSING SECTOR IN THE ECONOMY AND ITS DEVELOPMENT IN NAMIBIA

2.1 Agro-processing: Terminology and perspectives on its role in development

55. **Traditionally, agro-processing industry is defined as a subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector.** The agro-processing industry is thus the industry engaged in the transformation of products originating from the agricultural, forestry and fisheries sectors. The agro-processing industry is divided into upstream and downstream industries, where the upstream industries are considered the initial processors of agricultural raw materials into finished or semi-finished products (FAO, 1997). While downstream industries undertake further manufacturing operations on intermediate products made from agricultural materials.
56. **Value addition in agricultural raw materials has two components, namely value addition through production and value addition to primary agricultural products.** The emphasis of producer value addition is on the quality of inputs and the management of the production system to produce quality (primary) products for the next link in the value-chain. In livestock production this would include inter-alia, the availability and quality of natural pastures; pasture and rangeland management; the availability and quality of breeding animals; breeding season planning; selection criteria (genetics); supplementary feeding; water provision and disease control (preventative and reactive). Quality livestock ensures the required inputs for the local processing industry for further value addition to provide for the local and export markets.
57. **Value addition to primary agricultural products entails adding functionality to raw materials in terms of end-consumer requirements to complete the value chain.** It involves two broad interlinked processes, namely primary value addition to ensure food safety and quality assurance, and secondary value addition to produce consumer-ready products. Secondary value addition can be expanded to include tertiary value addition, where products are further refined to produce speciality products.
58. **Processing is only one link in a continuous chain between raw material production and final consumption.** The nature of the agro-industry in relation to other industrial subsectors lies largely in the biological nature of the raw material. The raw materials used by agro-industry are generally characterized by the variability of their production, seasonal nature and by their perishability.

These aspects put particular demands on both the organization of agro-industrial activities and on the agricultural base producing the inputs, thereby adding to the need for a close integration of raw material production and processing.

59. **The potential for agro-industrial development in developing countries is largely linked to the relative abundance of agricultural raw materials and low-cost labour.** The most suitable industries in such conditions are indeed those that make relatively intensive use of these abundant raw materials and unskilled labour and relatively less intensive use of scarce capital and skilled labour. Many of the industries using agricultural raw materials have, in fact, the characteristics that make them particularly suitable for the circumstances of many developing countries. Raw materials are readily available at a reasonable cost, and can often offset the disadvantages of a lack of infrastructure or skilled labour. Furthermore, for many agro-industries, a small plant may be economically efficient, which is another important factor in developing countries where the domestic market is limited by low purchasing power and sometimes by the small size of the market itself (Zambia Development Agency, 2014).
60. **The agro-processing industry in general plays a critical role for development, especially in developing countries.** According to Wilkinson and Rocha (2009), the agro-processing sector on average contributes 52 percent, 36 percent and 32 percent of the total manufacturing value added for low, middle and upper middle income countries, respectively. Moreover, the contribution could reach 66 percent for agriculture-based countries, 38 percent for the transforming countries and 37 percent for the urbanized countries.
61. **Agribusiness has been seen as a stimulus for growth in the agricultural sector.** A World Development Report (2008) noted that agribusiness can stimulate growth in the agricultural sector and reduce rural poverty. Similarly, the agro-processing industry has been identified as a key candidate for creating jobs and spurring growth owing to its strong linkages with primary agriculture. In order to realise the full potential of these divisions, it is imperative to address the challenges facing the small and medium enterprise agro-processing industry, such as the high cost of production inputs. Agribusiness can also play an important role in slowing the process of urbanisation, thereby easing the pressure on the infrastructure of cities. As more jobs are created in rural towns, social issues in cities also become smaller. Businesses in rural towns also become more sustainable with the broader base that is generated by agribusinesses.

2.2 Overview of Agriculture in Namibia: Some notable facts

62. **Over 60 percent of the population practice some form of agriculture for a livelihood.** Agriculture in Namibia occupies 64 million hectares or 78

percent of the land area, including 206,000 households and 1.17 million people. However, less than 2 percent of the total land area is arable because rainfall is limited. Only 40,000 hectares are suitable for intensive agriculture, and the country suffers from drought six out of every ten years (Mendelsohn et al. 2006). However, subsistence farming is a source of income for 28.9 percent of households. Five major farming systems exist in Namibia, namely small-scale cereals and livestock production, small stock production, mixed cattle ranching, intensive agriculture and natural resource production.

63. **The growth of the agricultural sector was negative during the recent past due to the drought of the past four years.** The main effects on the livestock, dairy, pig and poultry sectors were the availability and cost of feed and fodder. As the recent drought continued year on year, the condition of rangelands also deteriorated, hence the need for additional feed and fodder. While availability dwindled over time, the feeding costs sky-rocketed from 2014 to 2016 as the country's feed and fodder requirements are imports. The rainfall received in the 2016/17 rainfall season resulted in a stock-building phase. For the intensive production systems (pork, dairy and poultry) more feed and fodder became available with a better maize harvest, together with a decrease in price.
64. **Agricultural output in Namibia is extremely sensitive to climatic conditions.** Periodic droughts cause considerable stock losses and reduce grain production. Droughts have become common in recent years. The mean annual rainfall in Namibia is about 270 mm. The agronomic sector, especially dryland cropping, were also hit by the erratic and low rainfall. The net effect was poor harvests during the period 2015 and 2016. During the 2016/2017 rainy season most parts of the country received an average to above-average rainfall to at least ease the effects of the recent drought to a certain extent, albeit areas in especially the south-eastern parts of the country received dismal to no rain at all. Hence, the effects of the drought have not been broken country-wide. The better rainfall resulted in a bumper maize harvest during the last planting season of 2016 despite the occurrence of army fall worms.
65. **Namibia's commercial farmers are primarily involved in livestock farming; this is however under threat due to the introduction of game meat.** Due to climatic conditions, commercial farmers are predominantly engaged in livestock farming, with small-stock dominating the activities in the south. The central and northern part of the country are more suitable for large stock production. Furthermore, with the introduction of game meat for the health-conscious consumers seeking leaner meat and a more favourable fatty acid composition, traditional livestock farming is under threat of being replaced. The oversupply of game meat, especially during the hunting season, sees farmers losing out on business, as game meat is relatively cheaper than beef.

66. **The agricultural sector, despite its low contribution to Gross Domestic Product (GDP), is important to the livelihoods of most Namibians.** The GDP contribution of the agricultural sector was 3.4 percent of GDP in 2016, of which close to 60 percent is attributed to the livestock sub-sector. The contribution of the crop and forestry sub-sectors to agricultural GDP has continuously increased over the past years and reached a level of 40 percent in 2016 (Bank of Namibia, 2016). The national accounts previously distinguished commercial and subsistence farming, where commercial farming contributed about two thirds to the total output of the agricultural sector. In addition to the sector's direct contribution to GDP, the sector also contributes to economic activity through its value chains of meat processing, food and beverage production including milling (Namibia Agricultural Policy, 2015).
67. **The agricultural sector has potential to contribute to national foreign earnings.** Exports of livestock and crops were valued at N\$ 1.7 billion in 2016, accounting for 2.8 percent of total export receipts (NSA, 2017). Horticultural produce plays an increasingly important role in export and hence the government has identified about 27 000 hectares of potential irrigable land of which about 11 000 hectares is under production. Between 2003 and 2008, the overall value of game meat exports almost tripled, from less than N\$ 11 million to N\$ 31 million. In terms of volumes, South Africa remained Namibia's principal game meat trading partner. Since 2014 however, there has been no facility exporting meat from game species to overseas markets, and export activities have been largely confined to small amounts of processed products (biltong and droëwors) going to South Africa, with meat export quantities plummeting to 86 tonnes in 2014 and 38 tonnes in 2015 (MITSMED, 2016).
68. **Apart from the livestock sector, all the other sectors are deficit producers and rely on imports to satisfy the local demand.** Given that Namibia is the most arid country south of the Sahara, the production potential of these sectors is limited. Hence, livestock production will continue to dominate agricultural production, while chicken production still falls short of local consumption. Poor marketing, the small size of the domestic market, and the inability to add processing value and penetrate foreign markets all act as constraints to agricultural development.
69. **The livestock sector is an export sector and in this sense all role-players should equally benefit from the export value chain.** Primary producers of livestock are price takers and therefore cannot influence the price eventually realized. Any intervention in these value chains will decrease the alternatives available to producers for the same or a better price. However, the implementation of the Small Stock Marketing Scheme in 2004 resulted (i) in the dwindling numbers of commercial small-stock numbers and (ii) commercial small-stock producers diversifying into other avenues to sustain farming income.

2.3 Evolution and performance of the agro-processing sector in Namibia

70. **Agro-processing has a strategic importance for employment, income generation and value addition due to its close links to the agricultural sector.** In 2016, the agro-processing sector (food products, beverages, leather and related products) contributed approximately 5.0 percent to GDP (NSA, 2016). Namibia is a net exporter of unprocessed agro-products, especially from the livestock sub-sector. However, the country also relies heavily upon imports of food products. Most imports originate from South Africa and the European Union member states. The following review shows the growth levels, value addition and the export and import levels of the industries in Namibia.

Table: 2.1 Agro-processing industry in Namibia: growth rates (2008-2016)

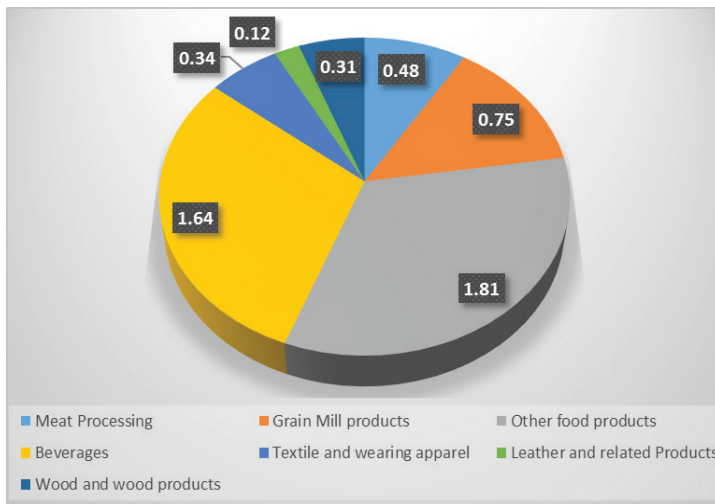
Agro-Processing sector annual percentage change	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average 2008-2016
Meat processing	-6.3	4.1	5.6	-2.7	-1.1	30.4	-17.2	-3.0	-2.1	0.9
Grain mill products	14.9	16.3	8.4	6.5	-1.6	12.8	13.7	13.0	0.7	9.4
Other food products	8.5	6.7	17.2	-10.3	-16.8	3.3	11.7	-12.3	4.0	1.3
Beverages	3.2	15.2	1.9	0.4	15.0	13.7	-16.5	-2.1	-1.6	3.2
Textile and wearing apparel	3.0	-1.1	3.6	4.7	6.1	8.2	-2.9	-8.9	3.7	1.8
Leather and related products	6.9	-35.9	11.6	12.7	11.3	-7.3	10.7	-1.8	-3.4	0.5
Wood and wood products	14.7	-3.8	-10.0	-1.0	-4.5	3.1	1.7	-2.6	3.5	0.1

Source: NSA, 2016

71. **The agro-processing sector has shown steady growth in most sub-sectors, with grain mill products exhibiting the highest growth.** Table 2.1 above shows a positive average growth for all activities of the subsector between 2008 and 2016, although it experienced negative growth in 2012 and 2015. Grain mill products is the only sub-sector that experienced positive growth in 2015. As expected, the growth rate of the industry is influenced by the climatic conditions experienced in Namibia, whereby the drought conditions are a recurrent phenomenon. The beverages sector had an average growth rate of 3.2 percent between 2008 and 2016.

72. **In terms of value addition in the agro-processing industry, “other food products” category is the highest contributor to GDP.** Figure 2.1 shows the composition of total value added of the agro-processing industry from 2007 to 2016. It reveals that “other food products” is the largest activity in terms of value added products produced in Namibia. It contributed an average of 1.81 percent to GDP from 2007 to 2016, followed by beverages with a contribution of 1.64 percent. The smallest contribution to GDP came from the wood and wood products sector with a contribution of 0.34 percent to GDP.

Figure 2.1: Total value addition



Source: NSA, 2017

73. **In terms of agro processing performance, Namibia’s export products are not well diversified.** There are only four agro-processed product groups and Namibia imports a significant amount of other food products. The high level of imports of other food products points to potential for growth in the agro-processing industry, although the microeconomic detail around each product would have to be thoroughly investigated before attempting to realize such potential. Table 2.2 shows the composition of total real exports and imports of the agro-processing industry from 2007 to 2016. Prepared and preserved fish have the highest export share value with an average of N\$ 4 329.6 million. The figure further shows that within the agro-processing industry, imports by textile, clothing, leather production footwear and paper production, printed matter, recorded media divisions contributed roughly the same.

Table 2.2: Total Import and export values of agro-processing industry in N\$ Million (2007 – 2016)

Exports											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
Meat, meat preparations	1640	1864	2154	1581	1458	1441	1326	993	927	758	1414
Prepared and preserved fish	2915	3548	5177	5527	4939	3993	4212	4347	4157	4481	4330
Other food products	190	253	328	218	226	226	250	219	142	138	219
Beverages	1292	1647	2026	1562	1573	1714	1625	1254	1096	567	1436
Imports											
Meat Processing	433	609	782	659	668	586	466	629	837	751	642
Prepared and preserved fish	250	294	444	334	316	317	422	525	512	847	426
Other food products	2473	2572	3428	3078	3137	3835	4409	4548	5453	8811	4174
Beverages	817	1144	1697	1294	1298	1483	2111	2618	2728	2814	1800
Tobacco products	220	347	506	431	403	451	523	545	622	555	460
Textile, clothing, leather prod, footwear	1619	2011	3143	2444	2667	2756	3335	4001	4250	4030	3026
Wood and wood products	281	346	441	416	453	528	588	733	820	829	544
Paper prod, printed matter, recorded media	1020	922	1313	1170	1166	1397	1627	1788	2151	2045	1460

Source: NSA, 2016

2.4 Sustainable Water Utilisation for Irrigation Purposes

- 74. Namibia is one the most arid countries in Southern Africa, receiving insufficient rainfall and having limited groundwater.** Namibia receives about only 2.0 percent of its rainfall as surface run-off water, and a mere 1.0 percent is available for groundwater recharge. The surface water scarcity has historically resulted in a reliance on groundwater, though this source of water is also limited due to low recharge rates and periodic ephemeral floods. Besides this, water resources are also affected by pollution through the use of pesticides and fertilisers in agricultural activities (GRN, 2004a).

75. **The lack of readily available water in the interior of the country, where the water is needed the most, is an important limiting factor for development.** The internal annual renewable water resources available from the ephemeral rivers and groundwater sources are estimated at 500 million cubic metres (Mm³/a). This is not much given the size of the country and the socio-economic needs of the growing population. The lack of readily available water in the interior of the country is highlighted as an important limiting factor for development (GRN, 2004a). The lack of water hampers sufficient water available to meet the demands for basic human needs, agricultural production, industrial development, mining, manufacturing and power generation.
76. **Namibia, however, has access to internationally shared perennial and ephemeral water resources.** The northern and southern borders of Namibia are demarcated by perennial and ephemeral river systems, i.e. the Kunene, Cuvelai, Okavango, Orange and Zambezi river systems on the northern and the Orange river on the southern border of the country (GRN, 2010a). These water resources could play an important role in the agricultural development for irrigation purposes and can raise the low productivity of agricultural production caused by low and unreliable rainfall through dryland crop farming. Currently, irrigation is mostly restricted to the areas adjacent to the perennial rivers and consumes huge quantities of water due to high evaporation and marginal soils (GRN, 2010a).
77. **Despite these water sources, the challenge with respect to water management is compounded as many of the perennial rivers are shared with several other countries.** Namibia is a downstream country in these watercourse systems, and the country is entitled to a reasonable and equitable share of the water, but this access is subject to negotiation between the basin States according to international water law.
78. **Namibia's water management framework draws its mandate from the Constitution, water policy, water law and water regulations promulgated in terms of the water legislation.** Article 95 of the Constitution of the Republic of Namibia deals with the maintenance of the welfare of the people. The adoption of water, sanitation and environmental policies are facilitated by the provisions of Article 95 (l) of the Constitution. It states that the Government must adopt policies for the maintenance of ecosystems, essential ecological processes and the biological diversity of the country, as well as the utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future.

Box 1: Government Initiatives in Agriculture in Namibia

The following box summarizes selected government initiatives in the area of Agriculture in Namibia, including the main policies in the new NDP5.

The Green Scheme national programme is aimed at encouraging development of irrigation based agronomic production. The Green Scheme programme aims at promoting food security and food self-sufficiency at national and household levels as well as increasing the contribution of agriculture to the country's GDP by encouraging the development of irrigation based agronomic production in Namibia. The Government has, to date, established about 11 Green Scheme projects (Etunda, Musese, Uvungu-Vungu, Sikondo, Shadikongoro, Mashare, Ndonga, Shitemo, Kalimebeza, Hardap, ORIP) covering a total area of about 6 000 hectares.

The implementation of the Green Scheme programme is still underway and more projects are expected to come on board. The Ministry continues to promote the Green Scheme Programme and its projects, through the establishment of more projects at Tandjieskoppe, Liselo/Katima Farm, Neckertal Dam, Zone, Bagani, Sesfontein/Khowarib and other places in the country. The successful implementation of the Green Scheme Policy represents a real opportunity for Namibia to achieve a significantly higher level of food self-sufficiency, while improving rural livelihoods, empowering marginalized stakeholders, increasing social equity and promoting investment in the agricultural sector in Namibia.

NDP5 Strategies:

NDP5 identifies Conservation Agriculture as a strategy to increase agricultural production for horticulture and cereals by expanding the green scheme projects. Agricultural production will be increased by advancing the use of Conservation Agriculture with at least 50 percent of farmers practicing it for both crop and livestock production in the whole or part of their farm land and applying appropriate technologies. Additionally, NDP5 is advocating for school and home backyard gardening initiatives to be introduced to enhance food security, nutrition and also promote good agricultural practices.

Under the NDP5, more hectares of land are envisaged to be developed for irrigation under the Green Scheme. An additional 5 536 ha of land for irrigation is expected to be developed over the NDP5 period. It is expected that by 2022, 88 percent of Namibians will have access to adequate food all year round. NDP5 targets to have production of nutritious foods to be increased and consumption of diversified meals to reach 60 percent by 2022. Furthermore,

82 200ha of land is targeted for bush thinning annually over the NDP5 period; a bush-based industry will be developed creating a total of 17,600 jobs and 460 enterprises, at least half of which should benefit women. NDP5 further intends to increase national food storage capacity from 22 900mt to 39 400mt over the NDP5 period. To increase productivity of subsistence farming use of drought resistant varieties will be promoted through crop rotation, soil enrichment, and organic pesticides usage.

Efforts will be made during NDP5 period to mobilize investors to develop agro businesses to take advantage of increased local and regional production. The efforts include the fortification of processed food, especially for baby feeds. This will also address the challenge of stunting among children. It is expected that by 2022 stunting among children less than two years old will be reduced from 24.1 percent to 12.1 percent.

The government intends to intensify agricultural extension services to smallholder farmers and/or communal farmers by providing information on agricultural practices. This will include information on how communal farmers could organize themselves into cooperatives, access credit and acquire agricultural implements such as tractors. In line with Agenda 2063 the aim is to mechanize agriculture production.

During NDP5, Government aims to minimise the impact of food and mouth disease (FMD) in NCA by extending the cordon fence to the northern borders of Namibia by 2022. Other major activities will include increasing enrolment and teaching in veterinary courses at tertiary education level. The development of a pharmaceutical plant in collaboration with the private sector, as a cross border initiative with neighbouring countries will be initiated. The current cordon fence has affected and limited the productivity of the NCA, through limiting their markets.

3. AGRICULTURAL PRODUCTIVITY AND FOOD SECURITY IN NAMIBIA

79. This section reviews the productivity of the agricultural sector as the input factor into the agro-processing industry to gauge the potential for agro-industrial development in Namibia. It also outlines the food security situation in Namibia.

3.1 Agricultural Production in Namibia

80. **It is estimated that over 50 percent of the Namibian population live in rural areas and many of them depend on smallholder crop production for their survival.** However, their livelihood is threatened by inherent poor soil fertility and seasons with irregular rainfall causing low production or crop failures. Low or variable production levels can also be attributed to inappropriate farm practices and management. These include mono-cropping without adequate soil nutrient replenishment, the burning or removal of crop residues and the frequent disturbance of the topsoil by plugging, disking or hoeing (Wilhelm, 2012).

3.1.1 Crop and Horticulture Production

81. **Mahangu is a subsistence rain fed cereal crop, also known as pearl millet, which is the major staple food for over 50 percent of the Namibian population.** The crop is mainly produced in the North Central Regions. Mahangu is highly adapted to low rainfall and the prevailing soil conditions in that area. For many years, small-scale farmers have survived on the low yields obtained from mahangu. The mahangu farmers in Namibia are amongst the few populations in Africa that have successfully developed an integrated food storage system where they can store their grain in storage baskets made of wood strips for up to five years.
82. **In Namibia, white maize is grown exclusively as a staple food and is planted under both irrigation and rain fed conditions.** The Green Scheme Projects contribute significantly to domestic white maize production under irrigation in Namibia. The Green Scheme Projects are government initiative programs managed by Agribusdev, an agency appointed by the Namibia Agronomic Board. Commercial producers in the Tsumeb, Grootfontein, Kombat and Otavi areas have also increased volumes of white maize produced locally under irrigation.
83. **Namibia is a net importer of staple grain, although gradual increases in local production are observed during normal rain circumstances.** The rain-fed white maize is produced in the Maize Triangle situated between Tsumeb, Otavi and Grootfontein. It is also produced in the Summerdown and Omaheke areas in the east, as well as in the Zambezi Region. Namibia is still a net importer of staple grain; however, the local white maize production does show a gradual increase in years of normal rainfall.
84. **In Namibia, wheat is a winter crop planted between April and October each year, and is produced only under irrigation.** As a result, this crop is not affected by Namibia's erratic rainfall. Wheat is normally planted during June/

July and harvested between mid-November and early December every year. It is produced at the Hardap Irrigation Project near Mariental in the south, at the maize triangles and the surrounding area as well as in the North Central Areas and Kavango Region.

85. **Namibia's horticultural subsector is steadily growing and produces crops that include potatoes, tomatoes, onions, and carrots.** The crops are only cultivated under irrigation as rain-fed crop conditions result in fluctuating yields and profitability for the producers. Table 3.1 shows a summary of the local production and consumption of horticulture produce, produced locally and imported. Most of the local consumption of potatoes, apples and bananas are sourced from imports. Namibia is, however, self-sufficient in producing cabbages, sweet lemons and pumpkins (Namibia Agronomic Board, 2016). Other crops produced in the country are yellow maize, sorghum, groundnuts, sunflower beans, cotton and lucerne. Fruits and vegetables, such as citrus, dates, grapes, tomatoes, butternuts, onions and potatoes are also produced.

Table 3.1: Local Consumption and sourcing of Horticulture Produce 2015/16

	Product Name	Domestic Tonnage	Import Tonnage	Total Consumption Tonnage
1	Potatoes	7,055	19,651	26,706
2	Onions	3,726	2,937	6,663
3	Apples	0	5,889	5,889
4	Tomatoes	2,771	1,594	4,365
5	Bananas	0	4,324	4,324
6	Carrots	963	1,683	2,646
7	Oranges	209	2,088	2,297
8	Lettuce	997	899	1,896
9	Cabbage	1,482	228	1,710
10	English Cucumbers	669	787	1,456
11	Other	5,707	9,780	15,487
	Grand Total	23,579	49,859	73,439

Source: NAB, 2016

86. **The horticulture subsector aims to create employment and stimulate growth by implementing measures for its development.** Namibia is implementing measures aimed at the development of the horticulture subsector, in order to provide the best quality produce for the domestic market, while at the same time creating employment and stimulating the economy. These efforts contribute to Namibia's self-reliance in terms of production, processing and marketing of fruits and vegetables. Despite these efforts, the horticultural

produce sub-sector saw a drop of 8 percent in actual local tonnage marketed to the formal sector due to the recent drought.

87. **Namibia applies trade restrictions to a number of imports that stand in direct competition with its local production.** This includes imports of maize, wheat and products thereof, horticulture products, flour and pasta. Mahangu, wheat and white maize are the most important sources of staple food in Namibia; as such there are import restrictions on these crops to allow for local production to be marketed first.

3.1.2 Livestock Production

88. **Livestock farming in Namibia comprises cattle, sheep, goats and pigs. In terms of output, beef production is the major livestock farming activity in Namibia followed by mutton/ lamb, goat and pork.** Beef is predominantly produced in the central regions of Otjozondjupa, Omaheke, and Kunene, while mutton and lamb is produced in the arid regions of Hardap, Karas and Erongo. Livestock importation in Namibia is mainly for breeding purposes and therefore, it fluctuates according to the needs of the farmers. The numbers imported decrease during times of drought, as farmers sell off their livestock. However, the numbers increase during the rainy years as the farmers try to stock up again.

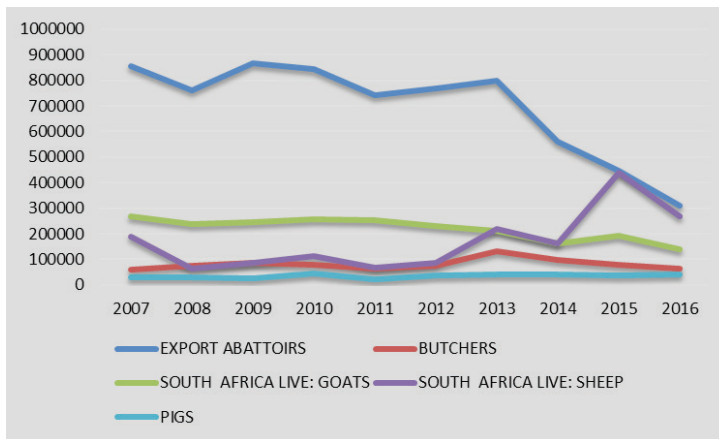
Table 3.2 Cattle market fluctuations

CATTLE MARKETED							
MONTH	EXPORT S - VCF	ABATTOIRS N - VCF	BUTCHERS	SOUTH AFRICA LIVE	ANGOLA LIVE	TOTAL	
2006	111,821	21,170	12,016	172,790	-	317,797	
2007	115,460	18,881	5,774	171,163	-	311,278	
2008	129,622	9,798	10,923	127,426	-	277,769	
2009	130,035	7,876	9,210	126,461	-	273,582	
2010	127,141	15,704	15,866	194,117	-	352,828	
2011	112,602	18,658	20,344	201,682	-	353,286	
2012	102,980	9,581	23,910	128,493	1,738	266,702	
2013	115,819	13,217	33,423	262,929	8,239	433,627	
2014	111,101	8,019	21,598	100,211	2,988	243,917	
2015	119,159	-	22,367	281,965	232	423,723	
2016	100,673	-	24,741	151,912	614	277,940	
TOTAL	1,276,413	122,904	200,172	1,919,149	13,811	3,532,449	

Source: Meat Board of Namibia

89. **Most cattle marketed in the country comes from the South of the Veterinary Cordon Fence (S – VCF).** The number of cattle marketed is depicted in Table 3.2, which includes both slaughtered and live exports. The figure shows the total number of cattle from 2006 to 2016. Cattle marketed is dominated by live exports to South Africa, followed by slaughtered cattle from the (S – VCF). Due to an outbreak of food and mouth diseases North of the Veterinary Cordon Fence (N – VCF) in 2014, the two A-Class abattoirs in the area, Meatco Oshakati and Meatco Katima Mulilo, were closed down.

Figure 3.1: Number of Small Stock Marketed 2007 - 2016



Source: Meat Board of Namibia

90. **A downward trend is observed in the number of small stock marketed over the years.** Figure 3.1 shows a downward trend in the number of small stock marketed the last 10 years. The number of live exports of goats is higher than that of the live exports of sheep over the years; however, an increase in live exports can be seen from 2014.

Feedlots

91. **There is only one operational feedlot in Namibia, which is the Okapuka (Meatco) feedlot.** The main reason mentioned as to why there is only one feedlot in the country, is that a feedlot cannot operate in isolation, it must be part of the value chain. This is due to the fact that it is costly to operate a feedlot since all raw materials (feeds, fodder) must be imported. In September 2016, the Directorate of Veterinary Services (DVS) ordered closure of the Okapuka Feedlot after two urine tests conducted in April 2016 returned positive for traces of zeranol, a synthetic hormone.

92. **Notwithstanding the fact that the scientific evidence pointed to feed contamination as the cause of the test results, the shut-down lasted two months.** The shut-down caused significant losses for the Corporation as the projected slaughter of 27,500 cattle amounted only to 20,807 cattle from the feedlot for that period. The situation translated into knock-on losses in earnings for producers and the Namibian economy as a whole. The closure of the feedlot resulted in Meatco sustaining significant losses, impacting on producers and the Namibian economy (Meatco Annual Report, 2016).
93. **Namibia has the potential to produce animal feed locally, through the green scheme programme.** The green scheme programme holds the potential for the eventual establishment of feedlots in the country. The green scheme produces different types of crops, from field crops to vegetables and fruits. The areas where crops are produced that are most suitable for animal fodder or that can be transformed into animal feed must be targeted to establish feedlots in their vicinity/proximity. The green scheme programme may not produce enough raw material to cater for all the needs, but it is advisable to start off small, grow and learn in the process. The green scheme programme is an intervention of the Namibian government, and looking at the complete value chain and how the produce from the green scheme programme can benefit the economy is essential.

3.2 Food Security Situation in Namibia

94. **Namibia food and nutrition security situation improved considerably in the last two decades since independence; however, this still remains a high priority for the government.** According to an assessment carried out following the 2012/13 drought situation, an estimated 330 925 people are food insecure, 447 577 slightly food insecure and 859 898 food secure, with food insecurity more prevalent in the north-western regions mainly due to prevailing chronic poverty and droughts (FAO, 2014). The highest percentage of food insecure households are found in the Kavango West (62.5 percent), Zambezi (50.7 percent) and Otjozondjupa (41.3 percent) regions (WFP, 2016)
95. **The main contributing factors to under-nourishment and food insecurity are inequality of the income distribution, the high poverty rate, and the incidence of HIV/AIDS.** Factors specific to rural areas include chronic droughts and consequent water shortages, resulting in crop failures and death of animals. Widespread soil erosion and land degradation, limited income generating opportunities, lack of agricultural land and isolation from markets, constraints on women to access land and resources, and lack of implementation of appropriate policies also play a significant role.

96. **Another factor that has contributed to food insecurity has been the loss of indigenous foods and the related indigenous knowledge for preparing those foods.** Indigenous foods are neglected and derided by many in the agricultural and food industries, as well as by urban consumers. The loss of these indigenous foods is mainly due to the change in diets, which have been modernised, and the perception that these are poverty food. However, they can be an important component in alleviating hunger, malnutrition and protecting the environment. Moreover, these plants are more diverse and reliable than conventional crops, and they contain micronutrients that many subsistence farmers and the rural poor lack (Danovich, 2015). The main food insecure segments of the population consist of resource poor households, women, the youth, the elderly, child orphans, the unemployed and households affected by HIV/AIDS.

4. AGRO-PROCESSING BY INDUSTRY

97. **This section reviews the status and size of the agro-processing industry as key sector in driving industrialisation and promoting food security in Namibia.** The discussion is guided by the National Accounts classification and the Food and Agricultural Organisation (FAO) definition of the agro-processing sector.
98. **The agro-processing industry in Namibia is dominated by the upstream industries with only a few downstream industries.** The upstream industries encompass meat processing, grain mill products, other food products, wood and wood products and beverages. While the few industries in the downstream sector comprise of textile and wearing apparel and leather and related products.

4.1 Upstream Industries

4.1.1 Food Products

99. **This section reviews the food products sub-industry, looking particularly at value addition growth and exports and imports.** The review covers the food products sub-industry, which is the meat processing, grain mill products, other food products and beverages. The value added, growth figures, and export and imports is reviewed on average between 2007 to 2016, where data is available.
- (i) **Meat and Meat processing**
100. **The meat and meat processing industry is a collection of firms involved in the marketing of animals, from the slaughtering to the distribution of such animals.** The meat and meat processing industries comprises of a number of firms involved in the slaughtering, processing, packaging, and distribution of animals such as cattle, pigs, sheep and other livestock. The poultry meat industry also forms part of the meat and meat processing industry.
101. **Namibia has a wide range of well-equipped abattoirs which cater to the different markets within Namibia and globally.** There are five formal³ well-regulated and highly efficient A-Class abattoirs that process cattle, sheep, pigs, and other livestock primarily for the export market. There are approximately 79 small abattoirs (B-Class and C-Class abattoirs) typically run by a local authority or private butchers, catering to the market needs of the surrounding region. The Meat Cooperation of Namibia (Meatco), is a major player in the

³ The five A-Class abattoirs are export abattoirs which cater to the major markets, this are namely Farmers Meat Market, which exports only sheep; Aranos Abattoir, Meatco Okahandja, Meatco Windhoek, which export only beef; and Brukkaros Farmers, which exports sheep and beef. The B-Class abattoirs are export abattoirs which cater to the regional market, while C-Class abattoirs are only for national consumption.

meat processing industry. As of financial year 2016/17, the plant in Windhoek increased its deboning and slaughtering capacity from slaughtering 420 heads of cattle per day to 560 heads of cattle per day, and deboning 360 to 480 per day (Meatco Annual Report, 2016).

102. **The poultry meat industry plays an important role in value addition to agricultural production and in creating employment.** The poultry meat industry is an important industry in Namibia. It involves substantial value addition to agricultural production and employment creation. Namibia still experiences a significant surplus demand for chicken meat and chicken products which reflects the potential for the sector growth, particularly that it does not necessarily require intensive capital and is not a high maintenance activity.

Figure 3.1 Meat Processing – Contribution to GDP

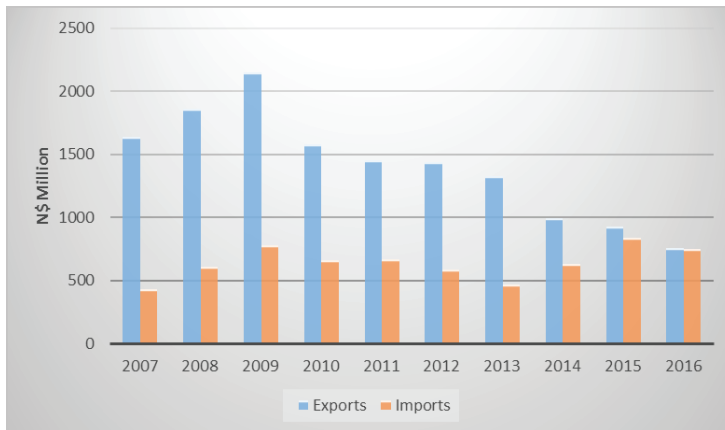


Source: NSA, 2017

103. **The meat and meat processing industry have shown declining growth in recent years, mainly attributed to the drought conditions.** In terms of value addition, the meat and meat processing grew on average by 0.48 percent between 2007 and 2016. Stagnant contribution to GDP can be seen from the period between 2014 to 2016 with a growth rate of 0.4 percent as depicted in Figure 3.1. This is caused mainly by the severe drought conditions experienced during this period.
104. **Local production in the meat industry is mainly exported in its primary state, implying a loss of local job creation in the form of value addition.** About 80 percent of local meat production is either exported as primary beef cuts, lamb carcasses and live exports on the hoof. It implies that a lot of (specifically)

secondary and tertiary value addition in the meat sector takes place outside Namibia. This equates to exporting local employment opportunities, while the dividends of value addition are not repatriated back to the country and to livestock producers. Namibia is self-sufficient in the production of meat and meat preparation products and thus the export values are much higher than the import values, as depicted in Figure 3.2.

Figure 3.2: Exports and Imports of Meat and Meat Preparations

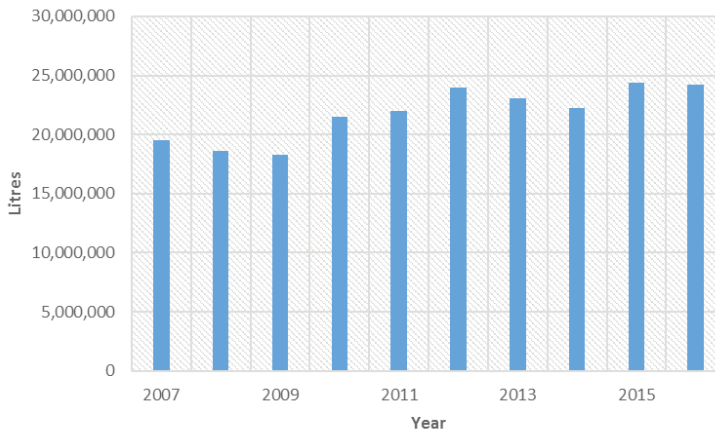


Source: NSA, 2017

(ii) Dairy Processing

105. The Namibian dairy industry is well developed and caters to local and export markets. Namibia Dairies is the biggest player in the dairy industry, however, there are a few small farmers supplying local supermarkets. The dairy sector in Namibia consists of the production of milk, yogurt and other milk products. An increase in milk production can be seen over the years, from a production of 19,514,738 litres of milk in 2007 to 24,227,160 litres of milk in 2016 as depicted in Figure 3.3.

Figure 3.3 Milk Production



Source: Bank of Namibia

(iii) Prepared and preserved fish

106. **The Namibian fishing sector includes inland capture fisheries, marine capture fisheries and marine and freshwater aquaculture.** Aquaculture is the farming of aquatic organisms, which includes the farming of fish, crustaceans, molluscs and aquatic plants in freshwater bodies and in the sea. At a global level, aquaculture is one of the fastest growing food production systems, and it can also produce a wide range of valuable non-food products. A range of aquaculture activities can bring important benefits in food security and income advantages at the level of individual households, especially in the rural and coastal areas, and it can support larger industrial scale ventures.

(iv) Other food products

107. **Crop production constitutes another important source of inputs for upstream agro-processing activities.** This includes activities such as milling of maize, mahangu and wheat; grinding groundnuts into peanut butter, oil pressing from plant seeds, and juice pressing from fruits.

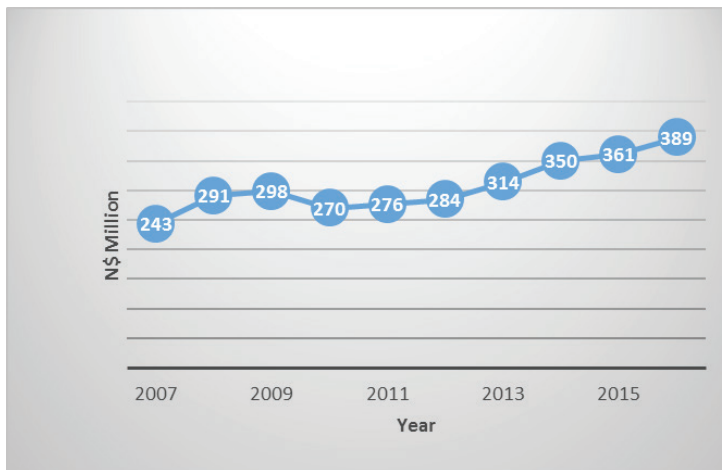
108. **Namibia has a well-established milling industry which is dominated by the private sector.** The Government is currently developing small milling facilities to increase processing capacity in the country. Marketing of cereals in the country is regulated by the Agronomic Industry Act (Act 20 of 1982). At present, all cereals produced in Namibia are marketed and consumed locally (Namibia Agricultural Policy, 2015). A total number of 36 millers are currently registered with the Namibia Agronomic Board.

4.1.2 Non-Food Products

(i) Wood and Wood Products

109. **Wood products play a significant role in the Namibian economy.** A significant part of the rural population derives their livelihood from the forest resources. On the other hand, a limited forestry industry obtains its raw material from these resources. The total economic value of forest resources exploitation increased from N\$ 243 million in 2007 to N\$ 389 million in 2016.

Figure 3.4 Wood and Wood Products



Source: NSA, 2017

4.2 Downstream Industries

110. **Downstream industries further process the upstream products made from agricultural materials.** This is where most of the value addition takes place, and activities include baking bread and biscuits, cereal and pasta production, textile spinning, paper production, beer brewing, and clothing and footwear manufacturing.

(i) Textile and Wearing apparel

111. **The tanning sub-sector, which is part of the textile and wearing apparel sector, comprises of three major tanneries with a number of micro, small and medium enterprises (MSME).** The three major tanneries in Namibia are the Meatco (Okapuka), Nakara, and Brukkaros tanneries. There are also a few small community-based tanneries, for example the Dune Tannery close to Mariental. The tanneries produce pickled skins, tanned hides and wet blues.

They focus primarily on chrome-tanning processes. Namibia imports vegetable-tanned leather from South Africa and other countries, mostly to serve the needs of manufacturers of finished goods. There are also 26 known micro, small and medium enterprises (MSME) that manufacture leather-related products (MITSMED, 2015).

4.3 Challenges within the Agro-processing sector

112. Although the agro-processing industry has significant potential to increase value addition, and offers opportunities to create jobs and income, to enhance food security and reduce dependence on imports, it is faced with numerous challenges.

The main challenges are:

- **Low rainfall and frequent drought in Namibia:** The upstream industry in particular is faced with the constraints of frequent droughts, poor soil fertility, and high temperatures, impacting the consistency of supply of the agricultural products that it has to process further.
- **High cost of production inputs:** The sector is also constrained by high costs of production inputs (seed, fertiliser, chemicals etc.), seasonality, as well as a lack of funding and commercial farming skills.
- **Retailers' reluctance to stock up on local products:** Local enterprises still face many difficulties trying to convince retailers in Namibia to stock and sell their products.
- **Lack of adequate storage facilities for value addition:** Cold storage facilities to maintain the lifespan of fresh produce in the country are few and in many cases raw products are exported and re-imported into the country for value addition.
- **Limited skills:** Namibia has limited skills in this sector to produce competitively. Further challenges cited at sector consultations include a lack of skilled labour and an inefficient coordination between the players along the value chains.

5. POLICY FRAMEWORK IN NAMIBIA

113. **Namibia's Vision 2030 provides a policy framework for long term national development goals.** The essential elements of Vision 2030 are prosperity, harmony, peace and political stability. Chapter 5 of Vision 2030, titled sustainable resource base, exclusively articulates and highlights the need to promote the sustainable, equitable and efficient use of natural resources, maximize Namibia's comparative advantages, reduce inappropriate practices and create a database for information sharing and programme management. The agriculture sector has aligned itself with these and is committed to make significant contributions to the overall goal of Vision 2030.
114. **The National Development Plans (NDPs) are five-year medium term strategies developed by the Government of Namibia, in pursuance of the Vision 2030 goals.** The fifth National Development Plan (NDP5), which was recently launched, has identified agriculture as one of the priority sectors which has potential to contribute to the attainment of high and sustained economic growth, employment creation and increased income equality. It is expected that the proportion of food insecurity will drop from 25 percent in 2016 to 12 percent, and the production of food will increase by 30 percent over the NDP5 period
115. **The Namibia Agricultural Policy is aimed at increasing agricultural productivity, agro-processing and marketing.** The Namibian agricultural sector is guided by the Namibia Agricultural Policy of 1995, as revised in 2015. The Namibia Agriculture Policy is aimed at contributing to increasing agricultural production, agro-processing and marketing as well as to serve as an overarching policy in the agricultural sector. The Policy is formulated in line with the Namibian Constitution and provides a framework for adjusting relevant laws to give effect to the stated policy objectives and strategies.
116. **The Small Stock Marketing Scheme is a quantitative export restriction scheme where an export quota is earned by marketing locally.** The idea behind the small stock marketing scheme is to ensure that more animals is kept in-land and thereby stimulating local development in terms of local slaughter capacity and value addition which will ultimately lead to a more competitive industry. Despite it's good intention of protecting local abattoirs and to stimulate local value addition. Since its inception in 2004, the number of small-stock marketed annually decreased year on year. This may have ultimately led to the recent closure of one of the biggest A-Class small stock export abattoirs, Farmers Meat Market in Mariental.
117. **The Namibian Agricultural Marketing and Trade Policy and Strategy of 2011 gave birth to the Agro-Marketing and Trade Agency (AMTA) which was created to manage the Fresh Produce Business Hubs in Rundu and**

Ongwediva. The marketing of fresh produce in Namibia is regulated by the Market Share Promotion (MSP) regulation, which controls the percentage of imports. In developing the domestic market for local produce and industrial products, priority is put on instituting regulations and developing infrastructure necessary for an orderly marketing of cereal and horticulture produce. The marketing of fresh produce is regulated by the MSP which was initially set at 5 percent in 2005 but increased to 44 percent in 2015/16. This means traders and retailers should ensure that 44 percent of their produce are sourced locally before they can qualify for an import permit in a given quarter (Agronomic Board of Namibia, 2016).

118. **Special import permit requirements are imposed on certain horticultural produce to ensure that local produce are marketed first before imports can take place.** In addition to the rules set out in the MSP, certain products such as onions and potatoes have special import permit requirements. The import permits on these products ensure that these products are not imported when there is sufficient produce in the country to meet the national demand. Therefore, local produce is marketed first before imports can take place.
119. **The reservation against the fresh Produce Business Hubs is that they were constructed at high costs without taking into account the volumes of fresh produce that the small-scale farmers can produce.** The non-profitability of these Fresh Produce Business Hubs was clear when the Minister of Agriculture, Water and Forestry requested a Board decision from the Namibian Agronomic Board to delve into its financial reserves to rescue AMTA financially⁴. Despite this, AMTA plans to expand its operations into other sub-sectors beyond agronomy.
120. **The poultry industry specifically is protected under the Infant Industry Protection (IIP) scheme which restricts the imported quantity of poultry meat.** The IIP enables the nurturing and preservation of industrial growth as well as economic growth, while ensuring policy space for existing economic value chains to get off the ground and build the required competitive capacity. Quantitative restrictions are imposed on the imports of poultry meat to meet local demand. Currently, only 600 tonnes of chicken are allowed to be imported per month, while 1900 tonnes are sourced locally. The protective restrictions will be reviewed again in 4 years.
121. **The Namibia Industrial Policy articulates the industrial ambition of Vision 2030, in which Namibia wishes to be an industrialised nation by 2030.** The Growth at Home Strategy has been formulated to guide and ensure the industrial policy objectives are achieved. The three strategic objectives outlined in the strategy are: to support value addition upgrading and diversification for

⁴ Market response from the role-players contacted, 2017.

sustained growth; secure market access at home and abroad; and improve the investment and climate conditions. The policy states that interventions aimed at supporting value addition will promote and provide needs-oriented, comprehensive support to industrial development. It will further upgrade projects which will contribute towards structural transformation of the Namibian economy and enhance domestic value addition. Agro processing as a subsector of manufacturing is targeted by the Growth at Home Strategy to promote the linkages with primary agriculture that facilitates the processing of raw materials and intermediate products from the agricultural sector.

122. **Appropriate water resources management is provided for by the Water Resources Management Act, (WRMA) No. 24 of 2004.** It provides for the implementation of the IWRM plan for Namibia's water resources to be managed, protected, developed, conserved and used in ways which facilitate equitable access to water resources by every citizen, in support of a healthy and productive life. The WRMA further provides for an integrated planning and management of surface and underground water resources, in ways which incorporate the planning process, environmental, economic and social dimensions is needed. In prescribing procedures as to how to develop and adopt efficient water management practices the WRMA highlights efficiency in improved water technology, particularly improvements in irrigation technology (GRN, 2004b).
123. **Also at the core of the water policy reform is the Integrated Water Resources Management (IWRM) Plan.** The IWRM Plan states that due to the dry climate and unpredictable rainfall, water resources challenges in Namibia can only be addressed through a high degree of efficient water resources management. The long term objective of the IWRM Plan for Namibia is to enable the country to achieve a sustainable water resource management regime contributing to social equity, economic efficiency and environmental sustainability in the country (GRN, 2010a).
124. **The National Drought Policy of 1997 attempts to change national thinking about drought.** It aims to distinguish between what is known as normal dry conditions that are to be expected in a country that is characterised by low and erratic rainfall, and extreme drought conditions. The policy proposed that drought assistance should only be provided during a disaster drought – one where drought conditions are so intense and protracted that they cannot be countered by normal risk management practices (GRN 1997a). The policy also emphasizes the need for creating an enabling environment through the decentralization of decision making and the use of civil society institutions. The government's policy is, however, outdated and its reaction to drought is rather reactive than pro-active. Although the government is in the process of reviewing the drought policy, the process is slow and should be accelerated.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

125. **A strong and an efficient agricultural sector would enable the country to feed its growing population, generate employment and foreign exchange, and provide raw materials for industries and a market for industrial products.** In order for the objective of the Harambee Prosperity Plan, improving agricultural output, to be realized, it is vital that agricultural productivity and industrialisation is promoted and achieved. Increases in agricultural production and the rise in the per-capita income of the rural community, together with industrialisation and urbanisation, lead to an increased demand for industrial products. In this way, the agricultural sector helps to promote economic growth by supplying intermediate inputs to the industrial sector.
126. **The agro-processing industry has been identified as a key candidate for creating jobs and spurring growth owing to its strong linkages with primary agriculture.** However, the inability to add processing value and penetrate foreign markets act as constraints to agricultural development. Growth prospects in the agro-processing industry are evident, as seen from its export figures, especially in the meat and fishing industries. Rapid growth in the manufacturing and export services, therefore, can only occur when the agricultural sector's productivity improves significantly.
127. **Agricultural output in Namibia is extremely sensitive to climatic conditions.** Periodic droughts cause considerable stock losses and reduce grain production. Droughts have become common in recent years. Therefore, in order for the sector to develop, the water as well as the energy situation have to be addressed.

6.2 Recommendations

128. The following recommendations are offered in an effort to address the agricultural constraints as highlighted in the paper.

Improving food security in the Country

129. **Focus on key crops to be grown locally:** It is important to note that Namibia as a dry country will not be in a position to produce everything it needs locally. The country will have to focus on certain key crops that have the potential for being grown successfully in the country. A decision will have to be made on what crops show the best potential for local production and effort should be concentrated on such crops. The extent to which local production is pursued and incentivised should be decided upon with due regard to the likelihood of import supply chain

disruptions caused by conflict or adverse climate elsewhere, and to the cost implications for Namibian consumers. These parameters and incentives should not be changed without good reason, given the need for consistent signals to producers, but would have to be revisited on an annual basis.

130. **Promotion of feedlots in the vicinity of green scheme projects will improve sustainable and quality of meat production.** Crop production will help to sustain feedlots where they have been established. Products from the irrigation schemes, especially cereals, could also be used as input for chicken feed. This will enhance efficiency in the coordination between the players along the value chains.
131. **Improve animal health infrastructure in the northern part of the country.** In the current trend of globalisation, animal health measures have increasing importance to facilitate safe international trade of animals and animal products. Therefore, the government should improve animal health infrastructure in the Northern part of the country to unlock the full potential supply of animals and animal products in the area.
132. **Training, people development and government agricultural extension services, geared to improving agriculture and agro-processing should be enhanced.** Incentives for the eradication of intruder bush can at least double pasture capacity, boosting production in the country. Agricultural support should shift from prioritizing food aid to providing poor farmers with access to training, markets and to farm inputs such as fertilizer and improved seed as those strategies are cheaper and allow farmers to grow food to feed themselves, sell the surplus and diversify into high-value crops, livestock and tree products. Linking farmers to local and international markets should be a priority policy initiative.

Promoting Agro-processing at national level

133. **It is important that policies applied at all levels of the food production and processing system are compatible and work towards the achievement of the same goal.** Whether in the form of a tax, subsidy, support or tariff, policy interventions must generate net benefits for society. Although a variety of sound policies and legal frameworks have been introduced to support food and nutrition security and growth of the agriculture, forestry and fisheries sectors, they need to be updated to bring them in line with current development realities. Government's intervention policies within the livestock export sector should cease, to prevent other role-players from benefitting at the expense of the primary producers.

- 134. Facilitating dialogue and collaboration between the public and private sectors:** One of the roles of governments is to create enabling environments for the private sector to optimise its role in rural development. Private investment, through an appropriate regulatory environment should enable competition, facilitate the adoption of new technologies, and ensure sustainable use of resources.
- 135. Promoting Public-Private Partnership (PPP) in Agro-processing and Green scheme Projects:** Government should consider securing more international and domestic resources since public capital is scarce, particularly in times of financial crisis when very low levels of foreign direct investment are expected to enter agricultural infrastructure development. To achieve this, government needs new forms of finance and contracting within the PPP framework to pool funding from private and public actors together and to make use of the replicable structured partnering process.

Water sector management

- 136. Water management principles should be laid down and managed:** 50 percent of water resources should be allocated for food production, while the other 50 percent should be reserved for human, animal and industrialisation use. Furthermore, of the 50 percent of water resources for food production, 25 percent should be allocated for fodder production for feedlots.
- 137. To ensure sustainable water utilization:** Monthly water measurements are needed on all bulk water supply sources (rivers, surface dams and boreholes). Relevant information should be provided to the Department of Water Affairs. All boreholes in the country should be registered. Drilling companies should be registered with the Department of Water Affairs and assist the department through the provision of relevant information on the new boreholes on a monthly basis to the Department of Water Affairs.

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LIST OF REPRESENTATIVES INTERVIEWED

Name	Institution	Position
Christof Brock	Namibia Agronomic Board	Chief Executive Officer
Paul Strydom	Meat Board of Namibia	General Manager
Abraham Nehemia	Department of Water and Forestry	Deputy Permanent Secretary
Anna Kankondi	Namibia Dairies	Manager: Procurement
Gunther Ling	Namibia Dairies	Managing Director
Maria Namukwambi	Meat Board of Namibia	Chief: Information Systems (Statistics)
Desmond J Cloete	Meat Board of Namibia	Chief Marketing Officer
Alisa Jakobs	Agricultural Bank of Namibia	Manager: Research and Product Development

AGRICULTURAL TRANSFORMATION IN NAMIBIA: CHALLENGES, OPPORTUNITIES AND POLICY PRIORITIES

*By Adeleke O. Salami, Wondemu A. Kifle, Martha Phiri, Amandine Nakumuryango,
Mark Eghan, Adams Adama and Kebba Jammeh¹*

1. INTRODUCTION

138. **In almost all developed countries, industrial growth was prompted by agricultural growth.** It is in the light of this that most developing countries now see agricultural transformation as a sine qua non for growth and industrialization. Namibia, an upper-middle-income country, should reinvigorate its drive toward agricultural transformation and industrialization. Despite its importance, the agricultural sector's performance in Namibia remains unsatisfactory, and this has significantly undermined the ability of the country to improve farm incomes, reduce poverty and inequality, and attain national food security. The country's agricultural sector comprises two distinct subsectors, the commercial and subsistence subsectors. However, low performance of the sector in general has exacerbated the poor performance of the subsistence subsector. This subsector directly supports 90 percent of the nation's farming population, occupies 48 percent of the total agricultural land, and accounts for close to 10 percent of the agricultural GDP.
139. **In contrast, the commercial subsector supports only 10 percent of the population, while holding about 44 percent of the total land and contributing 90 percent of the agriculture sector GDP.** The relatively high total factor productivity of the commercial subsector suggests that a large share of the future increase in total factor productivity of the agriculture sector in Namibia should come from the subsistence subsector. Such significant intersectoral and intrasectoral variations in total factor productivity also suggest that the Namibian economy needs structural transformation. While some structural transformation has taken place and poverty has significantly declined, the majority of Namibians are still employed in low-paying jobs, predominantly in primary agriculture. Furthermore, the unemployment rate (at 28.1 percent) and income inequality (Gini coefficient of 0.572) remain high (Phiri, 2017).
140. **To harness the agricultural potentials that promote value-adding economic activities and create quality jobs, while reducing poverty and inequality, Namibia needs to accelerate implementation of its structural**

⁵ African Development Bank, Avenue Joseph Anoma, 01 BP 1387, Abidjan 01, Cote d'Ivoire; email: a.salami@afdb.org. The views and interpretations in this paper are those of the authors and do not necessarily represent the views of the African Development Bank, the Board of Governors, the Board of Directors or the Governments they represent.

reform program, as articulated in the Harambee Prosperity Plan and the National Development Plan, in line with the aspirations of its Vision 2030.

Transformation of the agricultural sector in Namibia, therefore, must focus on accelerating the transformation of the subsistence subsector. In order to achieve this objective through evidence-based interventions, there is the need for understanding the factors that have locked the subsector in a low-level equilibrium, identifying the entry points and the appropriate policy and institutional reforms needed to address the binding constraints and to unlock the growth potential of the sector. Suboptimal performance, scale, and allocative inefficiencies of the subsistence subsector are evidenced by a significant yield gap. Also, lack of significant productivity change over time means that the sector is devoid of significant technical changes. Transforming the sector is expected to focus on supporting the farmers in their operations to close the yield gap, improve their economic efficiency (operating at the most optimum point of the production frontier), and scale up technological changes (a shift in the production frontier).

141. **This paper, therefore, looks at how Namibia can successfully transform its agricultural sector and what roles the African Development Bank (AfDB) can play in facilitating this transformation.** The paper is structured as follows. Section 2 sets the stage by outlining the conceptual and theoretical frameworks that link agricultural productivity and structural transformation. Following that, the status, challenges, and opportunities of food and agriculture development in Namibia will be discussed. Section 4 discusses the roles of technology, innovation, and access to finance in agricultural productivity by drawing from regional and international experiences. Section 5 reviews the AfDB's support to the agriculture sector in Namibia, focusing on the current projects and the future. Section 6 identifies the policy priorities for enhancing agricultural transformation in Namibia. The final section summarizes and draws some conclusions.

2. AGRICULTURAL TRANSFORMATION: THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. Overview of the Stages of Agricultural Transformation

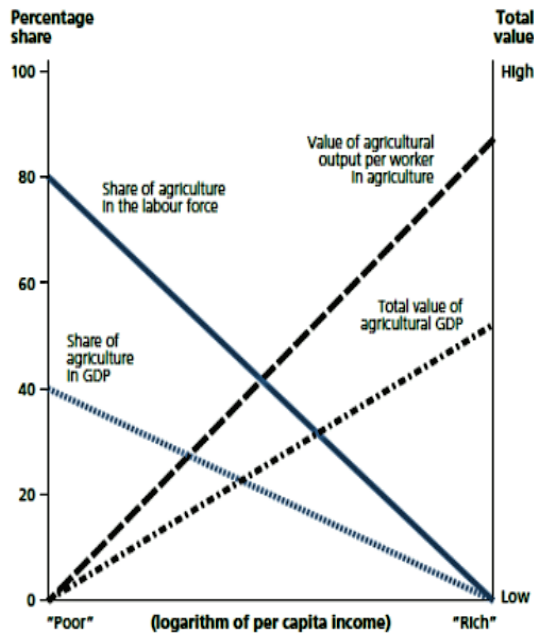
142. **Early literature on economic development provides two different views of the role of agriculture in structural transformation.** The first is that of Lewis and Rosenstein-Rodan (1943) and Rostov (1960). These scholars argued that subsistence agriculture is a default employment source and represents a pool of reserve labor. It follows that the challenge for development is to expand job opportunities into the emerging industry sector. On the other hand, the alternative view that emerged from the literature was supported by Schultz (1953) and advocated that many poor countries are in a situation that he called

“high food drain”, in which they have a very low level of income. It follows that these countries must produce a large amount of their own food, since imports are prohibitively costly and they have few resources to exchange for food (Schultz 1953).

143. **The latter view led to a large development literature, holding that agricultural surplus is a necessary condition for a country to trigger its development process.** This framework is well known by many scholars and various development stakeholders. How to make this happen without major difficulties and at a relatively acceptable rate, however, is another story. The current high rural–urban migration that stimulates agricultural labor outflow, especially in Africa, should not be seen as part of the process, given that most of the migrants do not find regular employment in the main cities. Indeed, for the structural transformation to occur, it is necessary that people leaving agriculture find jobs in the non-agricultural sector. Learning from what is taking place elsewhere, thus, is important for Namibia.
144. **Agricultural transformation can be understood as the process by which individual farms shift from highly diversified, subsistence-oriented production toward more specialized production, oriented toward the market or other systems of exchange, such as long-term contracts (Jayne et al. 2002).** For structuralist economists, such a transformation can arise from a sustainable sectoral shift that emanates from agriculture to other sectors. Agricultural transformation in most areas of the world has generally been an important component of broader economic transformation processes, according to Jayne and Ameyaw (2016).
145. **Agricultural transformation evolves through four principal processes (Timmer 1988), as depicted by Figures 1 and 2.** During the phase of the transformation process, as the agricultural sector is transformed, agricultural productivity per worker increases, with the increase in productivity leading to surplus of agricultural labor. During the second phase of the transformation process, the share of agriculture in employment decreases, and workers migrate to other sectors, such as industrial and service sectors (Kuznets 1957; McCullough 2017). Agriculture’s share of GDP declines steadily along this process, accompanied by income growth, urbanization, and poverty reduction. It can be easily understood why a close relationship prevails between agricultural transformation and economic and social development. Indeed, increased per capita income, coupled with Engel’s Law⁶, means that spending on non-food at the country level increases more rapidly than spending on food, which in turn leads to the shift of the economy away from agriculture, as indicated by a decline in the share of agriculture in GDP.

⁶ *Engel’s Law is an economic theory introduced in 1857 by Ernst Engel, a German statistician, stating that the percentage of income allocated for food purchases decreases as income rises.*

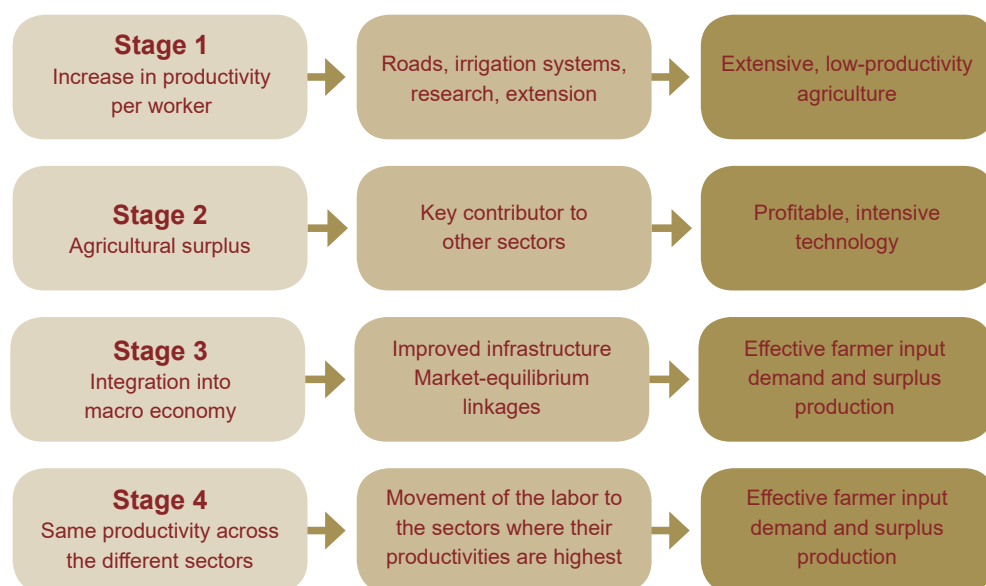
Figure 1. Stylized trends in agricultural output per agricultural worker, and agriculture as a share of the labor force and GDP during the course of the structural transformation.



Source: Adapted from Timmer (2014)

146. **The third phase of the transformation process involves the integration of the agricultural sector into the macro economy, through efficient market systems and improved infrastructure (Timmer 1988).** The final stage of agricultural transformation is a situation in which production factors have the same level of productivity across the different sectors (Barrett et al. 2017). The phenomenon is a dynamic one, powered by the productivity level within sectors, productivity differences across sectors, and movement of labor to the sectors where their productivities are the highest.
147. **African countries are in the early stages of agricultural transformation stages, as seen from the characteristics of the agricultural sectors.** Looking at the characteristics of agricultural sectors across the world reveals that African countries are mostly in the early stages of agricultural transformation process, with the largest cross-sector productivity gaps, largest labor shares in agriculture, highest values of the labor force employed in agriculture, and largest value added captured by agriculture (Gollin et al. 2014 a; 2014 b; McCullough, 2017). The low productivity of agriculture in Namibia in the context of agricultural transformation is not different from that of the rest of Africa.

Figure 2. Stages of agricultural transformation



Source: Adapted from Timmer (1988) and FAO (2015)

- 148. On the one hand, there are important implications for income levels and growth rates from the productivity differences across sectors, and there exist large differences in labor productivity between agriculture and non-agricultural sectors in African countries.** On the other hand, because of these differences, workers migrate out of agriculture to other sectors, which is a crucial way of fueling the overall economic growth (Gollin 2010). However, the conversion of this potential into a real, observable transformation is not automatic, as witnessed in many countries such as China, Egypt, Turkey, Brazil, Mexico, and Kenya between 1960 and 2000 (Gollin 2010).
- 149. Thus, isolating the factors with the potential to drive transformation of the agricultural sector is of crucial interest for economic development of the continent.** African governments have recognized the urgency of transforming its agriculture, and thus the Comprehensive Africa Agricultural Development Programme (CAADP) was established by the African Union assembly in Maputo in 2003 and renewed by the Malabo Declaration in 2014.
- 150. The Programme is supported by many development partners, such as the World Bank Group and AfDB.** Each of the member states in the Programme commits to ensure public investment in agriculture reaches a minimum level of 10 percent of their budget. However, the Programme does not specify the specific agricultural domain(s) in which the investment should be made. As

a result, 14 years after Maputo, the expected levels of change in agriculture have not occurred, and some countries are experiencing economic decline. Accordingly, many African governments, including the Government of Namibia (GRN), are yet to meet this target.

151. **Thus, revisiting the experiences of successful countries to inform ongoing agricultural transformation policies is an obvious task in order to enhance Africa's move toward closing the yield gap.** Drawing from classical structural transformation models, research on agricultural transformation shows how productivity growth in agriculture is crucial for any agricultural value chain transformation. Hence, not only understanding theories, but also learning how some countries have managed to transform their agriculture is of paramount importance in fueling Africa's economic development.
152. **The review of the existing theoretical works may provide some clues to explain the causes for poor growth performance, as well as the potential sources of growth that can be stimulated.⁷** Drawing on the classical economic perspective, relatively poor natural resource endowments, such as land, climate, and soil, could be key contributors to the observed low level of agricultural transformation of the subsistence subsector (Shifiona et al. 2016). However, although the level of natural resource endowments matters, both in the short and long term, it is the productivity of such resources that matters more. According to the neoclassical view, the level of human capital, technology, and investment, among others, are the most critical determinants of the productivity of natural capital, as well as its long-term sustainability (Auty 2007; Rasul and Sharma 2014). Therefore, according to this perspective, low and differential endowments of human and manmade capital could be the prime causes, and improving access to such resources might then address the constraints and enhance the transformation of the subsistence subsector. For instance, in 2016, Namibia's human capital potential (measured in terms of human capital index) ranked 103rd out of 130 countries (WEF 2016). Similarly, in the same year, Namibia's ranking on innovation, which is now widely recognized as a central driver of economic growth and development, was 97th out of 127 countries (Dutta et al. 2017).

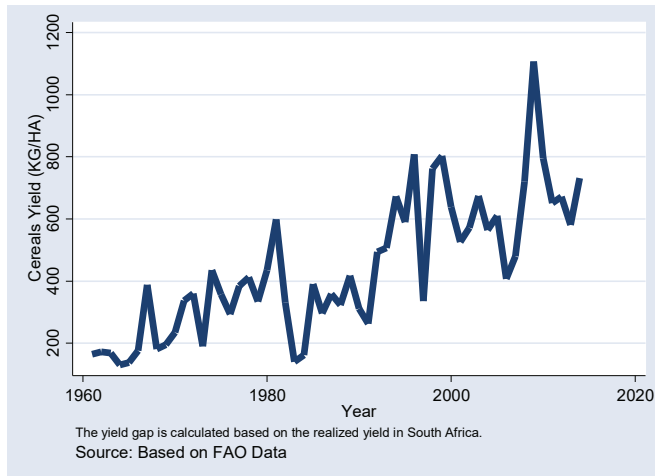
⁷ *Potential sources of growth include additional supply of labor, natural resources, capital, and increases in scale or specialization, improved efficiency, human capital, and technological progress. Changes in these variables will have significant impacts on growth. However, institutional arrangements, such as marketing systems, price and credit policies, a well-functioning legal system, and property rights, also matters and have important roles in stimulating or hindering development.*

2.2. Sources of Growth

2.2.1 Closing the productivity gap

153. **In the face of growing demand for food, but limited possibility for extensive cultivation, a significant increase in food production should come from growth in productivity.** One potential source of such growth could be to close the existing yield gaps of crop and livestock production. As can clearly be seen from Figure 3, there is very high and increasing yield gap of cereals produced in subsistence farming. While the average gap is close to 450 kg/ha, it has been showing an increasing trend at a rate of 2.7 percent per annum. Although it was showing improvement in recent years (reduction in gap), the improvement did not last long.

Figure 3. Cereals yield gap in Namibia: Yield gap to realized yield

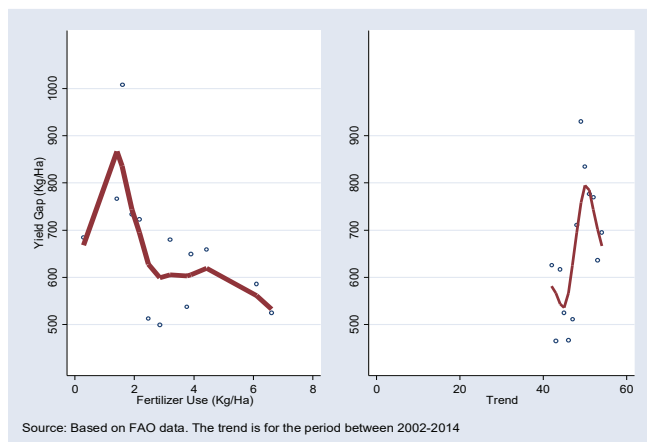


Source: Based on FAO data

154. **Farmers operate inside their production frontier because of lack of capital resources, limited knowledge of improved husbandry practices, limited availability and financial capacity to adopt improved technologies, or because such technologies are not profitable.** Unfavorable geographical factors are also significant contributors. For instance, in Namibia, 97 percent of the country's soils have clay content of less than 5 percent, and thus have low capacity to hold water and are deficient in the major nutrients (NDTF 1997). High transaction costs, market risk, limited access to market, and off-farm employment opportunities could also be contributing factors to the productivity gap. Market failures and inadequate provisions of critical public goods and services are also significant contributors.

155. **Given the high labor-to-land ratio of subsistence farmers, intensive application of improved seeds, fertilizers, and pesticides will reduce the existing yield gap in the short term.** Nevertheless, subsistence farmers in Namibia hardly apply such inputs. According to data of the Food and Agriculture Organization of the United Nations (FAO), the average fertilizer use in Namibia between 2002 and 2014 was 3.21 kg/ha, which ranges from 0.3kg/ha to 6.61kg/ha (our calculation based on FAO data).⁸ This rate of use is very low when compared with the global average, as well as with the neighboring countries.⁹ The application rate is also very low, compared with the average fertilizer use of 42.1 kg/ha in Zambia, 83 kg/ha in Botswana, 36.1 kg/ha in Zimbabwe, and 8.84 kg/hectare in Angola.
156. **As can clearly be seen from Figure 4, there is an inverse relationship between the level of fertilizer use and yield gap.** Such a trend was also obtained by controlling for other factors, which are captured by the trend term, further suggesting that increasing fertilizer application will have a significant contribution toward reducing the existing yield gap. However, as can be observed from Figure 5, the relation between the two is not linear. Although an increase in fertilizer application increases yield, increased application above a certain quantity will not necessarily lead to a substantial increase in yield. Given that the average fertilizer use in Namibia is well below the optimal or recommended level, it suggests that there are other intervening factors that may influence the productivity of fertilizer, such as improved seeds and adequacy and distribution of rainfall.

Figure 4. Fertilizer use and cereal yield gap in Namibia



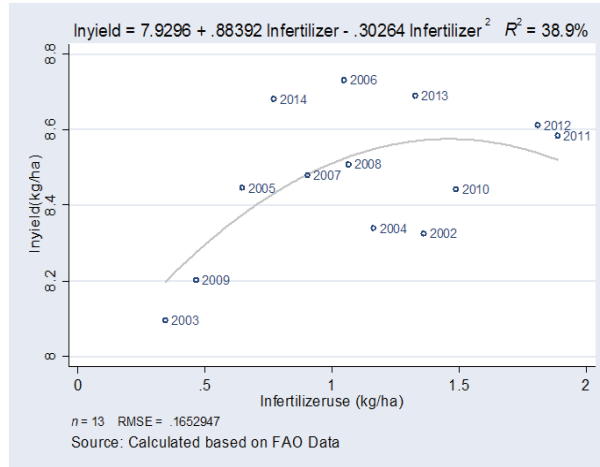
Source: Based on FAO data

⁸ The level of use also showed significant variation, with a standard deviation of 1.81 kg/ha.

⁹ In 2013, the average fertilizer application for Namibia was 3.77 kg/ha, which puts Namibia's rank of fertilizer use at 150th out of 159 countries.

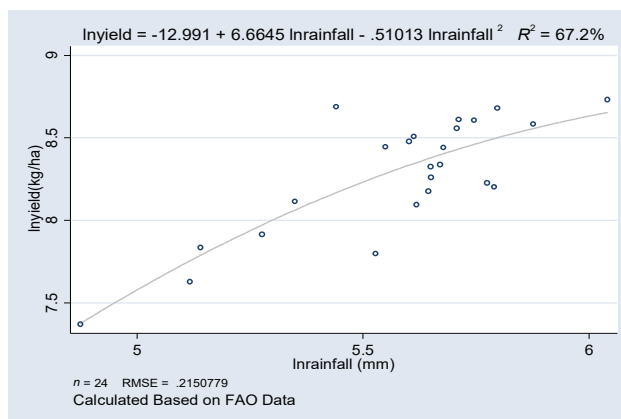
157. **Inadequate and irregular availability of rainfall is a prime factor that determines the productivity of fertilizer, as well as productivity of other inputs.** Only a small part of Namibia receives sufficient and consistent rainfall required for feasible crop production.¹⁰ In addition, in locations where there is a moderate rainfall level, low moisture-retention capacity of the predominantly sandy soils makes production risky, and often unproductive, and this may also undermine the productivity of fertilizer (CIMMYT 1999).

Figure 5. Quadratic plot of fertilizer use and cereals yield in Namibia



Source: Based on FAO data

Figure 6. Rainfall level and yield



Source: Based on FAO data

¹⁰ Some claim that, in the driest areas, nearly no farmers use fertilizer, even though it has been distributed free of charge (CIMMYT 1999). Therefore, although there is huge potential to increase productivity through the application of modern inputs, farmers refrain from applying fertilizer and other improved commercial inputs.

158. **As Figure 6 shows, there is a significant association between rainfall level and yield.** Yield level is more elastic to rainfall and the relationship between the two is also stronger compared to fertilizer. This obviously suggests that rainfall is a binding constraint and affects yield directly, as well as indirectly through its effect on factor productivity, including fertilizer. However, as the graph suggests, periods of high rainfall are not necessarily associated with higher crop yield. There were periods when the level of rainfall was similar, but the yield level was different. This may be because of unavailability of other complementary inputs, such as drought-resistant and short-cycle, high-yield varieties of crops grown. In addition, despite better rainfall, the level of economic incentive was not sufficient to use fertilizer and, hence, achieve higher return. Farmers are willing to use fertilizer only when the marginal value of fertilizer is greater than its marginal cost. Thus, they demand fertilizer only if they have the assurance that they are getting better prices for their outputs and that the increased outputs can be easily sold. Liquidity constraint to buy fertilizer could also be the other reason for low fertilizer use. Therefore, identifying and implementing appropriate measures that address the binding constraints that led to the existing yield gap will have important impact on the process of agricultural transformation in Namibia.

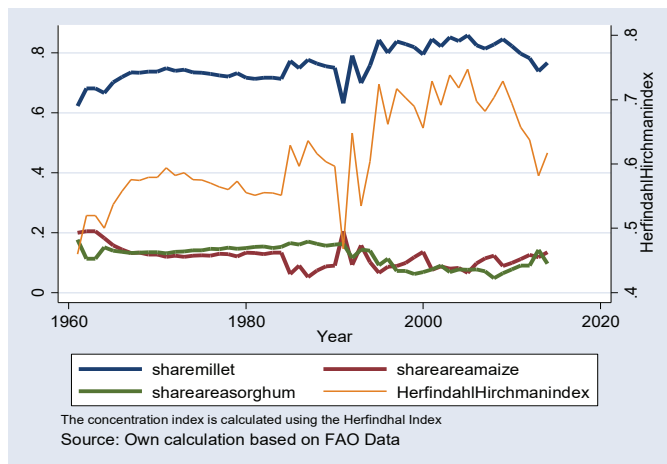
2.2.2 Specialization, diversification, and scale efficiency

159. **Even if farmers are operating on their production frontier (no yield gap), an increase in productivity can still be realized through the efficient use of existing technology and resources.** As subsistence farming is mostly producing for household consumption, the comparative advantage and, thus, market prices have little influence on resource allocation decisions. For instance, subsistence farmers in Namibia typically produce millet, maize, and sorghum. For rational reasons, such as risk consideration, high transaction costs and an imperfect or missing labor market, they may choose a cropping pattern or resource allocation pattern that is inconsistent with profit/revenue maximization. As a result, they mostly exhibit significant levels of economic inefficiency. This means, that by addressing market and policy failures and the institutional weaknesses that justified such inefficient resource allocation pattern, it is possible to increase efficiency and productivity.

160. **The sources for improving efficiency also could come from operating at the most efficient scale (scale efficiency), as well as either from specialization or diversification (economies of scope).** Farmers in communal farming typically practice integrated crop–livestock farming. Thus, by producing the most optimum crop–livestock mix, which is consistent with the market price ratios (tangency condition), there will be a potential efficiency improvement that comes from scope economies (Kurosaki 2003). Similarly, as can be seen from Figure 7, subsistence farmers allocate their limited land area among pearl millet,

maize, and sorghum. As the Figure shows, farmers seem to be concentrating more on millet production. Unless these crops are not competing for land, efficiency gain could be achieved by specializing with the crop for which they have comparative advantage. However, the degree of concentration has shown significant variations over time, possibly in response to market and weather conditions. Even if these crops have cost complementarities, efficiency gain still could be achieved through adopting a more optimal crop mix. Therefore, determining whether crop level specialization or diversification is the most optimal cropping strategy is necessary. In addition, identifying the necessary conditions that must prevail to make the most optimal strategy attractive to the farmers is also essential.

Figure 7. Degree of crop concentration



Source: Author calculation based on FAO data

161. **Alternatively, if there are significant regional differences in relative factor endowments, transport costs, and natural resource endowment, including climatic conditions, efficiency gain could be achieved by specializing in activities for which each location has comparative advantage(s) (Huffman and Evenson 2001; Kurosaki 2003).** Also, since labor-to-land ratio is very high, efficiency gain could be further realized by inducing farmers to operate at the most efficient scale level (de Roesta et al. 2017).
162. **For all these potential efficiency gains present in the mixed farming context, their significance, and economic viability depend on technology, farm size, transaction costs, the effectiveness of the regulatory framework, and environmental factors (Rota and Sperandini 2010).** Although specialization allows farmers to achieve higher productivity by improving the technical

efficiency of the farmers and realizing scale economies,¹¹ it makes them highly dependent on the commodity markets, thereby increasing their vulnerability to market risk. The benefits of the specialization strategy, therefore, will be compromised and, thus, will be viable only if markets are stable and there is effective market regulation (de Roesta et al. 2017). On the other hand, due to cost complementarities in crop–livestock integrated farming, farmers could achieve efficiency gain from economies of scope, namely by producing an optimum mix of farm products. Moreover, they are less susceptible to market risks, and, by producing for the niche markets, they could also capture higher added value—thus becoming more efficient than with specialization (de Roesta et al. 2017).

- 163. As a result, whether specialization or diversification is the most optimal strategy would be strongly context-dependent.**¹² Thus, for the Namibian context, it is necessary to establish whether diversification or specialization (both at the farm level and in each agro-ecological zone) is a more desirable strategy. Similarly, determining the most efficient farm size is also vital in designing land reform programs. The ensuing evidence-based policy and institutional measures will allow the farm sector to achieve efficiency gains by producing at the most optimal point of its production possibility frontier.

2.2.3 Promoting technical change

- 164. In the last five decades, the rate of increase in cereal production in Namibia was slightly less than the annual growth rate of population.** Moreover, almost all of the production increase was also from area expansion, and the average yield growth was nil, only 0.4 percent per annum (based on FAO data). The declining trend in soil quality and climate-change-induced rainfall variability as well as the increasing frequency of disease and pest incidence are making meeting the growing demand for food more challenging. Unfortunately, subsistence farming in Namibia has been devoid of significant technical changes. In order to see the significance of the technical change in the cereal production in Namibia, we postulated a simple production function.¹³

¹¹ Such as by helping farmers to acquire high production skills, apply latest production techniques, and realizing economies of scale.

¹² For instance, specialization can be more beneficial often beyond some minimal scale of operation. As farm size increases, the benefits of specialization and the associated productivity improvement may outweigh the productivity gain that could come through diversification. Similarly, although specialization could still arise in small-scale peasant farming, its feasibility and profitability, is influenced by the degree of market integration, transaction costs, and the extent to which factor and product markets are well functioning (Omamo 1998). On the other hand, as market conditions change and technical changes increase, integrated crop–livestock farming may be less profitable, especially if the input use of the crop production changes, and when cultivated forages and diet supplements are used, instead of crop residues. In that case, specialization becomes more profitable.

¹³ Since the data is for 12 years, the result must be taken with caution. However, when the fertilizer input is removed, for which we have only 12 years, the coefficient estimates and significance for all the other variables remain the same.

Following the literature, we introduced the trend variable to measure the technological change (Kumar et al. 2011). We postulated a production frontier as a function of average fertilizer use, size of land cultivated, average rainfall, and trend variables. The test, however, showed that ordinary least squares (OLS) analysis is sufficient. We also tested for autocorrelation, and the Durbin–Watson statistic showed that there is significant autocorrelation (1.21). The mean variance inflation factor (VIF) estimate of 1.6, however, showed that there is no serious multicollinearity. Therefore, we estimated the model using the Prais–Winsten estimation method, correcting for autocorrelation, and the result, reported below, showed that the trend term is highly insignificant, and the magnitude of the coefficient is also almost close to zero, suggesting that there was no significant technical change.

165. **In addition to closing the yield gap and endeavoring to achieve all potential efficiency improvements, developing new technologies will be critical to fend off the eventual diminishing returns, respond to the challenges of climate change, and meet the growing demand for food.** Therefore, a continuous effort to generate and disseminate improved technologies must be made to bring an outward shift of the production frontier. Such measures will not only trigger, but also sustain the process of agricultural transformation.

3. NAMIBIA'S AGRICULTURAL TRANSFORMATION: CHALLENGES, AND OPPORTUNITIES

166. **Despite the fact that Namibia's agricultural sector¹⁴ supports nearly 70 percent of the population and accounts for about 20.1 percent of the labor force, the country has not been able to utilize the opportunities that exist within the sector.** The agricultural sector in Namibia still faces a number of challenges that hinder its development. The low agricultural value addition and low wages undermine the quality of employment and the development of the sector. The agriculture value added, at 6.7 percent of GDP in 2015, was the lowest since 1980, having remained in single digits for most of the period (Figure 8). With a median wage of N\$1,200 (US\$90) per month, agricultural workers are the lowest paid (except for those employed by private households) and earn below the national median wage of N\$2,200 (US\$165) per month. This section briefly discusses the challenges and opportunities within the Namibian agricultural sector.

¹⁴ Including fisheries and forestry.

3.1. Challenges

3.1.1 Aridity and vulnerability to climate change

167. **Namibia is inherently a water-scarce country, with rainfall ranging from about 600 mm in the extreme northeast to less than 50 mm in the extreme south and along the coast.** About 22 percent of its total land area of about 825,615 sq. km is desert, 70 percent is arid to semi-arid, and the remaining 8 percent is dry sub-humid. Perennial rivers occur only on the country's borders, with floodplain wetlands concentrated in the northeast. Annual average rainfall in Namibia is much lower than that of the Southern Africa region as a whole. About 1 percent of rainfall replenishes the groundwater aquifers, and 2 percent constitutes run-off surface water resources, which suffer high rates of evaporation. Annual gross evaporation ranges from 2,600 mm in the northeast to 3,700 mm in the central southern area. Dams can lose between 20 and 65 percent of their water through evaporation within one season. Reflecting immense vulnerability to climate change, the country suffered seven major floods and eight droughts between 1999 and 2016, which reduced economic activities in the agriculture and industrial sectors. As a result of the protracted drought in 2015, the agricultural sector growth contracted by 14 percent, and local electricity generation at Ruacana Hydro Power Station fell by 18.8 percent, leading to a 7 percent increase in electricity imports.

3.1.2 Low access to agricultural land

168. **Agricultural land is a constraint.** Compared to South Africa with a nearly 80 percent share, agricultural land in Namibia accounts for about 47.1 percent of the total land area, of which only 34 percent supports economic crop and livestock production. However, due to poor soil conditions, only 1 percent of the total land area is regarded as good for rain-fed or irrigated, arable farming. Moreover, land distribution is highly skewed in favor of commercial farmers. Fifty-two percent of agricultural land largely under commercial production is owned by 30 percent of predominantly white farming households, with the remaining 48 percent largely communal land, supporting the remainder 70 percent of the households. Legislative efforts to address inequitable land distribution through the Land Reform Act of 1995 and the New Equitable Economic Empowerment Framework (NEEEF) adopted in 2011 have had limited impact.

169. **Under NEEEF, the government sought to improve land distribution through the following mechanisms:** (i) the government would buy agricultural land from commercial farmers on the “willing buyer, willing seller” principle and allocate to previously disadvantaged people; (ii) AgriBank, a state-owned bank, grants agricultural loans at below market interest rates to previously disadvantaged farmers; and (iii) communal land, all of which belongs to the

state, is parceled into small units and distributed by traditional leaders. A new legislation to enhance the implementation of the NEEEF is currently under consultation.

3.1.3 Low technology uptake and utilization

170. Agriculture in Namibia, particularly among small-scale producers, is characterized by low utilization of improved technologies, and low levels of inputs and productivity. Irrigation farming among small-scale producers, for example, has remained limited in spite of water scarcity. Over the period 1990 to 2004, total area under irrigation grew only by 72 percent to reach 8,600 ha in 2004, driven mostly by the commercial sector or state/parastatal farms. In 2004, irrigated land under small-scale producers, who make up 95 percent of the total farming, represented only 8 percent share of the total irrigation, up from about 7 percent in 1990. Furthermore, fertilizer utilization at 2.16 kg/ha of arable land (Figure 9) is significantly lower than South Africa (60.6 kg/ha) and the middle-income country (MIC) average of 178 kg/ha. While fertilizer usage in MIC has been increasing since 2002 in Namibia, it has remained low, averaging below 5 kg/ha. The use of mechanized machinery and services is very low in the agricultural sector of Namibia. Mechanization is required for land preparation to reduce labor requirements for plowing.

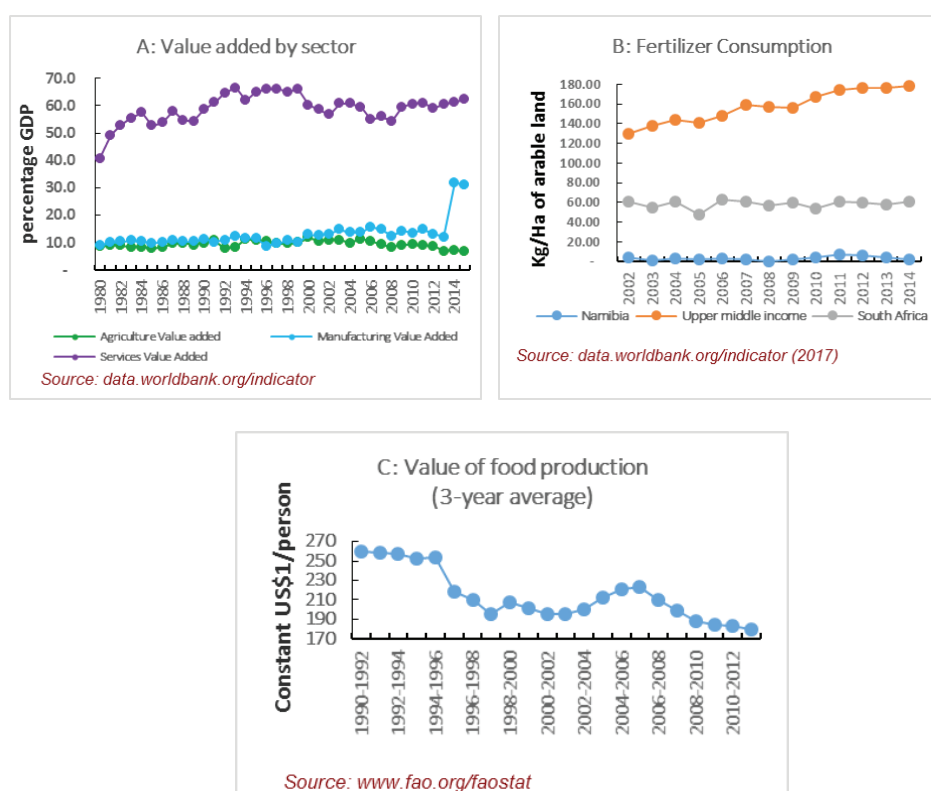
3.1.4 Low access to financing for agriculture

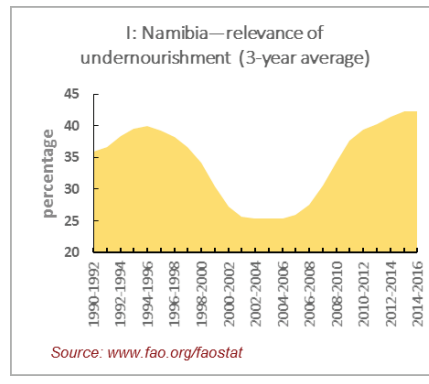
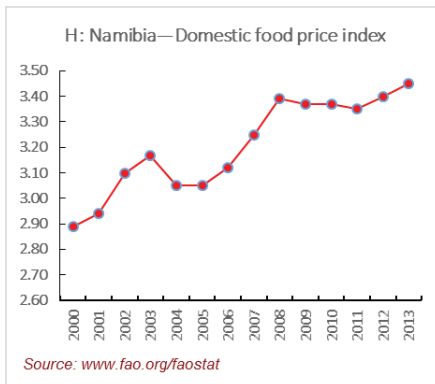
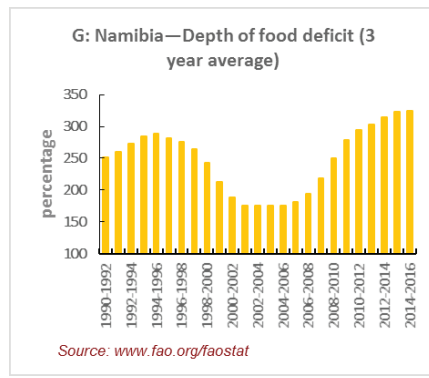
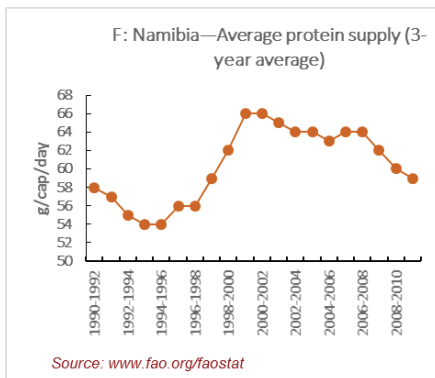
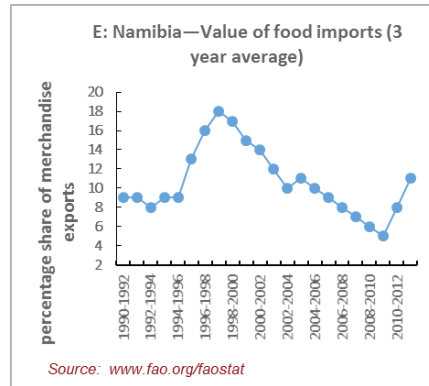
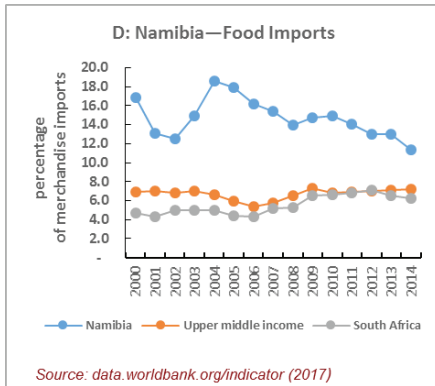
171. Access to finance continues to be a problem in Namibia due to possible information asymmetry that has resulted in few applications for credit assistance from banks. Less than 1 percent share of the total farming households in the sector (1,494) were households that applied for credit. These numbers show that access to lending for agriculture for small-scale farmers is almost negligible. There is, therefore, the need to investigate why farmers are not demanding credit from banks, even though the application success rate is high. At the macro level, public finance for agriculture is also very low. For instance, in 2014, government spending on agriculture was estimated at 5 percent of total government spending; this is less than the CAADP public funding threshold. Again, in 2014, from the official development assistance (ODA) that was available to Namibia, only 9 percent was agricultural ODA. According to the Namibia census of agriculture report of 2015, which focused on the communal sector, nearly 72 percent of farming households (1,074) that applied for borrowing over a five-year period up to the 2013–14 season received loans.

3.1.5 Low productivity and steady fall in value of food production

172. Reflecting the low utilization of agricultural technology, including fertilizers and other inherent factors, Namibia's average cereal yield per ha, at 588 kg (Figure 5), is very low compared to South Africa (4,893.5 kg/ha) and the MIC average (4,135 kg/ha). While usage in South Africa and MICs over the period between 1961 and 2014 has more than tripled and doubled, respectively, this figure grew by less than half in Namibia. This partly explains the steady fall in value of domestic food production. FAO estimates that the average value of food production (three-year average) estimated in constant US\$/person in Namibia has fallen from 260 in 1990–92 to 180 in 2011–14.

Figure 8. Selected agriculture and food security indicators





Source: FAOSTAT

3.1.6 Import dependency and rising food insecurity

173. Namibia is a net food importer (particularly for cereals). While it is broadly self-sufficient in meat supply, 60 percent of cereal needs are imported each year. In 2015, the country imported about 76 percent, 98 percent, and 91 percent of

its demand for maize, millet, and wheat, respectively (GRN 2017). Compared to South Africa (6.3 percent), the food imports share (11.4 percent) of total imports in Namibia remains high; it has, however, gradually reduced from 16.8 percent in 2000. Nonetheless, the value of food imports, as a share of total merchandise exports, having reduced over the period 1998 to 2010, has started increasing again (Figure 8), reflecting both gradual growth in food imports due to drought-induced scarcity, and weak commodity prices for Namibia's exports. This has negative implications for the current account balance and foreign reserves.

174. **Furthermore, rising food imports, combined with declining domestic production, are impacting on supply and availability, exposing households to food price fluctuations.** As a result, the domestic food price index has steadily increased, reaching 3.45 in 2013, from 3.37 in 2010 (Figure 8). The depth of the food deficit, measured in kcal/capita/day (three-year average) increased from 175 in 2002–04, the lowest since independence, to 325 in 2014–16, the highest since independence. Rising food prices and food scarcity is impacting the population's health. Prevalence of undernourishment (three-year average) in Namibia reached 42.3 percent in 2014–16, the highest level since independence.

3.2. Opportunities

3.2.1 Prioritizing agriculture in the National Development Plans

175. **Building on the gains made in the implementation of the fourth National Development Plan (NDP4), the government continues to focus on agricultural development as one of its key priority focus areas.** This has been articulated in the fifth National Development Plan (NDP5) 2017/18–2021/22 and the Harambee Prosperity Plan (HPP) 2016/17–2020/21. The HPP and NDP5 have identified SME¹⁵-based manufacturing (industrialization) as one of the key priorities on which to focus reforms and resources, in order to drive economic diversification and long-term, job-creating growth.
176. **The Growth at Home Strategy of 2015 provides a roadmap for export-oriented industrialization in line with the Industrial Policy of 2012.** It provides for promotion-quality jobs through SME value-added, market-oriented activities in agriculture, including cereals, horticultural crops, and livestock, as well as in the country's vast mineral resource sector, including diamonds, gold, and copper. These clearly spelled-out strategies and policy documents present a strong commitment from the government toward agricultural development in Namibia. Specifically, Namibia's 2017 ongoing programs and projects to enhance agricultural transformation include the Green Scheme; the Dry-land

¹⁵ *Small and medium-sized enterprises.*

Support Program; the Comprehensive Conservation Agriculture Programme (CCAP); and the new Harambee Comprehensive, Coordinated and Integrated Agriculture Development Programme.

3.2.2 Agribank and financing for agriculture

177. **Namibia has a dedicated financial institution to support the agricultural sector.** Agribank is a state-owned enterprise with the mandate to promote the growth and development of agriculture in Namibia through affordable and innovative financing. Out of the 72 percent of households that received credit services, Agribank provided credit support to almost 25 percent of these households. Given the fact that the success rate for credit applications from farmers is high, it is an opportunity for farmers to access finance for agricultural investments.

3.2.3 Cooperation with riparian states

178. **Namibia is highly dependent on its neighboring countries for a secure water supply.** To ensure good cooperation with its neighbors, Namibia has developed a regulatory framework, facilitates the establishment of Basin Management Committees, and is implementing related agreements while reviewing others. It has agreements with Angola (Kunene and Okavango Rivers), Botswana (Kwando–Linyanti–Chobe System in the Zambezi River Basin and Okavango River), and South Africa (Orange River). The Treaty of the Vioolsdrift and Noordoewer Joint Irrigation Scheme between Namibia and South Africa was also signed in 1992, establishing a parastatal authority to operate the irrigation project located on both sides of the Orange River at Vioolsdrift and Noordoewer. This presents an opportunity for Namibia to fully exploit the irrigation potential of the country to transform its agriculture. Memberships of the South African Customs Union (SACU) and the Southern African Development Community (SADC) also present an enormous export market for the agricultural produce from Namibia to regional member countries (RMCs).

3.2.4 Population growth, urbanization, and increasing domestic demand

179. **With Namibia's population expected to increase by almost half to 3.44 million by 2041, significant advances in agricultural production and productivity will be required to enable the country to feed itself.** Moreover, Namibia is also urbanizing rapidly. By 2016, 48 percent of Namibians were living in cities, up from 18 percent within five decades. The potential of agriculture can also be viewed from the available water and land resources. Furthermore, export of primary agricultural production is still very high in Africa compared to other regions of the world. The combination of urbanization, strong and evolving

domestic demand for food, strong international demand (and high prices) and potential for value addition to agricultural produce create unprecedented opportunities for investment and expansion of agriculture within the continent.

180. **Moreover, large investment opportunities still exist for expanding infrastructure (e.g. water, irrigation, rural roads, storage facilities, and sea ports) across the agricultural value chain in order to ease the movement of agricultural products from farmers to markets, both locally and regionally.** Furthermore, untapped value addition in agriculture, improvements in the business regulatory environment, the expansion of supermarket groups across Africa, such as Pick n Pay and Shoprite, all provide unique investment opportunities that bode well for agricultural transformation.

4. ROLES OF TECHNOLOGY, INNOVATION, AND ACCESS TO FINANCE IN AGRICULTURAL PRODUCTIVITY: REGIONAL AND INTERNATIONAL EXPERIENCES

181. **Over the past years, scientific and technological advancements have led to profound achievements in the industrialized world by enhancing agricultural production, which plays a crucial role in overcoming severe food insecurity.** For instance, huge public investments in scientific agricultural research during the Green Revolution contributed immensely to historical growths in food production in a time of widespread hunger and malnutrition, saving over a billion people from starvation. However, in developing countries where agricultural production is dominated by smallholder farmers who produce 80 percent of the food, these farmers are yet to experience similar gains, because they—the majority of whom are women—have inadequate access to improved seeds, fertilizers, modern irrigation practices, finance, and mobile technology, as well as to information and extension services (IFAD 2011).
182. **To transform agriculture in Namibia and thereby improve the livelihoods and incomes of households, especially those among the rural poor, there is need to raise agricultural productivity of these smallholder farmers.** Increased productivity of farmers is essential to enhance household food security, as well as to eliminate poverty in the Namibian economy. Learning from these experiences, accompanied with greater investment in the agricultural sector, can trigger agricultural transformation and the industrialization process in Namibia.

4.1. Regional Experience

183. **Within Africa, evidence abounds of countries enjoying the benefits of innovations, adoption, and diffusion.** One of the innovations that can widely be found is High-Yielding Variety (HYV) seeds for crops. Almost all countries of the continent are experiencing the impact of this technology. For instance, in Kenya, the use of HYVs of sorghum has increased producers' yields from 400 kg/ha to 1,000 kg/ha (Florence et al. 2015). Also, the introduction of e-markets in East Africa is a good example of new technology-enhanced productivity growth. This has been recently introduced in Rwanda, Uganda, and Kenya under the name of e-soko. E-soko introduces farmers to the e-market to help them market their agricultural produce and get premium prices. The e-market was mainly introduced to provide market information and bridge the information gap in order to address some of the supply constraints. This innovation has led to farmers' incomes increasing by 36 percent, according to the results of the study by Halewood and Surya (2012). Other initiatives that can be highlighted include the Kencall Farmers Helpline in Kenya, Cocalik and Radio Ada in Ghana, and Makwacha in Malawi. Kencall Farmers Helpline is a real-time operation that provide agricultural advice to farmers over the phone. As for the other initiatives, agricultural information delivery is targeted at smallholder farmers.
184. **To overcome problems associated with farming in arid conditions, scientists at the Africa Rice Center (WARDA) cross-bred the hardy, traditional African rice varieties with the high-yielding Asian varieties to produce the New Rice for Africa (NERICA);** higher yielding rice that is resistant to droughts, floods, and pests has also increased agricultural productivity in the West and other regions of Africa.
185. **Furthermore, Namibia can transform its agricultural sector by learning from the experience of countries in other regions, such as Nigeria and Kenya, with regard to cassava and flower production, respectively.** Nigeria, currently the largest producer of cassava in the world, has been increasing this production for the past 30 years, in terms of both area cultivated and yield per hectare. These achievements are spurred by government interventions and the efforts of non-governmental organizations in the cassava subsector to support production, processing, and marketing of the crop.
186. **Thus, Namibia can develop its agricultural sector by implementing policies to improve agronomic practices, genetic improvement, root storage, and the development of processing technology and rural infrastructure.** With regard to horticulture, Kenya is doing very well by encouraging flower production, using technologies including drip irrigation, fertigation systems, greenhouse ventilation systems, net shading, pre-cooling, cold storage facilities, grading,

bouqueting, fertilizer recycling systems to prevent wastage, wetlands for waste water treatment, artificial lighting to increase day length, grading/packaging sheds, and refrigerated trucks.

187. **A similar success story in the fish farming sector can be learned from the Mauritanian experience, where the government creates incentives, such as tax breaks, to attract investors into the aquaculture business.** The Mauritanian government also has adopted six successive strategies of fisheries and fish farming management, which aim to “give preference to national fishermen, strengthen basic infrastructures, help preserve resource and integrate the sector to the national economy” (dunevoices 2015). This makes the fishing sector a critical pillar of the national economy, as it is the main provider of jobs in the country while contributing a quarter of all tax income and half of all foreign-currency income. Namibia, with its huge shoreline could become the El Dorado of the fishing industry with the creation of an exclusive fish farming economic zone that maximizes sustainable productivity, maps fixed fishing zones, and imposes biological pauses, along with strict restrictions on the types of fishing gear to use in fish harvesting.
188. **All these initiatives require huge capital investments, making access to finance for agriculture purposes greatly important.** In order to accelerate access to finance for agriculture, the innovative finance and private equity funds in agriculture, such as the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) and the use of information and communication technologies (ICTs), such as mobile banking, drones, and agricultural credit cards provide useful lessons for Namibia (Box 1). Countries such as Nigeria, Kenya, and Rwanda have been taking advantage of the mobile phone revolution to drive technology uptake and financial inclusion, using facilities such as the E-Wallet in Nigeria and other African countries. Agricultural credit cards—credit cards such as those used by the urban middle class—are increasingly being used in a few countries to finance farmers’ seasonal cash-flow needs. MasterCard Foundation is at the forefront of the credit card initiatives aimed at helping the rural poor in Africa—many of whom are struggling farmers.
189. **Rainfall-indexed insurance against drought or flood has had a positive impact on the agricultural sector.** It emboldens farmers to make riskier and more-lucrative investments, and consequently increases earnings. A three-year study in Ghana found that farmers with rainfall-indexed insurance—in which insurance payouts are based on rainfall amounts—spent US\$266 more on harvest expenditures, compared with uninsured farmers. Insured farmers also earned US\$285 more in revenue, while their postharvest assets were US\$531 higher (Karlán et al. 2014). Index-based drought insurance products also showed positive effects in rural Kenya. Specifically, insured households are, on average, 36 percentage points less likely to anticipate drawing down assets,

and 25 percentage points less likely to anticipate reducing meals upon receipt of a payout (Janzen and Carter 2013). Farmers who can obtain weather-based insurance have better access to other forms of financing as well (Ruete 2015).

190. **These are regional experiences that can also be successfully launched in Namibia in order to tackle the financing constraints in its agricultural value chains.** Finally, Namibia can also gain immensely from the Diaspora Investment in Agriculture initiative (DIA) and the Financing Facility for Remittances (FFR), which are multi-donor initiatives administered by the International Fund for Agricultural Development (IFAD). Leasing and factoring are beneficial in that they reduce some of the traditional lending risks of agriculture. Leasing is used to finance machinery, automobiles, and equipment in agriculture. Factoring is when a company sells its invoices to a third party (the factor) at a discount, in order to improve cash flow (Ruete 2015). In the same vein, collateralization of “forward delivery” contracts from multinational and well-established buyers are being used as viable options of collateral for loans in financial institutions.
191. All these innovative agro-financing initiatives can trigger an agricultural industrialization process in Namibia, through increased production and processing of the greater part of what is produced, to boost economic earnings across the value chain.

Box 1: Role of access to finance in agricultural productivity: the Nigerian experience

Nigeria Incentive-Based Risk Sharing System for Agricultural Lending: NIRSAL was launched as a public–private initiative to generate an additional US\$3 billion in agricultural financing over 10 years. It is an innovative mechanism aimed at de-risking lending to the agricultural sector by providing a Credit Risk Guarantee (CRG) as a cushion for banks to lend to farmers, and at the same time incentivizes farmers through provision of the Interest Drawback Program (IDP), paid quarterly, based on the agricultural project. The goal of NIRSAL is to increase agricultural loans from 1.4 to 7 percent of Nigeria’s total bank lending.

This has benefited actors along the entire agricultural value chain by providing affordable financial products and reducing the risks of granting bank loans to farmers. Since its inception in 2012, more than 454 projects, valued at more than US\$306 million, have been guaranteed by NIRSAL, and a sum of US\$3.36 million paid out as interest rebates to borrowers who repaid promptly, as a mechanism to encourage good repayment behavior.

E-Wallet: The use of ICTs such as E-Wallet in Nigeria has greatly improved agricultural productivity. The mobile wallet is a technology business in the mobile and digital services sector in Nigeria “operating a payments ecosystem connecting financial sector customers, Mobile Network Operators and businesses to their increasingly mobile consumers”(VIA n.d.). The mobile wallet network extends to tens of thousands of villages and eight million farmers who, by using the mobile technology, receive direct subsidies that cut the cost of fertilizer by 50 percent.

4.2. Global Experiences

192. **In many parts of the world, particularly in Asia (e.g. South Korea and India), growth in agricultural productivity has been rapid, largely as a result of the extensive adoption of new agricultural technologies.** For instance, irrigation technologies have transformed the agricultural sector of these regions. Globally, Africa has the lowest irrigated area, as a percentage of total cultivated area – 6 percent, in contrast to about 30 percent in Asia (Salami et al. 2010 and Kanu, et al. 2014). The percentage of irrigated land in Namibia is less than half of Africa’s average.
193. **Therefore, expanding irrigation infrastructure in Namibia could increase the nation’s food security by enhancing the productivity of smallholder farmers who mostly rely on rain-fed and subsistence farming, despite the country’s huge potential to support irrigation development adjacent to its border rivers, such as the Zambezi, Okavango, and Kunene.** Supporting irrigation development along these rivers could help transform the country’s subsistence agricultural economy into a market-oriented economy, as well as enhance the livelihood of the over-70 percent of Namibia’s population who live in rural areas.
194. **In the Asian economies, technological advances of the Green Revolution complemented reliable and timely water supplies to provide a route out of poverty for millions of poor people, making most of the countries in the region self-sufficient for food, despite forecasts of famine and starvation.** As yields increased, countries like China created Special Economic Zones to add value to their agricultural produce. By 1995, real per capita income nearly doubled in Asia, and poverty declined from nearly three out of every five to less than one in three (Hazell 2002). Thus, the Asian irrigation experience is a valuable lesson for Namibia and other African countries to learn, as irrigation developments are instrumental in agricultural transformation.

195. **Namibia is one of countries in Africa with the least rainfall.** Thus, the country depends greatly on groundwater for agricultural production. Similar to Namibia, Israel also has a shortage of natural water resources. However, Israel has topped the league of countries in agriculture yields by becoming a global leader in agricultural technology, particularly those associated with farming in arid conditions (Box 2).

Box 2: Fishing and farming the desert made possible with technology from Israel

Israel makes fishing and farming possible in the desert through her Grow Fish Anywhere (GFA) advanced systems. Using pioneering technology, the country has made it possible to breed fish in artificial lakes in the Negev desert. The discovery that the brackish water under deserts can be used for agriculture and aquaculture has helped to make Israel a major exporter of fresh produce and dairy, despite the fact that two-thirds of its land area is defined as semi-arid or arid. In the past two decades, the aquaculture sector nearly doubled its production by growing from 11,391 tons in 1980 to 20,855 tons in 2015 (FAOSTAT 2015). The country's local cows have the highest amounts of milk per animal in the world, due to agricultural research and development. Israel produces 95 percent of its food requirements, despite the fact that it has only 20 percent arable land.

To consolidate these gains, the government encourages research in agro-technologies, especially in the fields of irrigation, water management, arid zone agriculture, intensive greenhouse cultivation, development of new seed varieties, and organic and ecologically oriented agriculture.

196. **Moreover, Namibia has great lessons to learn from the structural transformation of Korea's agriculture, which was followed by rapid economic growth and industrialization in the late 1960s (Box 3).** Since agricultural productivity is relatively low in Namibia, the government's policy in promoting agricultural development through the interaction between the agricultural and manufacturing sectors has not been encouraging—thus, the need to design and implement policies that will link the agricultural sector with the manufacturing and other industrial sectors. These are lessons that Namibia can learn from the Korean experience, by starting to invest in social overhead capital such as roads, to make the transportation of agricultural products and the supply of farming materials such as fertilizers more efficient, contributing to the enhancement of agricultural productivity and economic development.

Box 3: Korea's three-staged development experience

Korea's agricultural development underwent a three-staged development process. In the first stage, from the 1960s to 1970s, the government directed policy that focused on food production and self-sufficiency in staple grains, in order to address poverty and food shortages. Emphasis was placed on seed improvement, technology development, and extension.

In the second stage of development, from the 1980s to mid-1990s, the Korean government concentrated on enhancing agricultural productivity, increasing agricultural household income, and then improving the agricultural structure. After 2000, Korea's agriculture entered the "global era" and faced the new environment of market opening and trade liberalization in agricultural products; the government had to go through a major transformation in its policies, such as reducing subsidies on agricultural products. Korea's success in agricultural finance and structural transformation presents valuable lessons for Africa. Indeed, Korea's agriculture went through drastic structural transformation characterized by increased productivity, intensive mechanization, skilled labor, and adoption of modern technologies.

On the whole, total agricultural output and productivity increased considerably over the years. For example, Korea's actual labor productivity per household in agriculture was KRW 2,465 per hour in 1970 and KRW 13,972 per hour in 2012, showing an increase index of 5.67 times.

Source: Korea Institute for Rural Development (2016),

197. **Farm mechanization, among other factors, has proven necessary in order to increase crop production and reduce long hours of operations to achieve food security.** A considerable proportion of the Namibian farmers still rely on mainly primary farm equipment for agricultural production, which makes it impossible to compete in agricultural products with some parts of the world that are already mechanized. Namibia can learn from agricultural mechanization in China, which has experienced a major expansion.
198. **In China, use of large tractors has been growing at faster rates since 2003, when rural wages started to rise (Yang and Wang 2013).** Small tractor use in China also continues to grow, although at much slower rates. Small tractors, however, account for more total horsepower than large tractors (Yang and Wang 2013).

199. **China's impressive development since the early 1980s started with reforming agriculture policies and setting strong incentives for stakeholders at all levels.** As a result, agricultural GDP grew by about 4.5 percent annually, and farmers' incomes by 7 percent (Li and Wang 2016). China has lifted more than 600 million people out of poverty. China's agriculture is smallholder-based, with more than 200 million small farms with an average holding of 0.65 hectares. In this context, China's experience therefore shows that, with the right policy choices, sustained commitment, and effective implementation, smallholder agriculture can be transformed into a dynamic economic force (Li and Wang 2016).
200. **In Thailand, using data from various agricultural censuses, Dawe (2005) found that the use of harvesting machines grew rapidly for all farm sizes** (including those less than 3 hectares) between 1978 and 2003 in Suphan Buri, a province in the Central Plain with good roads and irrigation infrastructure.
201. **Rental markets have arisen in many countries and contexts in Asia (for example, pump irrigation in Bangladesh, thresher rentals in the Philippines, and the rental of harvesting machines in Thailand).** Rental markets for machinery and services that embody knowledge, moreover, have a long history in Asia and are becoming increasingly common. Contract rice threshing arose relatively early in the Philippines during the Green Revolution, and rental markets for groundwater are common in Bangladesh. These markets arose spontaneously, without much in the way of government promotion. At present, there are enterprises in China that provide harvesting services to small farms over a large geographical area, moving from south to north as the harvest progresses (Yang and Wang 2013). Pruning, spraying, bagging, pest management, and harvesting services are provided by various firms for mango production in the Philippines and Indonesia. Similar examples exist for livestock and coffee, as well as other food products. These rental markets may help greatly to overcome the "small farm problem" by overcoming some of the constraints faced by small farmers.

5. THE AFRICAN DEVELOPMENT BANK'S AGRICULTURE SECTOR SUPPORT IN AFRICA

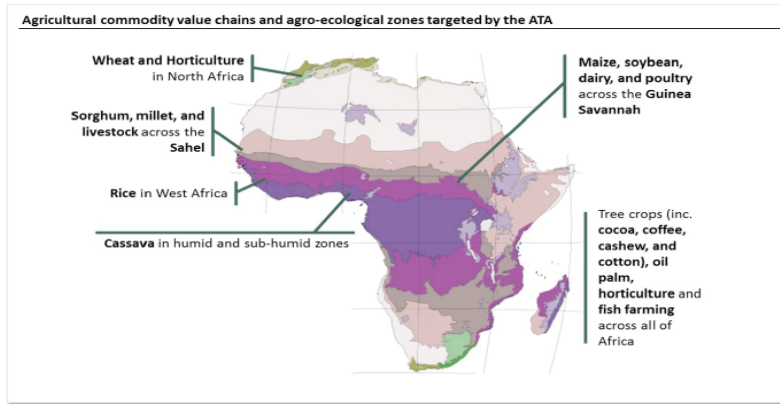
5.1. The Bank's Feed Africa Strategy

202. **The African Development Bank (AfDB), as regional development bank, has been playing "gap-filling" and "market-fixing" roles.** It is one of the main players in agricultural financing on the continent, both by providing investment funding, as well as through loan guarantees to potential private investors and risk-sharing and guarantee mechanisms, in addition to developing country

capacity, and extending policy advice. Between 1967 and 2016, the Bank Group approved loans and grants to its RMCs, with commitments amounting to US\$120.32 billion. Agriculture and rural development accounted for 11.4 percent (US\$13.73 billion).

203. **Currently, agricultural transformation remains one of the key development priorities of the Bank, and agriculture is one of the High 5s—the Bank’s vision for Africa’s economic transformation comprising five overarching and mutually reinforcing operational planks.** To transform Africa’s agricultural sector, the Bank has designed the Feed Africa Strategy covering the period 2016–25; for the next decade, the work of the Bank in the sector will be guided by the strategy. Feed Africa aims to transform African agriculture into a globally competitive, inclusive and business-oriented sector that creates wealth, generates gainful employment, improves quality of life and secures the environment. The approach entails replicating and taking to scale, successful agricultural programs across Africa and beyond in order to fully realize their transformational impact.
204. **Through the strategy, the Bank aims to achieve four ambitious goals:** eliminating extreme poverty, eliminating hunger and malnutrition, helping Africa become a net food exporter, and moving the continent to the top of global agricultural value chains, where it has clear comparative advantages (AfDB 2016).
205. **Rather than the traditional sector-wide approach, the Feed Africa Strategy is based on a commodity-focused integrated approach.** Accordingly, the transformation of the agriculture sector is envisaged to be achieved by selecting and transforming key value chains. Bottlenecks across the entire prioritized agricultural commodity value chains and within related agro-ecological zones will simultaneously be addressed. To this end, 18 priority value chains such as in rice, wheat, fish, palm oil, horticulture, and cassava have been identified with the objective of achieving self-sufficiency; to capture additional value added in key export-oriented commodities, such as cocoa, coffee, cotton, and cashews; in creating a food-secure Sahel in sorghum, millet, and livestock; and realizing the untapped potential of the Guinea Savannah in maize, soybean, and livestock (see Figure 9).

Figure 9. Priority agricultural value chains and agro-ecological zones

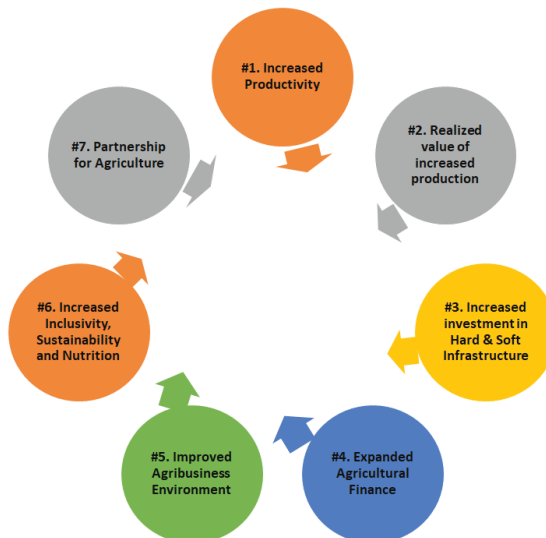
Figure 1 : Priority agricultural value chains and agro-ecological zones

Source: CGLAR "Technologies for African Agricultural Transformation (TAAT) proposal; Dalberg analysis.

Source: AfDB 2016

206. In order to transform the identified priority value chains, the strategy embraces seven sets of enablers (see Figure 10). Under each enabler, key activities that will be implemented by the Bank, the private sector, governments, and other donors (see Table 1). Since each specific commodity's growth potential varies, the strategy will take context-specific measures.

Figure 10. Feed Africa's seven enablers



Source: AfDB 2016

207. **Under the strategy, it is assumed that transformation will be market-led and achieved through the creation of three simultaneous conditions:** (i) a large-scale dissemination of productivity-increasing technology and inputs; (ii) the development of input and output markets, structures and incentives that ensure the full realization of the value of increased production; and (iii) a well-funded and competitive private sector that can manage and allocate skill and capital to scale up emergent success and drive long-term sustainable agribusiness growth.
208. **As agribusiness is increasingly gaining momentum, it is necessary to bring the youth onboard without delay.** The Bank estimates that 100 million young Africans will be entering the job market within the next 10 years. In this context, as part of its Feed Africa initiative, the Bank launched the ENABLE (Empowering Novel Agri-Business-Led Employment) Youth Programme. Through this Programme, which aims to produce some 300,000 agribusinesses and create jobs for 1.5 million youth in just five years, the Bank has set itself an ambitious target of nurturing a young pool of future agricultural millionaires in order to help address Africa's population growth challenge. The Programme is making steady progress in changing the way agriculture is perceived—from a subsistence undertaking to a lucrative investment that creates wealth, all in an effort realize rural transformation and makes Africa's rural areas as destinations of hope and prosperity. At least 30 African countries have submitted requests for AfDB funding toward various projects aimed at improving the business environment for youth involved in the information technology sector, large-scale agricultural production, and infrastructure development to spur the agricultural sector. In 2016, the Bank provided US\$8 million to eight countries to create 10,000 young graduate agribusiness entrepreneurs in each country.

5.2. Past and Ongoing Projects of the Bank in Namibia

209. **As one of the Bank's RMCs, Namibia has been a beneficiary of its support to the agriculture and non-agriculture sectors.** Notable among the completed AfDB projects in Namibia are the Aus–Rosh Road Project (2002) and Kamanjab–Omakange Road project (2004). Both projects were partially financed by the Bank at the cost of UA 16.23 million¹⁶ and UA 24.92 million, respectively. The Aus–Rosh Project was located in the area where mining is the principal economic activity and where there was also significant potential for irrigated agriculture. The Kamanjab–Omakange Road project was located in the region where intensive farming is practiced, particularly livestock. This region has also been the major supplier of cattle and goats both to the domestic and export markets. These interventions contributed tremendously toward the transformation of the agriculture sector and the overall economic growth of Namibia. The Bank has also supported Namibia in undertaking several sectoral

¹⁶ UA is the Bank Group's Unit of Account – 1 UA is equivalent to N\$ 18.01

studies, including the agricultural sector. One such study is the development of an aquaculture master plan, together with institutional support for inland aquaculture.

210. **At the end of December 2016, the Bank Group's active portfolio in Namibia comprised seven operations with a total commitment of UA 394.2 million.** The financial sector dominates the portfolio with 60.1 percent, followed by the transport sector with 39.5 percent. The rest are Middle-Income Country (MIC) Grants—technical assistance projects supporting the Walvis Bay Corridor Group, public–private partnership (PPP) institutional strengthening, statistical capacity building, and higher-education quality assurance system. The portfolio includes one operation funded through the the African Development Bank (ADB) public-sector window—the New Port of Walvis Bay Container Terminal Expansion Project (UA 155.7 million); two operations funded through the ADB private-sector window—Corporate Loan to Trustco Finance Limited (UA 3.3 million), and the Line of Credit (LoC) to the Development Bank of Namibia (UA 233.4 million).

5.3. The Future Areas of Strategic Focus of the Bank in Namibia

211. **The future support of the Bank in the agricultural sector will be guided by the Feed Africa Strategy.** Accordingly, its approach will focus on developing the commodity value chains identified in the strategy. Its support aims to simultaneously address all the bottlenecks across the entire prioritized agricultural commodity value chains. The strategic commodities identified under the Feed Africa Strategy are also key commodities in Namibia, such as pearl millet, sorghum, and maize. These commodities account for the bulk of the share of area under cultivation, and of labor, farm household income, and consumption budgets. Therefore, the future Bank support in Namibia is expected to have a significant impact on these value chains and the degree of agricultural transformation. As sorghum and maize are the primary crops cultivated by small-scale farmers, the Bank's support of these value chains will have a significant impact on farm income and rural poverty. Since pearl millet and maize, respectively, account for 20 percent¹⁷ and 33 percent of the cereal consumption in Namibia, respectively, the Bank's support will also have a significant impact on consumers' welfare. As Namibia also imports close to 50 percent of its cereal consumption, the backing of the Bank is expected to support the country in achieving its food security objective, and thus save substantial amounts of foreign exchange.
212. **Under the Feed Africa Strategy, various interventions are envisaged for millet, maize, and sorghum, to be supported by the Bank.** For sorghum and millet, the strategy aims to promote and support large-scale dissemination

¹⁷ Some put the share at 40 percent; this must be taken with caution.

of integrated soil fertility management practices. In addition, the strategy aims to support investment interventions that expand the use of water harvesting technologies, as well as increased access to affordable, high-quality, on-farm storage systems that improve quality of raw products for processors and improve feed access for livestock in the dry season. For maize, the strategy aims to support widespread dissemination of modern technologies for pest/disease resistance, provide access to finance, and to develop an inputs distribution network, promoting cooperatives and strengthening the capacity of other farmer groups. Where possible, under the strategy, the Bank aims to finance tailored, small-scale agricultural machinery, including seeders and weeders, which reduce labor input, as well as small tractors with tailored accessories. The strategy also aims to support the development of irrigation infrastructure, construction of main and feeder roads, and electricity access for processing and cold chains/storage.

Table 1: Key Activities for Transformation

AVC / AEZ	Key activities for transformation
Horticulture	<ul style="list-style-type: none"> • Large-scale dissemination of inputs and modern cultivation methods in urban areas • Establish trade corridors to meet regional demand • Develop SME agribusinesses and large-scale partnership with the private sector to support aggregation and distribution • Capital investment to develop cold and fresh chains to reduce post-harvest loss
Fish farming	<ul style="list-style-type: none"> • Capital investment to upgrade fish ponds to modern facilities • Develop SME agribusiness sector to support modern input/feed operations • Capital investment to develop cold and fresh chains for regional trade and distribution
Sahelian Region	<p>Crops (Sorghum, Millet, Cowpea and groundnut):</p> <ul style="list-style-type: none"> • Large-scale distribution of improved disease resistant varieties • Large-scale dissemination of integrated soil fertility management practices • Capital investment to expand the use of water harvesting technologies <p>Livestock (Goats, Sheep, Cattle):</p> <ul style="list-style-type: none"> • Develop and deploy index-based insurance products for small farmers • Develop SME agribusiness sector to improve health services and distribute disease management technologies (e.g., thermostable vaccine for Peste Des Petits Ruminants) • Widespread dissemination of sustainable feeding practices through forage and crop residues

AVC / AEZ	Key activities for transformation ²²
Guinea Savannah	<p>Crops (Maize and Soybean)</p> <ul style="list-style-type: none"> • Large-scale distribution of improved disease resistant varieties • Large-scale dissemination of integrated soil fertility management practices • Widespread dissemination of modern technologies (e.g., AflaSafe for suppression of maize aflatoxin, imazapyr-resistant maize to suppress striga, and NoduMax for greater nitrogen fixation by soybean) <p>Poultry</p> <ul style="list-style-type: none"> • Capital investment to leverage genetic potential through adapted breeds • Develop SME agribusiness sector to increase access to veterinary care, including creation of village-based companies • Capital investment to develop cold and fresh chains for regional trade and distribution <p>Dairy:</p> <ul style="list-style-type: none"> • Capital investment in dairy genetic improvement (e.g., using molecular approaches to genotyping) • Widespread dissemination of sustainable feeding practices through forage and crop residues • Capital investment to develop cold and fresh chains for regional trade and distribution

Source: AfDB 2016

213. **The livestock, horticulture, and fish farming subsectors are the other strategic subsectors that the Feed Africa Strategy aims to support, from which Namibia may be able to benefit.** For each subsector, the primary activities to be supported under the strategy are enumerated above, under the heading of key activities.
214. **In summary, the strategic commodities identified under the Feed Africa Strategy and the key activities that are envisaged to be supported match very well with the commodity focus and growth constraints of the Namibian agricultural sector.** Therefore, if Namibia can benefit from that support, the interventions that might be supported by the Bank are expected to significantly contribute toward closing the existing yield gaps, expediting technical change, improving the economic efficiency of the agriculture sector, and supporting the country to reasonably achieve its national food security objective. Although it will be conditioned by the competitiveness of the domestic goods and factor markets, as well as the conduciveness of the macroeconomic policy environment, the farmers are expected to be the primary beneficiaries of the interventions.

6. STRUCTURAL TRANSFORMATION OF NAMIBIA'S AGRICULTURE: POLICY PRIORITIES

215. **The previous sections identified and discussed a number of constraints that have been limiting the agricultural sector in Namibia from reaching its potential.** In this section, we outline the policy interventions required to address those constraints and unleash the growth potential of the sector.
216. **Although simultaneously eliminating all the constraints of the sector is the first best solution, it is not, however, practical as it requires significant resources and capacity, as well as complete knowledge of all the prevailing constraints.** Alternatively, implementing as much reform and investment interventions as possible could be second best. However, again since markets are interlinked, interventions to remove one or more of the distortions may be either ineffective or may end up generating undesirable effects. Therefore, isolating potential growth sources that figure prominently in the Namibian context and identifying those policy and investment interventions that have a direct and significant impact on the binding constraints of growth might be the way forward to bring agricultural transformation in Namibia.
217. **Accordingly, based on the review of the sector, we identified three potential sources of growth that can be exploited.** These are (i) to close the existing productivity gap (supporting farmers to move toward or operate on their frontier); (ii) to improve the efficient use of existing resources and technology, including a shift in the production pattern toward higher value crops and livestock products; and (iii) to develop new technologies that adequately take into account resource scarcity and climate risks. The following section briefly discusses the set of policies and investment interventions that are considered effective in addressing the binding constraints of the agricultural sector.¹⁸

6.1. Land: Access to Land and Tenure Security

218. **The land is a vital factor of production in agriculture and, thus, the most fundamental determinant of income-earning potential.** However, currently, access to land in Namibia is limited and highly uneven. The labor-to-land ratio is very high, particularly in the subsistence farming subsector. Therefore, altering the prevailing land-to-labor ratio and ensuring equitable access to land would improve not only the productivity of land but also reduce rural poverty and prevent the risk of serious social and political tensions. Tenure insecurity and absence of well-functioning land markets are other key features of the

¹⁸ *In the process of achieving agricultural sector growth, although the private sector plays key roles, the government is assumed to also play a key role by creating the enabling environment and providing the necessary public goods and services. In addition, it will implement measures to ensure that the resulting growth is inclusive and brings prosperity to all.*

subsistence subsector. Tenure insecurity reduces land productivity by distorting farmers' land-use decisions, willingness to invest in land development, and the adoption of improved land management practices (Tenaw et al. 2009). Similarly, the absence of a well-functioning land market hinders the transfer of land from less-productive to more-productive activities/producers and significantly undermines the efficient allocation and productivity of the land.

219. **Although other factors might also be contributing, such as differences in product composition and production conditions, lack of equitable access to land, tenure insecurity, and absence of a well-functioning land market may be key contributors to the observed reduced land productivity in Namibia.** For instance, despite the fact that government expenditure in the agricultural sector in Namibia has been well above the Africa-wide average, as can be observed from Appendices III and IV, agricultural value added per hectare of land is well below the African average, and the gap is also widening over time.
220. **Therefore, implementing land reform to ensure equitable access, more-secure property rights, and removal of restrictions on land markets could have significant potential to improve land productivity, reduce poverty, and accelerate agricultural transformation (Holden and Otsuka 2014).** However, improving the equity objective does not necessarily mean an equal distribution of land. While providing access to reasonable plot size that can sustain an acceptable standard of living is necessary, access to additional land above the minimum must be allocated through the market mechanism, so that land could be reassigned to those who can extract higher returns from land, which enhances both static and dynamic efficiency. Thus, although implementing land reform measures is necessary to improve both equity and efficiency, it is also essential to ensure that such reform measures will not end up stifling the overall land productivity of the country. To prevent such an outcome, establishing first whether there is an inverse relationship between farm size and productivity will be necessary.¹⁹ It is necessary because land redistribution will increase farm productivity only when there is an inverse relationship between the two. If there is indeed an inverse relationship, reform to redistribute land can be justifiable on the grounds of equity as well as efficiency. In addition, identifying an “optimal” farm size would also be necessary, so that evidence-based land reform measures can be implemented for both efficiency and equity improvement to be achieved.

¹⁹ *In addition, since the minimum efficient scale of land access varies under different technologies, unless there are constraints for small farmers in accessing technology, there may not be great efficiency gains from land redistribution schemes. Thus, it is also necessary to assess if differential access to technology is caused by capital market imperfection. If this is the case, ensuring that small farmers have access to technology and addressing other factors that could influence the efficiency of farm size, such as reducing transaction costs, as well as addressing market imperfections in the factor and product markets and ensuring the spatial integration of markets, might also be essential.*

6.2. Water: Irrigation Infrastructure

221. **Farming in Namibia is solely dependent on rainfall.** Nevertheless, only a small part of Namibia receives sufficient and consistent rainfall required for feasible crop production. Even in locations that receive the required level of rainfall, cropping remains risky and often unproductive, owing to the variability of rainfall and low moisture-retention capacity of the predominantly sandy soils. As a result, although there are huge yield gaps and potential to increase productivity through the application of modern seed and fertilizer technologies, due to water scarcity farmers refrain from applying such technologies. Inadequate water availability also limits the number and types of crops that can be cultivated and has constrained farmers to select crops providing low private and social returns.
222. **Namibia's irrigation potential is between 40,000 and 50,000 ha but, currently, only 15–20 percent of this potential has been used, and the bulk share of this is also accounted for by the commercial farms.** Based on the 2013/14 agricultural census conducted by the Namibian Statistical Agency, only 0.7 percent of farm households in the communal area used irrigation. Therefore, in locations that have irrigation potentials, and where investment on such schemes makes economic sense, investment to develop the irrigation potential addresses the constraints imposed by the low-level and infrequent rainfall. Such intervention increases yield directly, by allowing intensive utilization of land and labor, and indirectly by allowing increased application of modern seed and fertilizer technologies, thus permitting a cropping pattern nearer to the optimum. In addition, by increasing total factor productivity, it also creates multiplier effects and crowds in new activities—such as transport, trade, and storage services, and input distribution and technical advisory services—activities that further increase the productivity and efficiency of the farming sector.
223. **Despite its high economic potential, however, due to the high initial cost of such investment, smallholders simply may not be able to meet the capital cost of irrigation.** Therefore, considering its relatively higher social return and positive externalities, such investment and its management must be financed by the government, either wholly or with some element of subsidy, or through other schemes such as a public–private partnership.

6.3. Technology: Research and Extension Services

224. **Arid climate, limited rainfall, both in magnitude and distribution, and poor soil quality make agricultural research central to lessen the severe physical constraints and increase productivity in Namibia.** As noted above, only a small part of Namibia receives a sufficient level of rainfall. Even

in areas where there is relatively better rainfall, production remains risky due to predominantly sandy soils. In addition, even in naturally endowed areas, due to high population concentration, environmental degradation is on the increase. In order to effectively respond to climate-change-induced rainfall variability and increased frequency of disease and pest incidence, as well as to fend off eventual diminishing returns, it is critical that new technologies be developed.

225. **In the last five decades, the rate of increase in cereal production in Namibia was slightly less than the annual growth rate of population.** Moreover, almost all of the production increase was from area expansion, and the average yield growth was only 0.4 percent per annum (based on FAO data). In order to see if there was a technical change in the cereal production in Namibia, we postulated a simple production frontier as a function of average fertilizer use, size of land cultivated, average rainfall, and a trend term.²⁰ The trend term is introduced to measure technological change (Kumar et al. 2011).²¹ The result shows that the trend term is highly insignificant, and the magnitude of the coefficient is also almost close to zero, suggesting that during the last five decades there was no significant technological change.
226. **Given the existing high and widening yield gaps for crops, as well as livestock production, public/private funding for research and technology development will be critical to sustain the livelihood of farmers, improve yields, and accelerate agricultural transformation.** In the Namibian context, considering the weather risk and soil conditions, research efforts that focus on developing crop cultivars that can be grown under poor soil conditions and meet farmers' varietal trait preferences—such as short maturity, drought tolerance, and higher yield—will minimize the effect of poor soil and unfavorable climatic conditions on farm productivity. Due to regional differences in the level and variability of rainfall as well as soil conditions, the effort to develop new technologies should also be specific to location or agro-ecological zone. Similarly, given the economic significance of animal husbandry, technical changes to increase the productivity and global competitiveness of the livestock subsector are also critical, particularly in addressing the current acute feed shortage.
227. **In Namibia, improved farm management practice is claimed to generate significant yield improvement.** However, in 2013–14 only 25 percent of the farm households used an extension service.²² Therefore, identifying the

²⁰ The test, however, showed that OLS is sufficient. We also tested for autocorrelation, and the Durbin–Watson statistic showed that there is significant autocorrelation (1.21). The mean VIF estimate of 1.6 however showed that there is no serious multicollinearity. Therefore, we estimated the model using the Prais–Winsten estimation method, correcting for autocorrelation and the result is reported here.

²¹ Since the data is for 12 years, the result must be taken with caution. However, when the fertilizer input is removed, for which we have only 12 years, the coefficient estimates and significance for all the other variables remain the same.

²² Based on the 2013/14 Agriculture Census.

causes that contributed to low degree of uptake might be necessary to make evidence-based interventions. Coupled with this, assessing the effectiveness and efficiency of public expenditure in the agricultural sector might also be necessary. This is because, despite high public expenditure on agriculture, low levels of productivity might suggest that such expenditures are not generating the expected impacts or magnitudes thereof. Identifying the reasons for such anomalies may be necessary to explain the expenditures and, where appropriate, to reallocate them to other more-productive activities. Based on the findings of such studies, if it is found necessary to strengthen the extension system, both to facilitate the dissemination of new technologies and train farmers on improved husbandry practices, this will have a positive impact on yield and total factor productivity.

228. **While analyzing the challenges and policy options for Namibia's agricultural sector, rewarding individuals who have positively contributed to making farming more productive, profitable, and resilient in the country should be factored into the equation.** This will stimulate Namibians, especially youth, to make more meaningful contributions to the sector. In this regard, an Annual Food Prize can be instituted. The selection committee, timing, value of the prize, and modalities of the selection can be effected by the Ministry of Agriculture.

6.4. Finance: Access to Credit

229. **Increasing productivity requires some investment, the purchase of inputs, or sometimes the need to forgo income for some time.** For instance, proper management of land usually involves investments or decisions to set land aside for a while, which may require farmers to sacrifice some immediate benefits for the sake of increased benefits in the longer run. However, many poor families do not have enough savings to meet the investment, nor can they afford to sacrifice income. As a result, they may not be able to benefit from improved technology, such as those that are developed through public funding. Similarly, they are less likely to specialize in crops and livestock products that could generate a higher return at the cost of investment required and the forgoing of revenue for some time—such as the case with animal rearing and tree crop production. Such financial constraints prevent farmers from achieving static as well as dynamic efficiency gains and income. Lack of credit access by farmers also undermines the effectiveness of other public interventions, such as investment on irrigation, and research on the farm sector.
230. **In Namibia, although there are several financial institutions, there is a lack of financial resources for agricultural production (Amadhila 2016).** Only a few of the institutions are interested in financing or providing credit for farming activities. Even those that are willing to finance farming usually impose quite restrictive collateral requirements, which is particularly challenging for farmers

in communal areas where the majority of them do not have title to land.²³ Banks usually mention high transaction costs, the lack of expertise, and high risks as the main reasons for not financing agriculture. However, although lending for farming activities is risky, some claim that it is exaggerated, and much of the financial institutions' reluctance must be explained by their incorrect and excessive perception of agricultural risk (Amadhila 2016).

231. **The presence of huge unmet demand for finance in the agricultural sector, especially for smallholder farmers, in the face of high liquidity of the existing financial institutions suggests that the existing financing approach is ineffective or inappropriate.** This also indicates that, in addition to the traditional concessionary financing such as government guaranteed credits and ODA, governments and other development stakeholders need to explore other innovative ways of generating and meeting the financing needs of the sector. This is especially important as the traditional sources of financing are becoming inadequate, and the budget is also shrinking over time.
232. **Currently, there are several promising innovative ways and approaches that are found to be effective, such as innovative credit tools, bonds and equities; risk management tools; results-based financing; and crowdfunding.** While these new approaches attempt to solve such problems as market failures, institutional barriers, and the perceived/inherent risks associated with agricultural financing, they also generate significant resources to complement the traditional sources to meet the financing needs of small farmers.
233. **There is also a growing realization of the need to generate resource from domestic sources, such as through public–private partnership arrangements and private financing through involvement in the global, regional, and domestic value chains.** Particularly, value chain financing is considered a very important mechanism to deliver financial services to rural households. This approach, while reducing cost and risks and improving efficiency, facilitates access to finance by smallholders. Since the participation rate of Africa in the global as well as regional value chain is limited, developing strong linkages with actors in the value chain, including importers and supermarkets, can enable financing opportunities that Africa has not yet to exploit to be tapped.
234. **Therefore, as there is no single formula for a successful financing approach for a given country, as argued by Hoff and Stiglitz (1990), what it required is to assess the available new financing options that are viable in the Namibian context—those that involve minimum risk and transaction costs, but also meet the financing needs of small farmers.**

²³ *As a result, most of the credit provided to the farm sector is mainly offered to less risky agro-processing units, agro-trading, and related businesses rather than to small farmers.*

6.5. Market: Access to Market, Marketing Infrastructure, and Transaction Costs

235. **The role of markets on agricultural productivity is well established.**

Investment in irrigation, technical change, and extension services impact on farm production and productivity. However, the sustainability of such impacts will ultimately depend on the availability of markets and the prices that farmers get for their outputs. Similarly, while the resulting productivity increase makes specialization plausible, unless the transaction cost is low, farmers are unwilling to specialize. Likewise, high rates of return to agricultural research and the adoption of improved varieties are strongly influenced by the availability and affordability of such input to farmers. Therefore, access to market and the cost of market access are critical conditions that influence the effectiveness and sustainability of supply-boosting measures.

236. **Namibia is a net importer of grains, beverages, and other food products, but a net-exporter of non-cereal commercial crops and livestock products.**

High import dependency in cereals means there is adequate domestic demand for these crops. On the other hand, since Namibia is a member of the Southern African Development Community (SADC), its economy is well integrated with South Africa and other member countries. Therefore, the effective market size of Namibia will be determined by its own cost of production vis-à-vis its neighbors, as well as by the magnitude of transaction costs that it incurs to access those markets. Since there is an inverse relationship between transaction cost and distance, investment on transport infrastructure reduces transport and transaction costs and facilitates physical access to consumers' markets. As trade normally flows from deficit and surplus markets, transport infrastructure will improve farm gate prices of farm outputs by reducing the costs of farm inputs. As a result, not only are farmers' terms of trade improved, but also price volatility is reduced. The improved terms of trade, in turn, improve the incentive to use modern technology and inputs, as well as to specialize (DeSilva 2011). By improving the spatial market integration and the speed of spatial price adjustment, transport infrastructure will also enhance the effectiveness of macroeconomic or trade policy measures aimed at altering micro-level resource allocation behaviors.²⁴ Therefore, investment intervention in the rural transport network is a critical determinant of the agricultural transformation in Namibia.²⁵

²⁴ By connecting farmers to spatial labor markets, this will also permit full utilization of their labor resources, and generate additional income.

²⁵ Assuming that farmers are maximizing profit subject to production constraints, where public goods are some elements of the production and cost functions, each policy that alters prices and government expenditure will have independent as well as joint interaction effects on profit. It means each intervention will improve profitability directly, as well as indirectly, through increasing the effectiveness of the other intervention. The provision of public goods improves the effectiveness of price policy.

237. **In the face of sustained increase in world prices of staple food prices and the prevailing high level of food insecurity in many African countries, reducing the level of postharvest loss (PHL) will enhance food security and improve the real income of producers as well as consumers.** Available studies suggest that the magnitude of loss varies by types of crops, with the estimated loss as high as 30 percent in cereals, 50 percent in roots and tubers, and up to 70 percent in fruit and vegetables. The monetary value of PHL of grain in Eastern and Southern Africa alone is estimated to be US\$1.6 billion per year, or about 13.5 percent of the total value of grain production. The corresponding PHL for SSA is estimated to reach 15 percent of the annual production. According to some studies, even achieving a 1 percent reduction in PHL would be sufficient to replace food aid, displace the large share of food imports, or meet the annual caloric requirement of at least 48 million people. Moreover, some claim that promoting food security through PHL reduction can be more cost-effective and environmentally sustainable than a corresponding increase in production. Therefore, identifying and including PHL reduction is appropriate.
238. **In Namibia, around 18 percent of the roots and tubers, 8 percent of the maize, and 5 percent of the millet are lost due to PHL (FAO 2013).**²⁶ To reduce this, investing in storage facilities, improving postharvest management and distribution networks, and establishing marketing centers in rural areas are as important as increasing productivity.
239. **A commodity exchange and a warehouse receipt system (WRS) are imperative for the agricultural system.** It fits well into the agricultural transformation agenda and generally creates improved market integration while achieving considerable reduction in PHL. The success stories from Ethiopia and Tanzania provide testimonies worthy of replication by the GRN with the active involvement of the private sector. A virile commodity exchange will significantly enhance Namibia's agriculture potential. With the WRS, Namibia's farmers will be able to store goods as collateral to get credit at reasonable interest rates. Farmers can also trade the receipts on the floor of the commodity exchange.

6.6. Adopting Optimal Development Pathways

240. **Even if there is no yield gap, an increase in productivity can still be realized through the efficient use of the existing technology and resources.** Farmers in communal farming typically practice integrated crop–livestock farming. Thus, by producing the most optimum crop–livestock mix, which is consistent with the market price ratios, farmers could achieve improvement in economies of

²⁶ The Ministry of Environment and Tourism, on the other hand, puts PHL at 30 percent along the staple food crops (maize, millet, sorghum, beans), livestock, and fish value chains.

scope (Kurosaki 2003). Similarly, if there are significant regional differences in relative factor endowments, transport costs, and natural resource endowment, including climatic conditions, efficiency gains could be achieved by specializing in activities such that each location has comparative advantage(s) (Huffman and Evenson 2001; Kurosaki 2003). Similarly, given the current high labor-to-land ratio, there is room to achieve efficiency gains by operating at the most efficient scale level (de Roesta et al. 2017).

241. **Although all these efficiency gains may be present in the mixed farming context, their significance and economic viability depend on technology, farm size, transaction costs, the effectiveness of regulatory framework, and environmental factors (Rota and Sperandini 2010).** Although specialization allows farmers to achieve higher productivity by improving the technical efficiency and realizing scale economies, it makes them highly dependent on the commodity markets, which increases their vulnerability to market risk. The benefits of the specialization strategy, therefore, will be compromised and, thus, will be viable only if markets are stable and there is an effective market regulatory framework (de Roesta et al. 2017). On the other hand, due to cost complementarities in the crop–livestock integrated farming, farmers could achieve efficiency gains from economies of scope, namely by producing an optimum mix of farm products. Moreover, being less susceptible to market risks, by producing for the niche markets, they could also capture higher added value and could thus be able to be more efficient than specialized farms (de Roesta et al. 2017).
242. **As a result, whether specialization or diversification is the most optimal strategy would be strongly context-dependent.** Thus, for the Namibian context, it is necessary to establish whether diversification or specialization (both at the farm and each agro-ecological zone level) is a more desirable strategy. Similarly, determining the most efficient farm size is also vital in designing land reform programs.

6.7. Policy Framework: Remove Bias Against Agriculture

243. **Successful cases of agricultural transformation have shown that creating an enabling policy environment is a fundamental prerequisite for farmers and the private sector to invest in the agricultural sector.** Private investment in agriculture and adoption of new techniques are the necessary conditions for agricultural transformation. Similarly, the shift from orientation toward self-sufficiency in production pattern toward specialization and commercialization will make economic sense only when specialization generates a relatively higher return to land and labor. All these sources of productivity growth are significantly influenced by the agricultural terms of trade, which in turn influence the profitability, the capacity, and the incentive of farmers to invest and to use

modern techniques and specialize. Thus, while policies that tax the agriculture sector reduce incentives, policies that improve returns to farming facilitate agriculture sector growth. Therefore, any attempt that boosts the supply side will have a lasting impact on the farmer's welfare only if there is no policy-induced bias that nullifies the positive effects of supply-boosting interventions. Therefore, ensuring that general economic and sectoral policies (fiscal and monetary policies, trade and exchange rate policies, labor and investment policies) do not create a bias against the farm sector is critical. In addition, while the effort to make agriculture globally competitive is necessary, it is also necessary to take measures to protect farmers from unfair global competition. In particular, for products in which Namibia has a potentially comparative advantage, producers need additional support to put them on equal footing with foreign suppliers and protect them from unfair global competition.

244. In conclusion, in achieving broad-based improvement in farm productivity, the central policy issues would be:

- First, choosing the appropriate level and mix of public investments/expenditure aimed at supporting economic activities in the sector, and
- Second, ensuring that the system of economic incentives offers the appropriate stimuli to all actors.

7. SUMMARY AND CONCLUSION: AGRICULTURE TRANSFORMATION IN NAMIBIA

7.1. Summary

245. Despite its importance, agricultural sector performance in Namibia remains very poor. This has significantly undermined the ability of the country to improve farm income, reduce poverty and inequality and attain national food security. The subsistence subsector directly supports 90 percent of the nation's farming population and occupies 48 percent of the total agricultural land and accounts for close to 10 percent of the agricultural GDP. Relatively high total factor productivity of the commercial sector suggests that a large share of the future increase in total factor productivity of the agricultural sector in Namibia should come from the subsistence subsector. Any endeavor to transform the agricultural sector in Namibia, therefore, must focus on accelerating the transformation of the subsistence subsector. As a result, transforming the sector is expected to focus on supporting the farmers to operate on their production frontier (closing the yield gap), to improve their economic efficiency (operating at the most optimal point of the production frontier), and to scale up technological changes (shifting the production frontier).

246. **Agriculture in Namibia faces a number of challenges that hinder its development.** Low agricultural value addition and low wages undermine the quality of employment and the development of the sector. Challenges include: aridity and vulnerability to climate change, poor access to agricultural land, low technology uptake and utilization, low access to financing for agriculture, low productivity and a steady fall in value of food production, import dependency, and rising food insecurity. In order to overcome these challenges and develop the agricultural sector in Namibia, there is the need for rigorous agricultural structural transformation.
247. **In order to transform agriculture in Namibia, there is the need to raise agricultural productivity of smallholder farmers.** Increased productivity of farmers is essential to enhance household food security, as well as to eliminate poverty in the Namibian economy. In many parts of the world, particularly in Asia, growth in agricultural productivity has been rapid, largely as a result of the extensive adoption of new agricultural technologies such as irrigation technologies. However, Africa has the lowest irrigated area as a percentage of total cultivated area (6 percent) in the world. Irrigated land in Namibia is less than half of Africa's average. Therefore, expanding irrigation infrastructure in Namibia could increase the nation's food security by enhancing the productivity of smallholder farmers who mostly rely on rain-fed and subsistence farming, despite the country's huge potential to support irrigation development in its border rivers such as the Zambezi, the Okavango and the Kunene. Supporting irrigation development along these rivers could help transform the country's subsistence agricultural economy into a market-oriented economy, as well as enhance the livelihood of the over-70 percent of its population who live in rural areas.
248. **Agricultural transformation must focus on transforming the subsistence sector.** Evidence shows that subsistence farming in Namibia exhibits a significant yield gap, highly diversified production system and self-sufficiency-oriented production system. As a result, closing the yield gap, improving economic efficiency, and adopting technological change are believed to be the primary drivers of growth and transformation. This is achieved through improvements in policy and investment interventions, land markets and tenure security, irrigation development, research and extension services, transport infrastructure, and financing/credit.
249. **The African Development Bank has a key role to play in the structural transformation of agriculture in Namibia.** In the past, AfDB has been a major contributor to agriculture both in Namibia and Africa as a whole. In recent times, the Bank has scaled up investment and implementation of its Ten-Year Strategy, approved by its Board of Directors in 2016, and the High 5s priorities launched in 2015. The Bank has identified some priority areas, of which agricultural

transformation is the principal one. For this purpose, the Bank has designed the Feed Africa Strategy (2016–25). This Strategy aims to transform the agriculture sector with the ultimate objectives of ending hunger, improving lives, and creating wealth sustainably. As part of the Strategy, the Bank aims to achieve four ambitious goals: eliminating extreme poverty, eliminating malnutrition, developing Africa as a net food exporter, and moving the continent to the top of global agricultural value chains, where it has a comparative advantage (AfDB 2016a). Key enablers of the strategy were identified as: increasing agricultural productivity; promoting domestic value addition; creating an enabling environment for agri-business to develop and flourish; enhancing access to finance; ensuring inclusive, sustainable, and improving access to quality nutrition; and creating a partnership for Africa's agricultural transformation. Accordingly, for the next decade, the work of the Bank in the agricultural sector will be guided by the Feed Africa Strategy. Fortunately, Namibia has many prospects under the Feed Africa Strategy of the Bank. Therefore, the future area of focus of the Bank in Namibia is expected to concentrate on supporting the cereal and livestock sectors, particularly through promoting technology, catalyzing public and private investment and policy development.

7.2. Conclusion

250. **Namibia needs agricultural transformation in order to enhance its food security, eliminate poverty, and turn its national fortunes around.** By learning from the experiences of successful countries across the world, accompanied with greater investment in the agricultural sector through the support of development partners, especially AfDB, Namibia can accelerate agricultural as well as structural transformation. Improvements in policy and investment interventions, land markets and tenure security, irrigation development, research and extension services, transport infrastructure, and financing/credit are some of the ways the country can close its yield gap, improve economic efficiency, and successfully adopt technological change. Budgetary support for agriculture as espoused by the Maputo and Malabo Declarations, is crucial.

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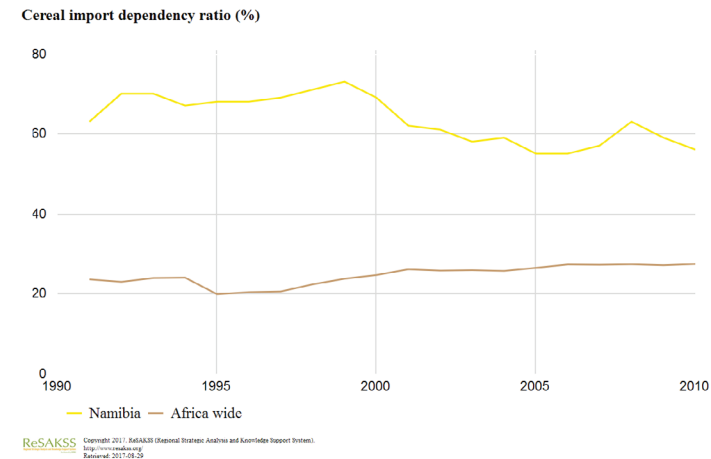
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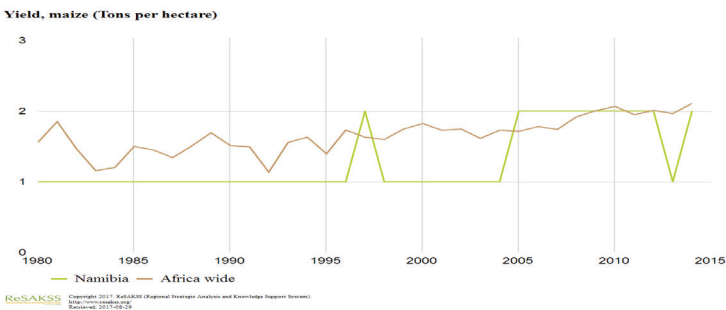
APPENDICES

Appendix I



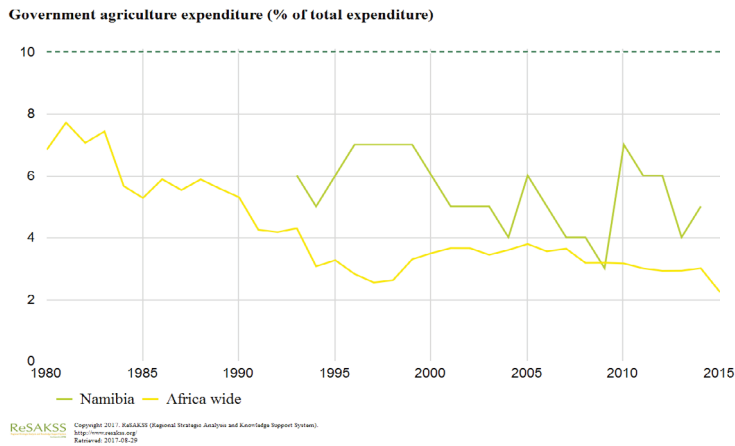
Source: Computed from Regional Strategic Analysis and Knowledge Support System (ReSAKSS) database

Appendix II



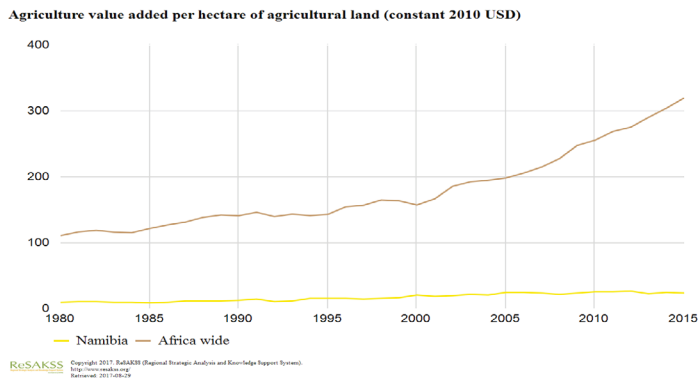
Source: Computed from Regional Strategic Analysis and Knowledge Support System (ReSAKSS) database

Appendix III



Source: Computed from Regional Strategic Analysis and Knowledge Support System (ReSAKSS) database

Appendix IV



Source: Computed from Regional Strategic Analysis and Knowledge Support System (ReSAKSS) database

PROMOTING INCLUSIVE AGRO ALLIED INDUSTRIALISATION: WATER AND INFRASTRUCTURE

By Dr. Vaino Shivute

1. INTRODUCTION

251. **In 2004, Namibia adopted Vision 2030, which spelled out the Namibian objective to be an industrialised country by 2030.** To achieve this vision, proper infrastructure is needed to support an industrialised economy: among others are a good transportation system consisting of roads, railway, harbours and air transportation. In addition, an extensive network of electricity infrastructure, reliable water supply infrastructure and a good communication network for the country are essentials for an industrialised economy.
252. **To be an industrialised country implies that the country must have industries operating at higher levels of technology.** One such sector that holds promise to lead Namibia to an industrialised state is the agricultural sector, given its important contribution to the Namibian economy. Agriculture contributes 3.8 percent to GDP on average but it supports more than 70 percent of the Namibian population and employ about 30 percent of the workforce in Namibia (NDP5, 2017).
253. **The agro-allied industry is relevant to development of any nation's economy and which Namibia cannot afford to be an exception.** Over time, all societies evolved from an agricultural base to a higher level of development with the emergence of industries, services and an improvement in basic economic infrastructure such as transport and communication. With the improvements in technology, the agricultural sector also tends to record improvements in productivity resulting in higher output per unit area than before.
254. **Water use in agriculture is at the core of any discussion of agricultural productivity and food security.** Due to population growth, urbanization, industrialization, and climate change, improved water use efficiency will need to be matched by reallocation of as much as 25 to 40 percent of water in water stressed regions, from lower to higher productivity and employment activities.
255. **Irrigation plays an important role in ensuring food security as it provides an important buffer to climate variability.** Given that irrigated agriculture is, on average, at least twice as productive per unit of land, provides an important buffer against increasing climate variability, and allows for more secure crop diversification, it is certain that irrigation will continue to play a key role in

ensuring food and nutrition security. Improving the efficiency of water use in agriculture will also depend on matching off-farm improvements with incentives and technology transfer for on-farm investments in improved soil and water management and improved seeds.

256. **The water that is currently utilised in Namibia comes from different sources.** Ground water forms a large component of the water utilised currently (60 percent), followed by surface water (40 percent). Surface water include water from perennial Rivers as well as the dams around the country that have been constructed to impound water for use. In recent years, desalination has been developed as a source of potable water for both domestic and industrial use. Going forward, desalination will increasingly play an important role, especially given the fact that Namibia is a dry country and the predictions about climate change is likely to impact Namibia negatively. For Namibia's coastal areas as well as further inland, desalination will play an increasingly important role going into the future.
257. *This paper focuses on the role played by the water infrastructure and other infrastructure such as roads, power, and communication and their contribution to the promotion of inclusive agro-allied industrialisation.*

2. AGRICULTURE WATER MANAGEMENT IN NAMIBIA

258. **There are areas in Namibia which are rich in underground water sources.** The area between Grootfontein, Tsumeb and Otavi is one of those areas. Mines that are operating in this area have to continuously pump out water to enable them to do mining. NamWater is currently drawing water from this area to supply Okakarara and the Waterberg area as well as Windhoek. Water is drawn from two disused mines at Berg Aukas and Kombat. Because of the underground water in this area, there are a number of farmers that are engaged in irrigation activities. The irrigation ranges from field crops to fruit and vegetables.
259. **Another area that is rich in underground water is the stampriet area.** This aquifer stretches all the way into Botswana. Stampriet is known for producing agricultural products which are irrigated from this ground water source. Farmers around this area engage in irrigation where they produce, grapes, melons, tomato onions and other vegetables.
260. **Recently, the Ministry of Agriculture, Water and Forestry announced the discovery of a new aquifer in the Oshana Region.** However, contrary to initial announcements that this aquifer has water to supply over a period of 400 years, the volumes that have been confirmed so far and which can be utilised on a sustainable basis are about 20 million cubic meters per annum and it is still work in progress. (From a verbal discussion with Mr. Abraham Nehemia, Deputy

Permanent Secretary for the Department of Water and Forestry). Studies are still ongoing to determine the extent of the water that can be abstracted on a sustainable basis as well as to verify the water quality across the aquifer.

261. **It is worth mentioning that the water consumed by the four northern regions of Omusati, Oshana, Oshikoto, Ohangwena as well as part of Kunene north come from the Kunene River.** Most of the underground water in these four northern regions are saline. The area has an extensive pipeline network to provide water to this most densely populated area of the country. Another area that has an extensive rural pipeline network is the Waterberg area around Okakarara.
262. **The towns of Rundu, Katima Mulilo, the Bukalo village as well as the Divundu settlement all get their water from the Okavango River.** Windhoek, Okahandja, Karibib, Rehoboth, Mariental and Keetmanshoop get their water from dams and the rest of the towns, villages and rural communities get their water from underground water sources.

2.1. Current Water Uses

263. **Average Water resources availability:** Namibia is a very dry country and often referred to as the driest country in sub-Saharan Africa. Rainfall in Namibia range from a few drops per annum in the south-west of the country to about 700mm per annum in the Zambezi Region, the area with the highest rainfall. The central part of the country where the capital lies get an average annual rainfall of about 300mm.
264. **All the perennial rivers are shared with Namibia's neighbours:** The Orange River in the south is shared with Lesotho, South Africa and Botswana. The Kunene River in the north-west is shared with Angola, the Kavango River is shared with Angola and Botswana. And the Zambezi River is shared with Tanzania, The DR Congo, Angola, Zambia, Zimbabwe, Botswana and Mozambique. Accessing water from the shared rivers has not been easy. There are River Basin Commissions that have been established which are responsible for the management of these Rivers. With population growth and increased economic activities along these rivers, the demand for water along these rivers will only increase in future and therefore each country will increasingly push for the maximum utilisation of water from these shared Rivers.
265. **The water in Namibia is used for various purposes, such as domestic consumption, mining, agriculture and tourism.** The table below show the various uses as well the volumes consumed. The table project future water use for the different sectors.

Table 1: Projected water demand for Namibia

Consumer Group	Demand in million m2 per annum				
	2008	2015	2020	2025	2030
Urban	66	80	91.1	103.5	117.2
Rural Domestic	10.3	10.6	10.9	11.1	11.4
Livestock	86.8	86.8	86.8	86.8	86.8
Irrigation	135.3	204.6	344.6	379.8	497.2
Mining	16.1	17.2	18.1	19.1	20.3
Tourism	19.6	27.5	31.9	35.2	38.9
Total	334.1	426.7	583.4	635.6	771.7

Source: IPPR, 2016

266. **From the above table, demand for irrigation water will increase significantly up to 2030.** Demand for urban, mining and tourism water will increase gradually while rural domestic demand will grow very slowly. Water for livestock consumption does not show any growth at all, suggesting that livestock numbers may stabilise in future.
267. **The Concept of Community Based Management of Rural Water Supply (CBM):** At independence, most of the water consumed in Namibia and supplied by government institutions was mostly subsidised, whether in urban or rural areas (M. Schnegg and T. Linke, 2015). Access to water by rural communities was below 50 percent at independence. After independence, government invested in rural water supply infrastructure, such that by 2011, the number of people in Namibia that had access to potable water was 80 percent, with 98 percent access in urban areas and about 65 percent access in rural areas. (National Census, 2011).
268. **Namibia embarked on a policy of Community Based Natural Resources Management (CBNRM) (M. Schnegg and M. Bollig) after the Rio Conference of 1992.** The Ministry of Environment and Tourism then embarked on a process of establishing conservancies which were managed by local communities with the initial assistance from the Ministry of Environment and Tourism.
269. **The Ministry of Agriculture, Water and Rural Development at the time embarked on a policy of Community Based Management of Rural Water Supply or in short, CBM. Through this policy, government decided to hand over water supply infrastructure in rural areas to communities to manage them.**
270. **A policy of full cost recovery was also adopted whereby end consumers were made responsible for the cost of supplying the water.** Part of the reason for doing this was that government decided to invest in water supply

infrastructure. It was realised then that given the investments that were being made coupled with the responsibility of operating and maintaining such infrastructure, it was clear that government was going to spend a substantial amount of money in the areas of operation and maintenance in addition to the investment made in water supply infrastructure. It was also around the same time that the then Ministry of Regional and Local Government decided on a policy of decentralisation. The aim was to decentralise some of the government services from the centre to the Regions and where possible to the lowest government and community structures. (Bock B. Falk T. and Kirk M., 2008).

271. **There was a concerted effort by the government to encourage communities to participate in the management of natural resources as well as to decentralise services from the centre to the lowest possible levels.** This approach required capacity building at local level, especially the institutional capacity. In the water sector, institutions that were established in areas with borehole water were slightly different from those in areas with rural pipelines.
272. **The principle was that government will invest in rural water supply infrastructure and the communities will be given the responsibility for operating and maintaining the water supply infrastructure.** Water point committees were established in areas with boreholes. These committees consist of community members who were entrusted with the responsibility of managing the water point. The Committee consisted of the chairperson, a treasurer a caretaker who will look after the water point and other members of the committee. The responsibility of the committee is to manage the water point, collect money to buy diesel to pump water as well as for the repair of the pump when the need arises. The Water Point Committee made the rules for the water point which members of the water point must adhere to. The care taker was expected to look after the water point and to do first line maintenance.
273. **In areas with rural pipelines, the setup was such that a Water Point Committee was established at the water point.** The water point normally has a plastic water tank on a stand, a trough where livestock can drink and a tap where people draw their water for household consumption. The water point is used by households in the vicinity of the water point and these households make up the membership of the water point. The Water Point Committee has the responsibility to manage the water point, collect the money to pay the account and make the rules for the water point which members of the water point are expected to adhere to. There are normally several Water Point Committees on a branch line.
274. **A Local Water Association is normally established to manage all the Water Point Committees along that Branch line.** The Local Water Association has the responsibility to produce water bills and hand them to each of the Water

Point Committees along the Branch line under its management. The Water Point Committees in turn collect the money from each household that make up the membership of the water point to enable the Committee to pay the water bill presented to it by the Local Water Association. Each Local Water Association is required to open a Bank account where the money is deposited. The money in the account is paid to NamWater at the beginning of every month. NamWater in turn bill the Local Water Association which is responsible to pay the water bills from NamWater.

275. **This system was functional until in 2013 when the Local Water Associations in the Cuvelai went on strike demanding to be paid for the work they do.** The original understanding reached with the communities was that they will do this work on a voluntary basis without payment. Since these Local Water Associations went on strike, the system has not been functioning as envisaged. A lot of money is locked up in the accounts of these committees and the money does not reach NamWater. Efforts are underway to try and address this problem. In the meantime, some individual households have moved away from the Water Point Committees and applied to NamWater to be connected directly to the NamWater system.
276. **In the Waterberg area which has the second largest pipeline network in the country after the Cuvelai, the system evolved differently.** After the establishment of the Local Water Associations and the Water Point Committees in the mid-nineties, the communities in the Waterberg area were reluctant to pay the water bills from the Local Water Associations and Water Point Committees. Communities in this area preferred to have their own individual connections for which they will take responsibility. They requested government to close the Community Water Points and in turn give each individual household its own private connection. Government acceded to this request and starting from 2005 onwards, the Ministry of Agriculture, Water and Forestry with the financial assistance from the Kingdom of Belgium started to close the Water Points and installed individual connections to each household that had applied to be provided with an individual connection. This changeover also included a rehabilitation of the system in this Area.
277. **When the system of Water Point Committees was operational in the Waterberg area, communities were reluctant to pay for the water.** They argued that the system was not fair and equitable as households with more cattle often pay the same amount of money per month as households with few cattle, for water consumed. However, when the system was changed to individual connections, payment did not improve. The main reason for this was that the debt owed by the Water Point Committees were divided up using a certain formula and each individual household got a share of the debt owed. Thus each individual household started off with an amount that it owed. This

discouraged the individual households from paying because the amounts owed were quite high and they argued that they could not afford to pay such amounts. Thus, the Waterberg area is facing a challenge regarding the payment for water.

278. **There does not seem to be a clear solution available.** Communities in this area have demanded the debt to be written off. However, this will create a precedent. Communities in other areas, notably the Cuvelai and even communities served by boreholes where they are currently struggling to pay for their water may demand the same treatment. Both the Ministry of Agriculture, Water and Forestry and NamWater are mulling over this issue to try and come up with a long term solution.

2.2. Rural Water Pricing

The pricing system applicable to rural communities can be viewed in **two ways**.

- Payment for water from boreholes in rural areas
- Payment for water from pipeline systems

279. **In areas where rural communities are depended on boreholes, government drilled and equipped the boreholes with government funds and those boreholes were then handed over to the communities for operation and maintenance purposes.** There are boreholes that have pumps that run on diesel. There are other communities that have taken over boreholes that are operated by a windmill. Communities that have inherited boreholes that run on diesel will have to collect money from the community around the water point to buy diesel monthly. In addition, the community is expected to repair the pump whenever there is a breakdown. This is quite a responsibility for these communities. It has been argued that the way money is contributed enable the poor to subsidise the rich (Neef, A. 2009)

280. **In areas where there are rural pipelines, the setup is slightly different.** NamWater sends a bill to a particular Local Water Association in charge of a branch line. The Local Water Association will split up the bill and send it to all the Water Point Committees along that Branch line for payment. The tariffs charged by NamWater are approved by Cabinet. A submission is normally produced by management and submitted to the Board of Directors. Once the Board of Directors approve the proposed tariffs, the submission is passed on to the Minister of Agriculture, Water and Forestry for his consideration. The Minister, after applying his mind on the matter will then submit it to the Treasury Cabinet Committee (TCC). This Committee will consider the submission and submit it to Cabinet for final approval.

281. **Cabinet has laid down principles that must be used by NamWater to set its tariffs.** These principles are contained in what is called the Lund Report (2008).

Once Cabinet approve the proposed tariffs, they are gazetted and implemented. These are bulk water supply tariffs used by NamWater to sell water to bulk customers such as Local Authorities. The Local Authorities will then use the NamWater tariff, put a mark-up and sell the water to customers within its area of jurisdiction. Local Authorities are entitled to use a mark-up because they have their own reticulation systems that they use to supply water to their customers. In addition, they employ people to operate these systems and these people are paid. Thus Local Authorities invest in their own reticulation systems, they are responsible for the operation and maintenance of such systems and this cost them money.

282. **On the other hand, the bulk water supply tariffs are also applicable to the rural communities who get water from the NamWater pipeline systems.** Because of the responsibility given to the Local Water Association to collect money and deposit it in a Bank account, the communities, in consultation with officials from the Ministry of Agriculture, Water and Forestry have decided to put a mark-up of N\$1.00 per cubic meter. This money is used by the person responsible for taking the money to the Bank to pay for a taxi to and from the town where the account must be paid. The latest gazetted tariffs are referred to information (2016/17).

3. THE IMPORTANCE OF WATER FOR AGRO-INDUSTRY IN NAMIBIA

283. **Irrigation is key to produce a crop successfully.** The perennial rivers together with the underground water that can be used for irrigation purposes successfully must be utilised to the maximum benefit of Namibia but in a sustainable manner. It is only through irrigation that suitable crops can be grown successfully in Namibia. And it is the success of irrigation that will underscore and support any processing industry that can be developed in Namibia. Without irrigation, it will be difficult to contemplate a successful agro-processing industry in Namibia, especially for vegetables. As for cereals, the country can import, and is importing cereals for processing, but it will not be viable to import vegetables for processing.

3.1 Trends in Irrigated Areas

284. **With the establishment of the green scheme by the government, this area continued to make a contribution to the local production of fruit and vegetables.** The green scheme is not confined to a particular geographical area. The green scheme concept covers areas in the country where production takes place under irrigation. Therefore, the Naute, Hardap, Etunda as well as the irrigation schemes along the Orange, Kavango and Zambezi Rivers are part of the green scheme as well as the areas around Tsumeb, Otavi and Grootfontein.

285. The government has established Agencies that operate in the area of production and marketing of agricultural produce. Agribusdev is an agency that is responsible for the production of agronomic products and was put in charge of all government irrigation scheme under the Ministry of Agriculture, Water and Forestry. Agribusdev is responsible for the following schemes:

Table: 2 Irrigation Schemes under the responsibility of Agribusdev

Farm Name	Farm Size (ha) Fenced Area	Region
Etunda	1 200	Omusati
Hardap	210	Hardap
Kalimbeza	229	Zambezi
Mashare	380	Kavango East
Musese	1 443	Kavango West
Ndonga-Linena	1 000	Kavango East
Orange River Irrigation Project (ORIP)	600	//Karas
Shadikongoro	590	Kavango East
Shitemo	1 000	Kavango East
Sikondo	1 000	Kavango West
Uvhungu-Vhungu	825	Kavango
Total	8 477	--

Source: Agribusdev, Annual Report, 2016

286. Agribusdev is an agency under the MAWF and its employees are employed by the MAWF and it is funded from the MAWF budget. It manages the irrigation schemes, but it can also enter into arrangements whereby private companies can be allowed to manage a particular irrigation scheme. The private company pay rent to Agribusdev and it is allowed to engage in production on that particular piece of land.

287. The MAWF has also created a marketing Agency called Agro-Marketing and Trade Agency (AMTA). This agency is responsible for the marketing of agricultural products. (AMTA Strategic Plan, 2014-2019). It buys products from Agribusdev as well as private farmers. It is in charge of the Fresh Produce Hubs in Ongwediva and Rundu. It is also managing the strategic grain reserves and buys grain from farmers around the country. Both Agribusdev and AMTA have the potential to promote agro-industries in Namibia.

288. The government is in the process of constructing the Neckertal dam along the Fish River in the Karas Region, west of Keetmanshoop. This

dam is scheduled to be completed before the middle of 2018. At the present moment, the Hardap dam near Mariental is the biggest dam in the country with the capacity of just under 300 million cubic meters. The Neckertal dam is going to be about three times more the size of the Hardap dam, making it the biggest dam in Namibia. This means that when full, the Neckertal dam will store a considerable volume of water. One can also assume that it will take a long time to fill up.

289. The main purpose for the construction of the Neckertal dam is irrigation.

The intention is to establish an irrigation area of about 5000 hectares and put it under irrigation. Agribusdev is expected to manage this irrigation scheme by engaging in production directly. But Agribusdev also has the mandate to lease out the land to private companies to produce. The Green Scheme policy also makes provision for the inclusion of small and medium scale farmers to be accommodated on the scheme and to be supported by Agribusdev with services.

290. In addition to the irrigation areas under the Green Scheme, there are areas where private farmers are producing as part of the Green Scheme.

These farmers are at the Orange River, the Hardap Irrigation Scheme, and the area around the Tsumeb, Otavi and Grootfontein triangle. These private farmers make a significant contribution to the Green Scheme and this production can also make a contribution towards agro-industries in the future. Thus, the areas under the Green Scheme as well as the private farmers form the basis for the development of agro-industries in Namibia. However, there is need to increase the area under irrigation in Namibia for both food security purposes as well as to strengthen the basis for the development of agro-industries in Namibia. One area with the potential to increase the irrigation area in Namibia is through the water that Namibia gets from the Kunene River.

291. There is an existing agreement between Namibia and Angola which make provision for Namibia to abstract 6 cubic meters per second from the Kunene River. (1969 Agreement).

At the moment, Namibia is abstracting an average of 2 cubic meters per second. One needs to give context to these figures as follows: The 6 cubic meters per second means that Namibia is entitled to draw about 189 million cubic meters per annum. And the current 2 cubic meters per second means that the country is only withdrawing about 63 million cubic meters per annum. This is about a third of what the country is entitled to. The implication here means that Namibia can actually set up at least two irrigation schemes the size of the Etunda irrigation scheme in the north. This will enable the country to produce more crops under irrigation. It will also enable Namibia to claim its fair share of the water from the Kunene River. In terms of international protocols, a country can only claim its fair share of a shared River by utilising the water.

292. **Namibia must invest in irrigation infrastructure to enable it to claim its share of the Kunene River water:** The areas referred to above have water that can be used for irrigation purposes to produce fruit and vegetables and even field crops. The most important issue to consider here is to ensure that production takes place under irrigation wherever there is water that can be used for irrigation purposes. In order to maximise the use of water, there is need to look at irrigation technology that will ensure that less water is utilised for an area that is as large as possible.

3.2 Water Irrigation Technology

293. **Given the fact that Namibia is a very dry country, it is important that the country adopt the right type of technology when it consider investing in irrigation technology.** There are a number of irrigation technologies available and we shall look at these technologies below.

- a. Flood or furrow
- b. Sprinkler Irrigation
- c. Centre Pivot Irrigation
- d. Micro Irrigation
- e. Drip Irrigation

a. Flood or Furrow Irrigation

294. **Flood Irrigation is the oldest method of irrigation technology.** It is a method whereby water is delivered to the field through furrows that have been prepared in the area to be irrigated. The field is prepared in furrows and the crop is normally planted on the elevated part of the field and the water flows in furrows between these elevations. Water is brought to the field either by a ground channel or by a pipe that deliver the water into the furrows. The following advantages and disadvantages of furrow irrigation was taken from: ([http//](http://)



www.agrotechnomarket.com/2016/05)



Furrow Irrigation

Advantages of Furrow Irrigation

- Lower Initial Investment cost
- Lower pumping cost per area of water pumped
- Furrow irrigation practice can minimise irrigation costs and chemical leaching and result in higher crop yields

Disadvantages

- An accumulation of salinity between furrows
- The difficulty of moving farm equipment across the furrows
- The added expense and time to make extra tillage practice (furrow construction)
- An increase in the erosive potential of the flow
- The need to level and remove any small hills that would have been bypassed by gravity flow of the water because of the difficulties of furrow irrigation in ensuring uniform dispersion of water over the field
- Generally, furrow systems are more difficult to automate, particularly with regard to regulating an equal discharge in each furrow.

b. Sprinkler Irrigation

295. According to Wikipedia, “an irrigation sprinkler is a device used to irrigate agricultural crops, landscapes, golf courses, and other areas. They are also used for cooling and for the control of airborne dust. Sprinkler Irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. This system is more useful in areas where land is not uniform and sufficient water is not available. The pump, pipes, and sprinklers are generally designed to apply water as uniformly as possible”

296. The sprinklers are either attached to pipes that have been laid in the

ground or they may also be attached to pipes that are above ground. When the pipes are above ground, this is referred to as the dragline system. These pipes have to be moved around the field to ensure that the whole field is covered and it is quite labour intensive. According to literature, sprinkler irrigation can be up to 75 percent more efficient compared to flood irrigation (Slabbert, M.J.). This means that water is saved and less water can be used on more land, for Namibia's arid environment, this is positive. The following advantages and limitations of sprinkler irrigation was taken from the following website:

(<http://www.agriinfo.in/default.aspx?page=topic&superid=8&topicid=2259>)

Advantages of Sprinkler Irrigation

- Suited to a complete range of topographies and field dimensions.
- High irrigation efficiency due to uniform distribution of water
- Accurate and easy measurement of water applied
- Land levelling is not essential
- Soluble fertiliser, herbicides and fungicides can be applied in the irrigation water economically and with little extra equipment
- More land is available for cropping
- No interference with the movement of farm machinery
- Easy to operate, operator can be trained quickly

Limitations of Sprinkler Irrigation

- It requires high initial investment
- Power requirements is usually high since sprinklers operate with more than 0.5 kg/cm² pressure
- Fine textured soils that have low infiltration rate cannot be irrigated efficiently in host windy areas
- Loss of water due to evaporation from the area during irrigation
- The water must be clean and free of sand, debris and large amounts of dissolved salts.
- Wind distorts sprinkler pattern and can use uneven distribution of water
- Ripening of soft fruit must be protected from the spray

c. Centre Pivot Irrigation

297. Centre Pivot Irrigation also called water wheel and circle irrigation is a method of crop irrigation in which equipment rotates around a pivot and crops are watered with sprinklers. The area of field covered by the centre pivot irrigation is largely dependent on the length of the machine employed. A variant to the centre pivot is the lateral move system. This system operates on the same principle as a centre pivot, the only difference is that the centre pivot rotates around the pivot whereas the lateral move system is not anchored and both ends of the machine move at a constant speed up and down a paddock in straight lines. The advantages and disadvantages of a centre pivot listed

below are taken from the website: (<http://agriculture.vic.gov.au/agriculture/farm-management/soil-and-water/irrigation/>)

Below is a picture of a centre pivot

The picture below on the left show a centre pivot at work while the picture on the right show an aerial picture of an area irrigated by a centre pivot



Advantages of Centre Pivot Irrigation

- It can be used to irrigate long distances with the only limitation that surface topography should be flat.
- Precise application: the system is designed to apply volume of water to match crop water requirements.
- If the system is designed to match soil characteristics, it can reduce the opportunity for surface water runoff or deep percolation
- The reported application efficiencies for new well designed machines are generally over 80 percent
- Labour requirements are generally lower than surface irrigation systems
- Fertigation allows the targeted application of small quantities of nutrients, with reasonable uniformity of application and less risk of nutrient losses
- The system can work on rolling topography.

Disadvantages of Centre Pivot Irrigation

- The systems have a relatively high capital cost compared to surface systems
- The operation and maintenance cost can also be high
- The system requires some form of energy source to operate, either electric or diesel
- Water may have to be filtered before use to prevent system blockages with sediments
- Operation and maintenance will require different set of skills compared to those required for surface irrigation systems

d. Micro Irrigation

298. **Micro irrigation involves the use of small, low volume sprinklers called micro-sprinklers on farm irrigation systems that irrigate orchards, and vineyards.** In most cases, the micro sprinkler is installed at the base of a tree to water only that tree. In some cases, the micro-sprinkler is installed between two trees. Water can be provided from tubes which are either above ground or buried. (ATS Irrigation Inc.). Micro irrigation has also been defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery system. In the literature, drip irrigation is also referred to as micro irrigation. But for the purposes of this paper, we adopt the first definition above of micro irrigation. The advantages and disadvantages below are taken from a paper titled "Micro irrigation Systems by Schwankle L.J.



Micro Irrigation at work

Advantages of Micro Irrigation

- They provide a high degree of water application uniformity, often the highest of all irrigation systems.
- They allow excellent control of the amount and timing of irrigation.
- They can easily irrigate irregular terrain
- Weed growth is minimised since only a portion of the ground is wetted

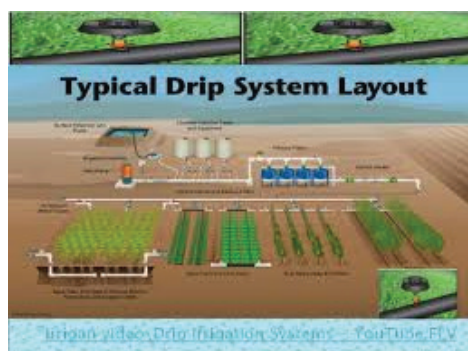
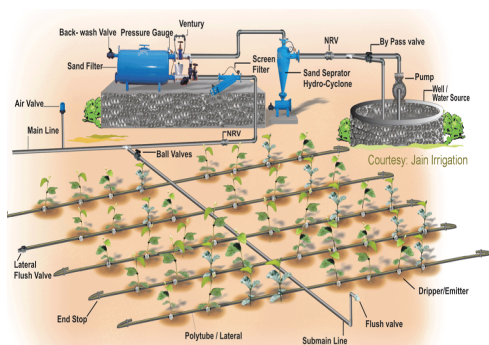
Disadvantages of Micro Irrigation

- High initial cost of the system
- Excellent management is needed to maintain the system since clogging of the emitters by physical particles, organic materials, and/or chemical precipitates may occur

- The irrigation water must be pressurised resulting in high energy cost
- Cover crops cannot be grown year-round due to the localised nature of the water applicators

e. Drip Irrigation

299. **Drip irrigation is an irrigation method that applies water to the crop root zone using polyethylene tubing.** The tubing come in different diameters and thickness. The thickness of the tubing is directly related to its durability. Small holes called emitters are usually spaced along the length of the tubing. During irrigation, pressure forces the water out of the emitters drop by drop. Once water is in the soil, its movement and wetting pattern will depend on the physical characteristics of the soil (University of Nebraska, 2005).



Advantages of Drip Irrigation

- The system has the potential to be the most efficient irrigation method available to date
- The system has the potential to save water because less water is applied compared to other systems
- The system can be used to apply small and frequent volumes of water and nutrients which has the potential increase the yield

- After installation, the labour requirements is similar to that of a centre pivot and much less than for surface systems
- The system adapts well to a field of any size and shape.
- The system operates at a relatively low pressure. Because of the low pressure, the energy requirements are also low.

Disadvantages

- Initial investment cost is high
- Water obtained from a shared water system where the farmer has no control may have the potential to result in water shortages.
- Management time for this system can be higher than for other systems
- Emitters can clog up
- Rodents can damage the tubing
- Soil salinity above the tubing can increase with time

3.3 Cost Comparisons of some of the irrigation technologies

300. Information could not be available to enable a comparison of the irrigation technologies described above in full. The cost comparisons that are made below are based on the information that was available. Cost comparisons between drip, micro and furrow irrigation systems.

Table: 3 Costs comparisons of drip, micro and furrow irrigation systems in South

African Rands

Irrigation system	Drip	Micro	Furrow
Type of crop	Oranges	Oranges	Sugarcane
Initial investment	200 000	277 586	132 012
Annual fixed costs	28 510	39 817	17 764
Annual operating costs	36 957	38 980	106 375
Annual fixed plus operating costs	65 467	78 797	124 139

Source: L.K. Oosthuizen et al, 2005

301. In the above table, costs comparisons were made for three irrigation systems, drip, micro and furrow for two types of crops. The investment costs for micro was highest followed by drip, and furrow was relatively cheaper. This pattern is reproduced for annual fixed costs. However, annual operating costs for furrow was highest while that for micro and drip were relatively close. This work was taken from L.K. Oosthuizen et al, 2005.

302. In a slightly different comparison, MJ Slabbert looked at irrigation system efficiency in Mpumalanga, South Africa. He looked at efficiency as to “how efficient the whole system is from the point of extraction to the plant’s root

zone. Thus, what percentage of the volume pumped reaches the root zone and stays in the root zone, without moving through to deeper layers in the soil." The results look as follows

Table: 4 Comparison of irrigation systems efficiency

System	Efficiency
Dragline	50%
Pivot (wobbler)	75%
Floppy	75%
Drip	95%

Source: M.J. Slabbert, Transvaal Suiker Boerdery

303. Clearly, dragline is low in efficiency, while drip is very efficient with pivot and floppy in between. He then went on and compared the same systems in terms of cost per hectare and cost per area.

Table: 5 Costs comparisons per hectare and per area for the different irrigation systems

System	Efficiency	Cost per hectare	Cost per area
Dragline	55%	R349	R10 472 727
Pivot (wobbler)	75%	R256	R 7 680 000
Floppy	75%	R256	R 7 680 000
Drip	95%	R202	R 6 063 158

Source: M.J. Slabbert, Transvaal Suiker Boerdery

304. **From the above, it is clear that drip irrigation is very efficient and this is the system that must be considered seriously in dry environments such as Namibia, assuming that one can afford it and have the skills to manage it.** Here one will have to look at drip irrigation and sprinkler technology that minimise the use of water.

3.4 How Irrigation Technology relates to agro-processing

305. **Given the dry Namibian environment, it will be advantageous if one can put the largest area under irrigation using a minimum amount of water.** It will also be necessary to look at high value crops that can be put under irrigation, they will add more value to the economy and put more money in the pockets of the farmers. High value crops will ensure that the contribution of the agriculture sector to the overall economy is increased. By putting the largest

area possible under irrigation will ensure that the maximum amount of crops is produced in the country.

306. **By producing a higher volume of crops will ensure that any agro-processing facility that comes into operation will be assured of material input from the irrigation scheme.** Higher volumes will also encourage the start-up of new processing facilities that will utilise the crops that will be produced. When a higher volume of crops is produced locally, that will ensure that local demand is met and for certain crops, the surplus can be processed. Processing should be encouraged because it will add value to the crops. Processing also ensures that processed products are available during the off-peak season.
307. **The availability of water as described above will ensure increased production of agricultural crops.** By using the right technology, less water can be used to irrigate a larger area of land and to produce more crops with less water. It is also important that any processing facilities to be established must be done as close as possible to the production area to minimise transport and handling cost. It is a well-known fact that Israel is a dry country, but it has developed and perfected irrigation technology that has made it a crop exporting country.
308. **Israel exports oranges, tomatoes and other high value crops.** The technology is available and Namibia must simply acquire the technology and put it to good use. Thus, the volumes of water that Namibia has at its disposal can enable the country to establish a viable crop sector, producing more than enough to meet local demand in specific crops that can be grown locally and to produce for processing industries after the local demand for fresh produce has been met.

3.5 Policy Implications

309. **The different irrigation technologies considered above provides a clear indication of the performance of different irrigation systems.** This means that measures must be put in place by the government to encourage farmers to use less water by adopting the most appropriate technology that saves water. The following measures can be considered.
- Outlaw flood or furrow Irrigation which use a lot of water with a phasing out period of 5 to 8 years.
 - Give farmers tax incentives when they purchase equipment that saves water. Initial investments for these systems are quite high
 - Adjust the water tariff upward so that the tariff can act as a deterrent against using a lot of water. This will encourage the farmers to switch to the new technology
 - Put in place a campaign that promote the use of water efficient technology and to sensitise farmers about the virtues of water efficient irrigation systems.

The above mentioned measures can be applied in combination or apply one at a time.

4. WATER GOVERNANCE IN NAMIBIA

310. **The issue of governance is becoming increasingly important in many aspects of our lives.** When one mention corporate governance, it reminds us of the series of King Reports that have been produced which spell out what ethical conduct and behaviour is expected from companies. The UNDP defines governance as follows:
311. *“The exercise of political, economic and administrative authority in the management of a country’s affairs at all levels. Governance comprise the complex mechanisms, processes and institutions through which citizens and groups articulate their interests, mediate their differences, and exercise their legal rights and obligations”* (UNDP, 1997, quoted from the IIED document authored by C. Batchelor)
312. **In the area of water, issues regarding the governance of water are becoming increasingly important.** In Namibia, the government has adopted a policy of Community based management of Rural Water Supply or CBM. Furthermore, a policy of decentralisation was adopted which ensured that decisions are devolved to the lowest possible level for decision making. CBM entails the direct involvement of communities in water supply issues that affect them on a daily basis.
313. **Batchelor quoted a definition of water governance from Rogers and Hall, 2003; as follows:** *“Water governance relates to the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services at different levels of society”*
314. **He also quoted another definition by Moench et all, 2003; as follows:** *“Water governance is the set of systems that control decision-making with regard to water resources development and management. Hence water governance is much more about the way in which decisions are made than the decisions themselves”*
315. **At independence, Namibia inherited a water act from South Africa, Act no 54 of 1956.** This Act was the basis upon which water supply in Namibia was based until recently. It was replaced with the Water Resources Management Act, Act no 11 of 2013. This act made provision for the establishment of the following institutions:
 - Water Advisory Council
 - Water Tribunal

- The Water Regulator

316. **The new act emphasises the issue of community based management.** The Ministry of Agriculture, Water and Forestry also produced a policy document on Integrated Water Resources Management. According to Schnegg, (2016); “Starting in the early 1990’s, water governance in rural Namibia has profoundly changed. After independence, and in accordance with global environmental policies, it became a central theme of Namibia’s environmental legislation to transfer responsibility, costs, and benefits of resource management to local user associations.”
317. **In the water sector, emphasis was also placed on community based management of rural water supply.** The general thrust here was to transfer responsibility from the centre and vest it in communities. This approach was aimed at improving governance of the natural resources at local level. The government also put the responsibility to pay for the cost of receiving a service like water on the communities. This was received with mixed feelings. There have been cases where both government and NamWater were taken to court because the plaintiff claimed that they could not take their medication because they could not afford to pay for water in Windhoek. This approach was supported by some NGO’s who argued that water is a human right and it must be provided free of charge. (LaRRI), 2004). NamWater argued that it has a mandate to operate on commercial principles and to supply water based on full cost recovery principles. This debate has not been resolved as yet and is still continuing.
318. **NamWater argued that if there are people that cannot afford to pay for water, it is the responsibility of government to support them through a subsidy to enable them to buy water.** The NamWater Act makes provision for the government to subsidise communities who cannot afford to pay for water with money appropriated by parliament. The government has accepted this responsibility and cabinet has taken a decision to subsidise households that cannot afford to pay for their water. The Ministry of Agriculture, Water and Forestry and NamWater were tasked to work out the modalities of implementing such a subsidy. The challenge facing the Ministry and NamWater is to determine as to who is poor. This is not an easy task, if the subsidy has to reach those who genuinely deserve it.

5. THE ROLE OF INFRASTRUCTURE IN PROMOTING INCLUSIVE AGRO-ALLIED INDUSTRIALISATION

319. **The National Development Plan No. 5, under the heading: “Expansion and**

Modernisation of physical Infrastructure” state the following: “Infrastructure enables economic growth and is the bedrock for better living conditions. Energy, Water, Transport/Logistics, ICT, Research and Innovation are the vital forces that support structural transformation and value-added industrialisation. During the NDP5 period, sustainable investments in infrastructure will be prioritised and sequenced to support industrialisation and export development.” This section shall look closely as to how different types of infrastructure can support industrialisation and specifically agro-industrial development.

5.1 Transport Infrastructure

320. Namibia is a vast country with an area of 824 000 km² but a small population of 2.1 million. This means that average population density is low with vast areas uninhabited. But as a country, it is essential that investments are made in the transport infrastructure to support economic development.

a. Railways

321. The railway coverage in Namibia is generally good, running from north to south and from east to west. Railways play a very important role in any economy. It is costly to establish a railway and its associated infrastructure, but once it is in place, it helps with the transportation of goods, especially heavy goods. It also helps with the transportation of passengers. The utilisation of railways take the pressure off the road network and make it much safer, because most of the big trucks will not be on the roads, as the cargo that they need to transport will be on the trains.

322. Railways are a safe mode for the transportation of cargo. In developed economies, one can make use of refrigerated containers on the train to transport perishable goods such as agricultural products. It is also safer and more convenient to transport things such as fuel on the train. Given the long distances in Namibia, a train can transport a lot of cargo and weight does not have the same limitations on the train as on the road. Namibia therefore need an efficient and functioning railway network.

323. At the moment, the railway transportation system in Namibia is not utilised to its maximum capacity. The railway network is old and needs to be rehabilitated. The rolling stock needs replacement in such a way that it caters for the needs of different customers. For example, heavy cargo such as cement, sugar, beer, fuel and machinery, etc. must be transported on the train to make our roads safer and to reduce the crowding of the roads by heavy trucks. It will also extend the lifespan of our roads and reduce the maintenance cost because the number of vehicles on the roads will be reduced by the number of trucks that will stop using the roads.

324. **Agriculture will benefit from the use of railways.** Livestock that must be transported to the markets can be loaded on the trains. If one looks at the location of the main abattoirs at the moment, which is Windhoek and Okahandja, they are reachable by train. If the railway is rehabilitated, farmers may have to transport their animals for short distances to take them to the nearest railway siding, but they will benefit from using the railways. Adjustments may have to be made from the railway side to accommodate the need of their customers in terms of handling different types of cargo. A good functional railway network is essential to any economy.
325. **Perishable agricultural products can also be transported by rail.** Areas that may benefit from this are the green scheme farmers in the area around Tsumeb/Otavi/Grootfontein. There is a railway running through this area to Windhoek. The government is in the process of building a third fruit and vegetable hub in Windhoek where farmers can take their products for sale. Farmers at the Hardap irrigation scheme can also make use of the railway that runs from Mariental to Windhoek. Farmers at Stampriet can transport their products by road to Mariental and from there put them on the train to Windhoek and other markets. Unfortunately, the green scheme farmers along the Kavango River as well as at Etunda and Olushandja will not be in a position as yet to make use of railway transport. With the further extension of the railway network in Namibia, areas such as the green scheme projects along the Kavango River can benefit from rail transport.

b. Ports/Harbours

326. **Namibia has two main harbours along the Atlantic Ocean, Walvisbay, the main port and Lüderitz, the secondary port.** The Harbours are important to the economy because they handle import/export cargo for Namibia as well as cargo that comes from and to the landlocked neighbouring countries of Botswana, Zambia, Zimbabwe, and even as far as the DR Congo. Our northern neighbour Angola also make use of the port of Walvisbay. It has been argued that the major ports in South Africa of Durban and Cape Town are congested and neighbouring countries have been looking for alternatives to handle their import/export cargo.
327. **Namibia has positioned itself to cater for the need of the neighbouring countries and has even gone to the extent of entering into agreements to provide dry dock facilities for these landlocked neighbouring countries.** By providing this service, Namibia generate revenue in the process, provide employment locally and has the potential to build up a reputation as a country that deliver an efficient and competitive service. Such a service can eventually be used to export agricultural produce but it can also be used to export and import agricultural products of neighbouring countries. The perishable nature of

agricultural products requires a speedy and efficient service.

328. **The port of Walvisbay is mainly used to export and import products for the neighbouring countries mentioned above.** The port is currently being expanded to be able to cater for larger ships as well as to increase the volume of cargo handled by the port. Walvisbay is home to most of the fishing companies that do business there and export their fish to the EU through this port. Agricultural products such as maize and wheat that is imported from outside are handled through the port of Walvisbay. Most of the fuel imported to cater for the need of the Namibian economy, is imported through the port of Walvisbay. The fuel storage depot that will handle the bulk of the imported fuel is under construction there and will play a very important role within the economy.
329. **Lüderitz in the south, is a smaller port, but it still plays a significant role within the Namibian economy.** Lüderitz is home to some of the fishing companies that operate from there. It is also used to export zinc that is mined at Rosh Pinah by both Scorpion Zinc mine and the Rosh Pinah mine. The zinc is currently transported by truck to Lüderitz making use of road transport to export it. The farmers at Aussenkehr farm next to the Orange River are currently exporting their table grapes to the EU through the port of Cape Town. However, if proper facilities are developed in Lüderitz for the handling of table grapes, the farmers can be persuaded to make use of the port of Lüderitz to export their products.

c. River Transport

330. There are four main perennial Rivers in Namibia, the Orange, Kunene, Kavango and Zambezi. Rivers. Transport by River is not very much developed in Namibia.
331. **The Orange, Kunene, Okavango and Zambezi Rivers:** The characteristics of these three rivers are such that they do not lend them easily to normal river transport especially cargo. These rivers are navigable for short distances for sports purposes or tourism by small boats. The Okavango River is also used for local transport using local boats made from tree trunks. During the dry season, these rivers are normally quite shallow. Namibia and South Africa intend to construct a dam in the lower Orange River. This was initiated by Namibia and will enable a dam to be constructed along the Namibia/South African border. Namibia will have joint control with South Africa over this dam.
332. **The Zambezi River is navigable.** It only runs along the Namibian border for a short distance. The River is mainly used by tourist operators to ferry around

tourists to look at the local scenery for short distances. Even though a number of green scheme projects are stationed next to some of the perennial Rivers such as Kavango, Zambezi and the Orange River, these projects will not be in a position to use these Rivers as a means of transport because of the location of the markets where to produce must go to. The markets are inland and not along the Rivers.

d. Air Transport

333. **Air transport in Namibia is in the process of development.** Although the country has vast distances, the small population is not always conducive to support the use of some of the routes. The main carrier is Air Namibia which is a company owned by the government. It operates a limited international, some Regional routes, mainly to neighbouring countries of South Africa, Angola, Zambia, Zimbabwe and Botswana. It is the major operator on the domestic routes with some scheduled flights to Ondangwa, Rundu, Katima, Walvisbay and Luderitz. The main purpose of flying the domestic routes is to provide a passenger service to mainly government and business people who would like to get quicker to their destinations because of the long distances.
334. **Despite the fact that Air Namibia only flies to certain destinations in Namibia, all the major towns in Namibia have landing strips, enabling smaller planes to land there.** There is a thriving private operations that is being run from Eros Airport, which is the suburban airport in Windhoek, used to land planes of a certain size. There are a number of private companies operating mainly smaller planes to ferry business people, government officials and tourists to different parts of the country. Eros Airport is convenient because it is closer to town and quicker to get to. Air Namibia operates from Eros and the Hosea Kutako International Airport.
335. **Air transport is essential for an industrialised country.** Local air transport has been picking up slowly, through the scheduled flights of Air Namibia but also through the private local charters. But because, the population is small, it is unlikely to see large numbers in the near future making use of air transport.
336. **Making use of air transport also imply that people using it have disposable income above a certain threshold, that will allow them to do that.** To encourage the use of air transport, there is need to grow the economy to grow the disposable income of Namibians, which among others will enable them to make use of air transport, both passenger and cargo. Air transport may be useful once the country start exporting perishable agricultural products.

5.2 Energy Supply

337. **Namibia is not self-sufficient in energy supply.** The country imports more

than half of its electricity needs. According to NDP5, *“Lack of access to energy remains a critical barrier to poverty alleviation and industrialisation efforts. In 2015, sixty-three percent of the energy requirements in Namibia was imported from neighbouring countries. The maximum electricity demand is around 656 MW while at most only 484 MW is produced domestically.”* (NDP5, 2017). The following table show the different power generating facilities and their capacities.

Table: 6 Power generating facilities and their capacities.

Plant Name and Type	Installed capacity MW	Current Maximum Net Output MW	Upgrades Underway Extra MW Complete		Planned Retirement
Ruacana - Hydro	332	332	15	2016	TBD
Van Eck - Coal	120	60	21	2016	2025
Paratus – LFO/HFO	24	6		--	2018
Anixas – LFO/HFO	22.5	21.5	--	--	TBD
Innosun – Solar PV	4.5	4.3	--	--	TBD
Hopsol – Solar PV	5	5		--	TBD
Total - MW	508	428.8	36	--	--

Source: Republic of Namibia, Ministry of Mines and Energy, 2016

338. **From the above table, one can see that the Ruacana plant is the biggest power generating facility in Namibia.** One can also observe that both Van Eck in Windhoek and Paratus will be retired in the near future, leaving a sizable gap. From the table, it can also be observed that renewable energy facilities are gradually moving in. Until, recently, the policy on renewables was not very clear. But with the clarification given, investors in renewables are gradually coming on board to generate energy that they sell to NamPower, the power utility in Namibia.

339. **In order to fill the energy gap that cannot be filled by local generation, NamPower has signed power supply agreements with Eskom of South Africa, ZESCO from Zambia, ZESA from Zimbabwe and Aggreko in Mozambique.** All these agreements give Namibia the flexibility to import power from any of these countries at different times and at different rates to augment its power supply needs.

340. ***“The NamPower transmission backbone consists of transmission running from the Ruacana power station to the Omburu, substation and from there to the South African border for a length of 1 518 km. There is a transmission ring connecting the Van Eck power station to the Kuiseb.”*** (Ministry of Mines and Energy, 2016).

341. **Namibia is also connected to Zambia through what is known as the Caprivi Link Interconnection with converter stations at Zambezi and Gerus stations.** The Zambezi substation is located in Katima Mulilo. The Gerus substation is situated outside Otjiwarongo in central Namibia.

342. **The generation of adequate power is essential to any developed economy.** In looking forward, NDP5 state the following: “By 2022, Namibia has a sustainable mix of locally generated energy capacity of 755 MW to support household and industry development.” Considering the current supply situation, it is unlikely that the NDP5 target quoted above will be met. There are several generation projects which could be treated as committed power plants which will come on line in the near future as shown in the table below. Committed Power Plants as of January 2016.

Table: 7 Power plants that will come on stream in the near future

Project	MW	Notes
REFIT	70	PPA's signed, up to six months for financial close
NP Solar	37	Currently in bidding stage
GreeNam Solar	20	PPA signed
Diaz Wind	44	PPA signed
Total	171	

Source: Republic of Namibia, Ministry of Mines and Energy, 2016

343. **From the previous table, Namibia generates 508 MW and the projects that are in the pipeline and committed will generate an additional 171 MW which will add up to 679 MW.** This still leave a deficit of 75 MW which hopefully will be covered by 2022. However, if one takes into account that Van Eck and Paratus will be retired in the near future, they will leave a gap of 144 MW that must be covered from somewhere. Power supply is essential for industrialisation. It is needed to power industries, supply households with power needs, schools, hospitals etc. Namibia has still some ground to cover to fulfil all the needs. The rural areas are behind urban areas. The rural electrification program will have to be stepped up to enable the country to be on target with its projected power requirements.

344. **Agricultural industries will need power and this is more likely to be met from the rural electrification program.** For example, the government projects that are under the green scheme are engaged in irrigation and the irrigation is done through pumps that are consuming electricity. Any expansion of these schemes will require more power. The farms that are part of the green scheme

in the Tsumeb/Otavi/Grootfontein area use underground water that requires power to extract. These farms use electricity for those who have access to the national grid. But there are those that are using diesel powered pumps to pump water. In terms of Vision 2030 and NDP5, these farms will have to be supplied with electricity at some point in the future. If processing facilities are established at some point in future to cater for the needs of the agricultural products that are coming from the green scheme farms, these processing facilities will need electricity to operate.

345. **The vast number of commercial farms in Namibia use diesel pumps to pump water predominantly for their livestock and for domestic use.** Most of these commercial farms do not have access to electricity. It will be a requirement to supply them with electricity if the aspiration to industrialise has to be fulfilled. Given the vast distances involved, and the low population of the country, it is going to be quite an expensive operation to supply the commercial farms with grid power. Alternatively, other sources of energy such as solar power will have to be explored to supply affordable energy to these farms.
346. **Apart from using water for irrigation purposes, water is also used to generate hydro-power.** Agro-processing need power, therefore, Namibia need good and reliable sources of water for both domestic and agricultural consumption as well as a reliable source of electricity to enable the smooth functioning of agro-industries. Transport infrastructure is essential for the movement of agricultural inputs as well as the moving of agricultural products to the markets. For any exports or imports of agricultural products, harbours are essential. The following table demonstrate how energy use can influence the cost of pumping water.

Table: 8 Fixed costs, Annual costs per hectare in US\$ for using different technologies

Type of Technology/Country	Tanzania	Malawi	Zambia
Traditional Gravity	\$16	----	\$585
Improved Gravity	\$43	----	\$218
Manually operated treadle pump	\$49	\$53	\$85
Diesel Pump	\$212	\$240	\$258
Electric Pump	\$152	\$173	\$181

Source: Food and Agriculture Organisation

347. **From the above table, it can be seen that applying water for irrigation through gravity flow is very cheap in Tanzania but very expensive in Zambia.** No explanation was given for this large difference. A treadle pump is

used to draw water from a well up to a depth of 7 meters. The cost is moderate. However, when one compares the cost of irrigating with a diesel and electric pump, one can clearly see that it is much more economical to irrigate with an electric pump than with a diesel pump. Thus the availability of electricity for agricultural purposes is very important.

5.3 Communication Infrastructure

348. According to NDP5, “By 2022, Namibia has universal access to information, affordable communication and technology infrastructure and services.”

This will be achieved through the following:

- Upgrade ICT Infrastructure across the country
- Expand modern broadcasting services to all communities
- Promote e-services and innovation
- Build a geo-ICT Infrastructure

349. According to the NDP5 Implementation plan, the above mentioned programs will cost N\$2.318 billion over the five-year period. The development of ICT infrastructure brings benefits to any economy. Within the agricultural context, ICT infrastructure enable producers and processors to access information which can assist them to improve their production processes. It helps them to access the latest market information on where to market their products. It also enables them to get the latest price information on their products.

350. There are about 13 radio stations in Namibia. Most of them are based in the capital, but a few have expanded their services to the coast and the north, The Namibia Broadcasting Corporation transmits in English and other local languages. The NBC broadcasts nationwide and has a wide following because of the local languages. It is used effectively for the dissemination of information on various aspects of development besides news coverage.

351. “Namibia’s mobile phone network population coverage has increased exponentially to 95 percent, while mobile subscriptions are recorded at 119.16 per 100 inhabitants.” (NDP5). The mobile network in Namibia is dominated by one company, MTC. The second mobile operator, TN Mobile, is still trying to establish itself and find its feet in the local market. Having access to a cellular network enable one to access the internet, although the speed may differ depending on where one is in the country. The usefulness of having access to the cellular network means that producers will have access to the latest information. MTC intends to expand their network coverage countrywide with the objective of providing 100 percent population coverage to all Namibians (Water and Environmental Consultants, August 2017).

352. **There are two television stations in Namibia, the Namibia Broadcasting Corporation (NBC) and One Africa Television.** The NBC has three channels. However, there is a company in Namibia called Multichoice, which is operating a service providing access to a wide range of television stations from around the world. They provide their services through subscriptions and by installing a receiver dish where the service is needed. Because of the cost associated with the installation and subscription fees, this service, unlike the NBC is not readily available to many Namibians. Only those who can afford to pay for the service have it. But nonetheless, it is a service that is available in Namibia and help with the dissemination of information through their different programs.

6. AGRO ALLIED INDUSTRIALISATION AND VALUE ADDITION

353. **Namibia is a small open economy that exports mainly basic commodities from the mining and agricultural sectors.** The country imports mainly finished consumer products from outside. Within the parameters of an open economy, Namibia wants to add value to the raw material exported and reduce the value of imported consumer goods. To achieve this objective, there is a need to have a clear and coherent multisector strategy as to how to achieve that objective. First of all, there is need for a clear policy position on the matter. NDP5 state that “by 2022, the contribution of general manufacturing sector to GDP has increased from N\$17.8 billion in 2015 to toN\$20.6 billion” (NDP5, 2017). This target seems realistic and within reach if efforts are made to achieve it.
354. **Agro-industries are part of the broader manufacturing sector.** NDP5 further states that Namibia intends to “develop agro-processing industries by utilising local produce and regional value chains” (NDP5, 2017). Because agro-industries require raw material as input, such industries can also help to boost local production through increased demand in the form of raw material that serve as input to such industries. The NDP5 also warns that “Limited Manufacturing technology and skills for agro-processing and modernisation of the agriculture sector have resulted in limited economies of scale and hence value addition.” This suggests that Namibia will have to take a critical look at technology and skills if it wants to increase manufacturing in the agriculture sector.
355. **Agro-industry technology can be introduced at two levels.** At one level the country can consider introducing modern agro-processing machines that can be operated by large and medium sized enterprises. A good example here is the technology used to process maize and wheat in Namibia by Namib Mills. Although there are smaller companies engaged in the production of maize meal, Namib Mills is the biggest role player in the milling of maize and wheat.

Namibia currently has the capability to supply all the local needs for maize meal and wheat flour. It even export some of the processed products.

356. **Already in the mid 1990's, Keyler (1996) pointed out that "The millet procurement model has shown, small scale hammer mills can be competitive with imported and processed maize in villages."** Furthermore, Keyler continues, "Some rural development projects have demonstrated that the hammer mill technology is adaptable to rural needs and provides an affordable alternative to manual processing. In addition, small scale mills generate more rural employment than middle and large-scale processing units." Thus one can consider agro processing at a large scale level using large processing units but also at small scale using small scale units.
357. **In the area of vegetables, very little secondary processing is done.** Agribusdev does some primary processing of potatoes (washing and brushing), as well as grapes and dates (packaging). It also does some secondary processing of rice (processing and packaging), sunflower (cooking oil), wheat and maize (wheat flour and maize meal). (Agribusdev, 2016).
358. **Agribusdev is an agency established by the government to engage in the production of agricultural produce to enable Namibia to be self-sufficient.** It is operating a number of government owned farms under the green scheme where it produces cereals as well as vegetables. A decision will have to be taken by the government as to which agency will focus on the processing of agricultural products, Agribusdev or AMTA. The other agency established by the government is AMTA, which stands for Agricultural Marketing and Trade Agency. This agency was established to do the marketing of all agricultural products. Thus Agribusdev produces and AMTA does the marketing. The agency which will do the processing will be expected to operate relatively large processing facilities, thus operating in a space that is above the reach of SME's.

6.1 Private investors

359. **The government can also encourage private investors to come and put up processing facilities** on the green scheme farms where Agribusdev is operating or in areas where there is high potential for the production of fruit and vegetables. Private investors can be given an opportunity for example to lease some of the land operated by Agribusdev on a long term lease which will enable the investor to recoup their investments.
360. **Agribusdev is currently operating 11 green scheme farms where they engage in the production of cereals, fruit and vegetables.** These farms are: Aussenkehr, Hardap, Etunda, Shadikongoro, Shitemo, Uvhungu-vhungu, Ndonga Linena, Sikondo, Kalimbeza, Mashare and Musese. Agribusdev also has potential projects lined up which they are expected to operate as part of

the green scheme in the near future. These are: Katima Liselo; Zone; Neckertal and Tandjieskoppe.

361. **It is possible to consider allocating some of this land to private investors on a long term lease.** In a verbal discussion with the CEO of Agribusdev, Mr Uugwanga, he indicated that three of the farms currently under Agribusdev are being operated by private firms on a lease basis. Currently, these leases are for agricultural production only. However, the production by private investors can also be linked to the processing of agricultural products. This will enable private operators to lease the land to produce and to do the processing of the produce from those farms. One can assume that these private investors if allowed to do processing will be in a position to do processing either on a small scale or large scale using modern technology.

6.2 Small Scale Processors

362. **The other approach is to encourage the development of small scale processors.** This will entail equipping individual entrepreneurs with the necessary skills and support to engage in the processing of agricultural produce on a small scale. In recent years, processing technology has been developed that can be used to process cereals, fruit and vegetables on a small scale (Mhazo et al, 2012). The increase of mahangu mills in the north is a result of investments by small scale processors. To encourage more processing, there will be a need for the government to acquire the necessary technology and place it in government centres in strategic locations where demonstrations can be made about what the technology can do. Also government should set the standards and ensure that the producers are capacitated to adhere to those standards
363. **For example, the rural development centres formerly under the MAWF and now under the MURD can be used for this purpose to demonstrate the use of technology.** Also community centres under MURD can be used for this purpose. Some of the people who are employed at these centres can be trained to do the demonstration of the technology. These centres can assist in the ordering of equipment needed. If government want to increase agro-processing, this process cannot just be left to the private sector alone. It will need some government intervention at the beginning until a critical mass has been reached whereby the private sector can be left to drive the process further.

6.3 Skills Development

364. **In considering skills for agro-processing, there are two categories of skills that need to be considered.** First of all, one needs the skills and capabilities to do the processing. The knowledge and skills to operate a particular machine

is acquired once the machine has been bought. However, one also needs an understanding of the processes that take place when food is being processed. For example, when brewing a particular drink, there may be a need to understand what is going on in that process by knowing what the fermentation process entail or understanding the role of certain enzymes in food processing.

365. **Namibia is fortunate in this regard.** The University of Namibia, Faculty of Agriculture, and Department of Food Sciences train young Namibians in the science of processing food and beverages. These students complete a four-year degree program and on completion they have a good understanding of most of the processes involved in the processing of both crops and animal products. However, most of these students are not always employed where their skills can be utilised effectively. Because of lack of employment opportunities, some of them end up doing things for which they have not been trained for. At least the country has a basis for food technologist that can be utilised to develop our agro-industries.
366. **The other category of people needed to operate and sustain agro-industries are those that are responsible for the repair and maintenance of the equipment.** In Namibia, it will be advisable to look at the Vocational Training Centres (VTC's) and equip them to produce artisans that have the knowledge and skills to operate and maintain the agro-processing equipment. Specific short courses can be provided aimed at equipping those who are interested to repair and maintain equipment within the communities. The equipment have to be imported because Namibia has limited capacity at the moment to produce such equipment.
367. **In neighbouring Zimbabwe, the situation is different.** According to Mhazo et al, in Zimbabwe, "Technology manufacturing and marketing is now fully market driven. However, issues surrounding intellectual property rights and patenting have not yet been resolved. Many a time, technology generated by public sector research organisations ends up being used for commercial purposes without due recognition of the people involved in knowledge development." It is important that we learn from other countries, not to repeat the same mistakes. The issue of intellectual property is an important one that must be handled properly.

7. STRATEGY AND POLICY OPTIONS FOR NAMIBIA

368. **Since independence, Namibia has made significant improvements in the supply of water to communities.** The average percentage of the population that has access to potable water is 80 percent. This figure is lower in rural areas. It is suggested here that government must make funding available to enable programs to be put in place that will ensure that the 20 percent of the

population that has not yet access to potable water is reached in the next 10 years.

369. **Irrigation technology is available in different types.** The cost of technology also differs. Given the fact that Namibia is a drought prone country, it is suggested here that the country chooses the technology that saves water. From the above review of technology, the technology that is more efficient in water usage, is also the one that is the most expensive in terms of investment. However, if investments are made in such water saving technology, it will pay off in the long run.
370. **Government must consider paying incentives to farmers to adopt the technology that is most efficient in water usage.** Alternatively, farmers can also be provided with tax relief if they use the right technology. Another way of addressing this issue is to outlaw irrigation methods that are wasteful and give farmers 5 to eight years to phase out the wasteful technology.
371. **The use of electricity in agricultural production is very important.** It is suggested here that the rural electrification program is pursued vigorously. A developed economy need adequate electricity for all the sectors. The agricultural sector here is no exception.
372. **Consideration should be given to develop renewable sources of electricity such as solar and wind.** Namibia has one of the highest number of hours in terms of radiation. Thus solar power can be pursued with confidence. Solar generating power plants can either be connected to the national grid. However, if doing that is expensive, they can be developed as standalone units/grids.
373. **Water governance has received adequate attention since independence.** The concept of community management of natural resources is a noble one. However, it is currently experiencing challenges. Mainly because there has not been enough support for local governance structures such as training and back-up. It is suggested here that more effort is put in the support of local governance structures to enable communities to take responsibility for the management of local resources such as water.
374. **It may not always be possible for the poorer parts of the communities, especially in rural areas to always afford to pay for the water.** It is suggested here that the subsidy scheme that is currently being worked out by the Ministry of Agriculture, Water and Forestry and NamWater is expedited to enable support to be provided to the needy communities.
375. **The handing over of water supply infrastructure to communities must be relooked.** Communities that cannot afford to maintain their water supply

infrastructure must be treated on merit so that where the need arise, support can still be provided by the government to enable the system to continue.

376. **There is an option for the country to invite private investors that have technology and capability in this area.** For agro-processing to take off, the government must take the lead by providing the necessary incentives to support Agribusdev as a start or to private investors or both. Support will be needed in the area of finance, information dissemination about the technology, training of artisans who will do the repair and maintenance of the equipment and machinery.
377. **Rural Development centres and community development centres must be used as institutions to train and disseminate information on new agro-processing technologies.** These centres must be mandated and equipped with the necessary and adequate resources to play a leading role in the dissemination and promotion of agro-processing technology.
378. **Government must seriously consider the long term leasing of irrigation land on the green scheme to private investors** who have the know-how, capability and capacity not just to produce agricultural products, but also to establish agro-industries. To achieve the objective of establishing an agro-industry in Namibia, government has to take the lead.
379. **The development of infrastructure in the area of water, energy transport and communication technology is essential for any industrialised economy.** As a country aspiring to be industrialised in 2030, investments need to be made in infrastructure in these sectors. Such infrastructures must be operated efficiently to benefit the local economy as well as to make it attractive for the neighbouring countries to make use of our transport infrastructure to import and export their goods. These infrastructures are also essential to the development of an agro-industry sub-sector in the country.

8. CONCLUSION

380. **Water is scarce in Namibia, therefore, efforts must be made at all cost to ensure that Namibians who do not have access to potable water are catered for.** Irrigation technology is available in the market, Namibia must identify and acquire the best technology in terms of water use efficiency.
381. **Water Governance is important, hence community structures must be strengthened through training and back up support.** Water subsidy is a must for the poor to enable them to have access to clean water. This will also

enable the service providers to provide the service that is needed. Without such payment, the service will deteriorate or stop altogether.

- 382. **Electricity is key to any developed economy, thus rural electrification is a must because it will encourage investments to be made in rural areas that were not there before.** Electricity supply will benefit any development that the government or private will embark upon.
- 383. **Good transportation infrastructure is essential in any developed economy and for the realisation of vision 2030, this is one of the areas where investments will be needed to support the economy.** A developed economy cannot operate without a good transportation system. For the delivery of goods and services a good transport network is a basic necessity.
- 384. **Finally, Communication technology is one of the enablers that need to be in place for the economy to thrive.** Investments in this sector is a must.

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115. <http://agriinfo.in/default.aspx?page=topic&superid=8&topicid=2234> Definition and Concept of Micro Irrigation

Policy Issues Emanating from the 18th Bank of Namibia Annual Symposium

By Bank of Namibia Research Department

1. INTRODUCTION AND BACKGROUND

385. **The Bank of Namibia held its 18th annual symposium at the Safari hotel on the 21st of September 2017 under the theme: Feeding Namibia: Agricultural Productivity and Industrialisation.** The theme was selected because most agricultural practices in Namibia are still subsistence in nature. Lack of technological advancements affect the whole production chain, including agro-processing, while lack of investment in agriculture often results in poor productivity along the whole value chains. With erratic rainfall patterns, more frequent drought occurrences are experienced in the country. Despite being small, Namibia's population faces food insecurity and is vulnerable to food starvation. In the current policy and research environment, there is significant momentum behind developing and promoting the agricultural sector as a catalyst to industrialisation. Developing industrial agri-businesses would raise productivity in the sector and ultimately support economic growth and structural transformation by enabling the labour force to move away from the agricultural sector into manufacturing and services. Financing requirements for Namibian agriculture remain substantial. Important investments need to be targeted towards water and irrigation, as well as the promotion of good agricultural practices. Investment in water harvesting techniques and irrigation is becoming ever so critical especially with climate change. It is against this backdrop that the deliberation was guided by the following key questions:
- a) How can Namibia increase agricultural productivity thereby increasing food security?
 - b) How can Namibia upscale food production by looking at the number of population it will have by the year 2030?
 - c) How can the different value chains be aligned to be able to become an industrialised country?
 - d) What measures need to be undertaken to adequately utilize the scarce water in the country?
 - e) What is the international experience and how can Namibia learn from it?
 - f) What are the policy implications to consider for increased production?

386. **These issues were addressed through presentations given by local**

and international speakers, and supplemented by a panel discussion comprising of representatives from the agricultural and water sectors, policy makers, as well as the Bank of Namibia.

387. **A key conclusion that emanated from the 18th annual symposium was that agriculture is an effective tool to eradicate poverty.** The deliberations at the symposium concluded that Namibia has to find sustainable ways of ensuring food security (at the household and national levels) and guaranteeing that the agricultural sector is developed within its unique circumstances. Amongst the areas that have been identified as holding potential, within the agricultural sector, is the expansion of the agro-processing industry, which involves value addition to primary agricultural products.
388. **Namibia needs to accelerate the implementations of its structural reforms in order to harness the agricultural potentials and promote value adding economic activities.** These include creating quality jobs while reducing poverty and inequality. This can only be achieved through the acceleration of the implementation of the country's structural reform programmes as articulated in the various national development documents, in line with the aspirations of Vision 2030. Transformation of the agricultural sector in Namibia, therefore, must focus on accelerating the support and mechanisation of the subsistence sub-sector. In order to achieve this objective through evidence based interventions, it is vital to understand the factors that lock the sub-sector in a low level of equilibrium trap, identify the entry points and the appropriate policy and institutional reforms needed to address the binding constraints, as well as to unlock the growth potential of the sector.
389. **It was also noted that to achieve the desired growth in the agricultural sector, proper infrastructure is needed.** As such, Namibia must choose the most efficient system in terms of water use, accompanied by an efficient water governance system. All these require adequate funding from government. Moreover, the growth of this sector and the general development of the country, is dependent amongst others on a good transportation system consisting of roads, railway lines, harbours and air transportation. In addition, an extensive network of electricity infrastructure and a good communication network are essentials to support an industrialised economy.
390. **The papers, presentations and discussions at the symposium raised a number of policy issues and recommendations** with regard to unlocking the untapped potential in the manufacturing and tourism sectors. These issues and recommendations are listed and discussed below:

2. KEY POLICY ISSUES EMANATING FROM THE SYMPOSIUM

i. Private investment in agriculture is needed for growth

391. **There was unanimity that private investment in agriculture is an essential component of agricultural productivity.** Government should consider leasing some of the irrigation green schemes to the private sector which is endowed with the necessary skills and know-how in agro-industries. Moreover, Public-Private and Development Partnerships are essential for the success of agricultural transformation in the country and should be utilised.

ii. Ways of managing water should be laid down

392. **Water management principles should be established and efficiently managed, while the promotion of irrigation systems that use water resourcefully should be emphasised.** It is proposed that about 50 percent of water resources should be allocated for food production, while the remaining half should be reserved for human, animal and industrial use. Furthermore, of the 50 percent of water resources for food production, 25 percent should be allocated for fodder production for feedlots. It is important that the country adopts the right type of technology when considering investing in irrigation technology. Irrigation systems that use less water such as the micro irrigation systems and drip irrigation systems should be promoted, instead of systems that use more water.

iii. Promote feedlots at Green Schemes

393. **Promotion of feedlots in the vicinity of green scheme projects will improve sustainable and quality of meat production.** Crop production will help to sustain feedlots where they have been established. Products from the irrigation schemes, especially cereals, could also be used as input for chicken feed. This will enhance efficiency in the coordination between the players along the value chains.

iv. Increase Green Schemes in the country

394. **In many parts of the world, particularly in Asia, growth in agricultural productivity has been rapid, largely as a result of the extensive adoption**

of new agricultural technologies. For instance, irrigation technologies have transformed the agricultural sector of these countries. It will also be necessary to look at high value crops that can be used under irrigation, as they have the potential to add more value to the economy and put more money in the pockets of the farmers. Moreover, high value crops will ensure that the contribution of the agricultural sector to the overall growth of the economy is increased. By putting the largest area possible under irrigation will ensure that the maximum amount of crops is produced in the country. It is worth noting that through existing agreements, Namibia is entitled to draw 180 million cubic meters of water per annum from Kunene River, however, only 63 million cubic meters is withdrawn yearly.

v. Infrastructure development of rails, roads, water and electricity

395. Infrastructure development is critical for the transformation of the agricultural sector. Infrastructures such as electricity/energy, ICTs, water, improved inputs, finance, roads, and rail to transport finished agricultural and processed foods, are crucial for the transformation of the agricultural sector. The lack of infrastructure drives up the cost of doing business and this can discourage food manufacturing companies from getting established, especially in rural areas. Infrastructure development is, therefore, needed to promote agriculture as a business and to provide fiscal and infrastructure incentives for food manufacturing companies to move into rural areas, closer to zones of production than consumption.

vi. Specialization, Diversification and Scale Efficiency

396. Producing an optimum crop-livestock mix, which is consistent with the market price ratios, has the potential to improve efficiency. Subsistence farming mostly entails producing for household consumption and using comparative advantage. This, therefore means that market prices have little influence on resource allocation decisions. For instance, subsistence farmers in Namibia typically produce millet, maize and sorghum. Although for rational reasons, such as risk consideration, high transaction costs and imperfect or missing labor market, they may choose a cropping pattern or resource allocation pattern that is inconsistent with profit/revenue maximization. As a result, they tend to exhibit significant level of economic inefficiency. It therefore means that, by addressing market and policy failures as well as institutional weaknesses that justified such inefficient resource allocation patterns, it is possible to increase efficiency and productivity. Farmers in communal farming typically practice integrated crop-livestock farming. Thus, by producing the most optimum crop-livestock mix, which is consistent with the market price ratios (tangency condition), there will be a potential efficiency improvement that comes from scope economies. Economies of scope results in the decrease in

the average cost of production.

3. POLICY RECOMMENDATIONS

397. **After a fruitful deliberation through the panel discussions at the symposium, the following policy recommendations emanated:**

- There needs to be a sustainable food production system to make sure that there is food security in the country.
- The strategy should be securing food security but at the same time making sure that food is affordable. Industrialisation should produce food, sustain it and create employment so that people have income to access food.
- Namibia's food problem may still persist, unless the unemployment issue is solved through agricultural industrialisation.
- Government needs to come on the table to fund the gap in the water infrastructure as this is a crucial enable in the agriculture, agro-processing and ultimately in food production.
- Train the youth in farming: implement compulsory horticulture projects or gardens in the primary and secondary school curriculums.
- There is a need in Namibia to move away from dependable tendencies such as welfares. The social protection schemes should be structured in such a way that ensures all able-bodied people between age of 18 to 59 years contribute meaningfully to the development of the country, before they qualify for any social grants.
- Give people in the rural areas access to land, water, knowledge as well as decentralised energy supply.

Concluding Remarks and Vote of Thanks

*By Dr. Emma Haiyambo, Director: Strategic Communications and Financial Sector
Development, Bank of Namibia
21st September 2017, Safari Hotel,*

Theme: Feeding Namibia: Agricultural Productivity and Industrialisation

Director of Ceremonies
Honourable Ministers and Members of Parliament, present
Members of the Diplomatic corps
Board Members of the Bank of Namibia
Honourable Regional Governors and Councilors, present
The Mayor of the City of Windhoek
Permanent Secretaries
Distinguished Speakers and panelists
Captains of the Industries
Members of the Media
All invited guests
Ladies and Gentlemen;
Good afternoon!

398. **It has been an honour and privilege for us at the Bank of Namibia to host the 18th Annual Symposium under the theme “Feeding Namibia: Agricultural Productivity and Industrialisation.”** As mentioned by the Governor, the symposium is a platform where we interact with the public and policy makers to discuss issues of national importance, which have an impact on policymaking. The support we have received from our policy makers and the public at large when it comes to this event, as you have witnessed, not only highlights its relevance, but also gives us the motivation required to continue hosting such events.
399. Director of Ceremonies, ladies and gentlemen! Before delivering my vote of thanks, allow me to point out a few key issues which emerged from the discussions today:
400. **Namibia’s development strategies emphasize agriculture as a pillar and key sector for structural change, economic transformation and to support food security.** This entails that Namibia has to find sustainable ways of ensuring food security (at the household and national level) and guaranteeing that the

agricultural sector is developed within its unique circumstances. Among the areas that have been identified as holding potential is the expansion of the agro-processing industry, which involves value addition to primary agricultural products.

401. **We have learned today that in order to harness the agricultural potentials that promote value adding economic activities and create quality jobs while reducing poverty and inequality,** Namibia needs to accelerate the implementation of its structural reform programme as articulated in the various national development documents, in line with the aspirations of Vision 2030. Transformation of the agricultural sector in Namibia, therefore, must focus on accelerating the support and mechanisation of the subsistence sub-sector. In order to achieve this objective through evidence based interventions, there is need for understanding the factors that lock the sub-sector in a low level of equilibrium trap, identifying the entry points and the appropriate policy and institutional reforms needed to address the binding constraints and unlock the growth potential of the sector.
402. **It was also clear from the presentations and discussions that to achieve the desired growth in the agricultural sector, proper infrastructure is needed.** As such, Namibia must choose the most efficient system in terms of water use, accompanied by an efficient water governance system. All these require adequate funding from government. Moreover, the growth of this sector and the general development of the country, is dependent amongst others on a good transportation system consisting of roads, railway, harbours and air transportation. In addition, an extensive network of electricity infrastructure and a good communication network are essentials to support an industrialised economy.
403. **Another important factor that was raised is the importance of partnership between the public and private sectors (PPPs),** as well as partnership with the development partners which adds the fourth 'P' as introduced by our partner from the African Development Bank present here today.

Ladies and gentlemen,

404. **Let me now do my job (that of thanking you).** On behalf of the Bank of Namibia Board, Management and staff, I wish to extend a heartfelt appreciation to all the speakers, panellists, invited guests of various industries and the general public for your invaluable contributions. Allow me to especially take this opportunity to express our sincere appreciation to the Minister, Hon. John Mutorwa, for not only delivering a keynote address, but for also gracing this occasion with his presence, especially when taking into account his busy schedule.

405. **In the same vein, I also extend a special thanks to other dignitaries in our midst.** Your presence here makes us believe that the theme we chose was not only pertinent, but will receive the necessary attention. I would also like to thank the media represented here today, for not only capturing the event, but also for ensuring that the Bank of Namibia symposium discussions and deliberations will be taken beyond this venue in order to ensure that the nation at large also benefit from today's discussions. Also, my gratitude goes to the Management and staff of Safari Hotel for this beautiful and convenient venue and for supplying us with good refreshments during our deliberations. Let me also extend a final word of thanks to the organising committee members, staff members of the Bank of Namibia. Thanks for a job well done.
406. **Finally, I would like to inform you that as usual, the proceedings of the symposium will be compiled in a booklet, titled: "Bank of Namibia Annual Symposium 2017", which will be posted on the Bank of Namibia's website.** Once again, thank you all and the Bank of Namibia looks forward to seeing you at our 19th Annual Symposium next year.

I wish you an enjoyable and productive rest of day ahead.

Thank You!