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REGIONAL NETWORK OF AGRICULTURAL POLICY RESEARCH INSTITUTES

1st Annual Agricultural Outlook: 2014-2023

Anticipating and responding to the region's policy challenges in the decade ahead

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Foreword

The Outlook provides a baseline scenario and future projections of maize markets within the region. The analysis includes impact assessments of domestic policy on regional trade flow patterns as well as farm profitability.

The need for a regional network of national agricultural policy institutes within the Eastern and Southern African (ESA) region was recognized as early as 2009. At that time, it was realized that though countries within the region have their own national agricultural policy research institutes, these institutions were not effectively coordinating with each other in the areas of regional policy analysis, outreach and capacity building activities. As a result, in the absence of a platform for engagement, the ability of these national agricultural policy institutes to provide practical solutions to the regional policy challenges facing their member states was limited. To address this gap the national agricultural policy institutes from seven countries[1] within ESA formed the Regional Network of Agricultural Policy Research Institutes (ReNAPRI) on November 16, 2012 in Lusaka, Zambia.

ReNAPRI is an African-led, African-driven regionally coordinated group of national agricultural policy research institutes duly established and operating in Eastern and Southern Africa member states. The vision of ReNAPRI is to support national agricultural policy research institutes in Africa to be centers of excellence that guide and inform national and regional agricultural and food security policy issues. The mission of ReNAPRI is to support dynamic collaboration amongst national agricultural policy research institutes to produce sustainable and high-quality research, outreach and capacity development that promotes national and regional agricultural policy objectives.

To that end, the network, through its 1st Annual ReNAPRI Agricultural Outlook: 2014 – 2023[2] seeks to provide relevant and timely national and regional policy support to national governments and Regional Economic Communities (RECs). The Outlook provides a baseline scenario and future projections of maize markets within the region. The analysis includes impact assessments of domestic policy on regional trade flow patterns as well as farm profitability. To generate this Outlook, ReNAPRI has partnered with various non-African institutions, which include; the Food and Agriculture Organization (FAO) of the United Nations (UN), Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri; and Michigan State University (MSU). Furthermore, ReNAPRI acknowledges and appreciates the tremendous insight of numerous industry specialists over the year. Although all industry partners' comments and suggestions are taken into consideration, ReNAPRI's own views are presented in the Outlook publication.

[1] The national policy institutes who participated at the Lusaka meeting include: the Institute of Social and Economic Research (IRES) at the University of Kinshasa in the Democratic Republic of Congo; Tegemeo Institute of Agricultural Policy and Development at Egerton University in Kenya; the Centre for Agriculture Research and Development (CARD) at Bunda College in Malawi; The Research Center for Agricultural and Food Policies and Programme (CEPPAG) at Eduardo Mondlane University in Mozambique; the Bureau for Food and Agricultural Policy (BFAP) at the Universities of Pretoria and Stellenbosch in South Africa; the Department of Agricultural Economics and Agri-business at Sokoine University of Agriculture (SUA) in Tanzania; and the Indaba Agricultural Policy Research Institute (IAPRI) in Zambia.

[2] **Disclaimer:** The views expressed in this report reflect those of ReNAPRI and do not constitute any specific advice as to decisions or actions that should be taken. Whilst every care has been taken in preparing this document, no representation, warranty, or undertaking (expressed or implied) is given and no responsibility or liability is accepted by ReNAPRI as to the accuracy or completeness of the information contained herein. In addition, ReNAPRI accepts no responsibility or liability for any damages of whatsoever nature which any person may suffer as a result of any decision or action taken on the basis of the information contained herein. All opinions and estimates contained in this report may be changed after publication at any time without notice.

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The outlook for the region is generated by the ReNAPRI sector model which was developed by ReNAPRI in partnership with FAPRI at the University of Missouri. The models are econometric, recursive, partial equilibrium models. Within each country, the important components of supply and demand for maize are identified and equilibrium established in each market by means of balance sheet principles where demand equals supply.

Context and purpose of the baseline

The ReNAPRI baseline 2014 presents an outlook of maize production, consumption, prices and trade for select countries in ESA for the period 2014 to 2023. This outlook is based on assumptions about a range of economic, technological, environmental, political, institutional, and social factors. The outlook for the region is generated by the ReNAPRI sector model which was developed by ReNAPRI in partnership with FAPRI at the University of Missouri. The models are econometric, recursive, partial equilibrium models. Within each country, the important components of supply and demand for maize are identified and equilibrium established in each market by means of balance sheet principles where demand equals supply. A number of critical assumptions have to be made for baseline projections. One of the most important assumptions is that average weather conditions will prevail in Eastern and Southern Africa and around the world: therefore yields grow constantly over the baseline as technology improves. Assumptions with respect to the outlook of macroeconomic conditions are based on a combination of projections developed by the OECD, the IMF, the World Bank and Global Insight. Baseline projections for world commodity markets were generated by FAPRI at the University of Missouri. Once the critical assumptions are captured in the ReNAPRI sector model, the outlook for maize is simulated within a closed system of equations. This implies that, for example, any shocks in the maize sector in Kenya are transmitted to the maize sector in Zambia, and vice versa.

This year's baseline takes the latest trends, policies and market information into consideration and is constructed in such a way that the decision maker can form a picture of the new equilibrium in regional maize markets. However it is important to note that **markets are extremely volatile. While the baseline presents the most accurate estimates of long-term trends given currently available information, the probability that future prices will not match baseline projections for any particular year is high. Given this uncertainty, the baseline projections should be interpreted as mid-point estimates of future outcomes, based on the understanding that stochastic temporary events (e.g. weather issues) will undoubtedly produce results within a distribution of future outcomes. Moreover, policy factors (e.g. changes in input-subsidy programs, marketing board operations, and trade policies) cause structural shifts in agricultural commodity markets over the long run.** This baseline, therefore, serves as a benchmark against which alternative exogenous shocks can be measured and their effects on markets estimated. In addition, the baseline serves as an early-warning system to inform role-players in the agricultural industry about the potential effect of long-term structural changes on agricultural commodity markets, such as the impact of the sharp increase in input costs or the improvement in technology on supply response.

To summarise, the baseline does NOT constitute a forecast, but rather a benchmark of what COULD happen under a particular set of assumptions. Inherent uncertainties, including policy changes, weather, and other market variations ensure that the future is highly unlikely to match baseline projections. Recognising this fact, ReNAPRI incorporates scenario planning and risk analyses in the process of attempting to understand the underlying risks and uncertainties of agricultural markets. Stochastic analyses, not published in the baseline, can be prepared as independent reports on request. The ReNAPRI baseline 2014 should be regarded as only one of the tools in the decision-making process of the agricultural sector, and other sources of information, experience, and planning and decision making techniques have to be taken into consideration.

Key baseline assumptions

Policies

The baseline assumes that current international as well as domestic agricultural policies will be maintained in their current form. In a global setting, this assumes that all countries adhere to their bilateral and multilateral trade obligations, including their World Trade Organisation (WTO) commitments. Maize imported from beyond the COMESA region carries an import tariff of 50%.

Eastern Africa

Kenya

Kenya is a member of the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) and therefore obeys the EAC common market protocol, whereby maize from member countries remains duty free, apart from the import declaration fee (IDF) of 2.75%. Under the COMESA 'small trader regime,' member countries commit to simplifying border clearance procedures and reducing costs (including NTBs) for small traders.

The East African Commodity exchange was launched in July 2014 by Kenya, Rwanda and Uganda and while it is expected to support maize trade within the EAC, it remains early to predict the future impact of this initiative. In the past, Kenyan millers sourced maize directly from traders in Tanzania and Uganda, however in May 2014, the Kenyan government made an arrangement which enables millers to purchase maize directly from Tanzania's strategic grain reserve (NFRA). In addition, Kenya appears to be softening its position on GM maize though no significant policy change on the ban has been made to date. Unless production levels in Uganda and Tanzania are affected significantly by exogenous shocks, it is unlikely that import duties will be waived to allow imports from outside COMESA .

The government continues to import fertilizer that is availed to farmers at subsidized prices, however the importation of subsidized fertilizer has in the past not been well coordinated, which frequently results in late imports and delivery and consequent delays in planting.

Tanzania

Domestic and Trade Policies related to maize in Tanzania are derived from the highest level, with Development Vision 2025 aimed at reducing poverty by transforming the population from poor rural to semi-industrialized middle-income. The sector-wide, Agricultural Sector Development Strategy (ASDS) has been applied since 2001 and includes, amongst others, the Agricultural Sector Development Program (ASDP) and Kilimo Kwanza initiative. The latter was initiated in 2009, specifically focusing on public-private partnership in agricultural investments. The Tanzania Agriculture and Food Security Investment Plan (TAFSIP) was initiated in 2011, under CAADP suggestion, with an aim of establishing financing mechanisms for the various programs included in the ASDS. The two initiatives (ASDS & TAFSIP) are currently being harmonized into the on-going Big Results Now (BRN) initiative.

Agricultural support strategies are aimed at supporting agriculture from four angles namely; input supply, agro-financing, agro-mechanization and marketing. Through the National Input Voucher System (NAIVS), sector-wide subsidies were provided on fertilizer and seed for both maize and rice, while agro-chemicals and seedlings were provided for cotton, cashew nuts, coffee and tea. Following poor performance however, the NAIVS has been replaced by a new delivery system effective from 1 July 2014. The new system is agricultural loan-based, targeting registered farmer groups whereby the government undertakes to subsidize farmers through loan guarantees, allowing them to pay a fixed interest rate of 4% per annum, starting in the 2014/15 production season. This new system will entail a quadripartite arrangement between the farmer groups, designated financial institutions, appointed input suppliers and reputable crop buyers.

Agro-financing support on maize and rice involves loan facility provision to smallholder farmers at a concessional rate of 8% per annum. Loans are provided through micro-finance, whereby the local government supports the formation of Savings and Credit Cooperative Societies (SACCOS) and other credit associations.

Agro-mechanization efforts have targeted the provision of farm implements, including tractors, power-tillers, ox-ploughs and processing machinery to farmer groups through district councils and/or big private buyers who import in large quantities. The power tiller technology has been adopted by many small scale farmers, particularly in rice farming areas. Support on agro-mechanization has been through cost sharing arrangements in which 80% of machinery cost is paid by Local Government Authority (LGA), while farmers are granted full exemption from licence fees on tractors, as well as access to fuel for agro-machinery at subsidised prices.

Marketing support has been concentrated on Warehouse Receipt Systems (WRS) and market infra-structure, in which temporary seasonal bulking markets are established in rural and urban areas. Most of the bulking markets only consist of sheds, with limited quality storage facilities. Further the National Food Reserve Agency (NFRA) also buys in maize. Quantities purchased are subject to budget limitations and current storage capacity remains a restriction at only 200 thousand tons.

Despite full VAT exemption on unprocessed crops through the EAC treaty, non-tariff barriers remain a major challenge to efficient maize trade. Nevertheless, informal cross-border trade continues unabated.

Southern Africa

Malawi

The Malawian Government's agricultural policy focuses on attainment of food security to avert hunger and reduce poverty. Amongst other initiatives, the Ministry of Agriculture has implemented a Farm Inputs Subsidy Program (FISP), since 2005/06.This program has enabled farmers to obtain fertilizer, improved seed and storage pesticides at highly subsidized prices. Pricing and marketing of most smallholder farmer crops and livestock are liberalized, except for maize, which in many respects remains managed and controlled by government. The government announces indicative minimum prices to protect farmers and has commonly applied export bans in years when domestic production estimates have not been sufficient to supply domestic consumption requirements. Maize imports are also regulated through import licenses, although in most years maize is still informally imported from Mozambique (FEWSNET Cross Border Trade Bulletins). Pan-seasonal and pan-territorial producer prices are no longer applied. In general, marketing and price policies are dictated by two opposing forces: (1) keeping prices low for low income consumers and (2) keeping prices attractive for smallholder farmers and other producers to stimulate production and improve national food security.

With a few exceptions, the current market situation is characterised by limited development of wholesale markets, continuous uncertainties for farmers, small remote markets that attract few traders with more bargaining power than farmers, farmers remaining price takers as opposed to price setters, farmers selling over 60% of their marketed produce at farm gate level, scanty and asymmetric market information, limited value addition, limited adherence to grading and quality standards as well as inadequate access to financial services.

Mozambique

Most policies in Mozambique are aimed at improving the agricultural sector as a whole, rather than focusing on specific crops. In the past two decades, Mozambique has generally applied open market policy by allowing free trade of food staple commodities. In compliance with the Washington Consensus, which is based on principles of market liberalization, fiscal discipline and privatization, the government has implemented trade reforms, including the elimination of trade restrictions as well as currency exchange controls. Under these reforms, prices for agricultural commodities and services were liberalized.

As a signatory of the General Agreement on Tariffs and Trade (GATT) and member of the WTO, Mozambique has gradually reduced import duties on agricultural commodities since 1992. However, Tschirley and Abdula (2007) noted that Value Added Tax (VAT) on imported maize grain is a key policy instrument that could impact negatively on maize markets, especially in the southern region. VAT is applied to all maize imports, effectively resulting in an import tariff. In order to improve market efficiency, the Mozambican government provides VAT rebate payments to large scale processors who import maize grain and process it for sale into the domestic market.

While no price controls are currently applied to food staples, Mozambique has a long history of price control and direct government participation in the markets of staple commodities. In the 1980s and early 1990s through the AGRICOM Company and later the Cereals Institute of Mozambique, the government bought and sold staple food commodities, especially maize. However, in 1996, the Cereal Institute of Mozambique was re-structured and transferred its market activities to the private sector. As a result, the market for major staple commodities has been liberalized since 1997 and prices of these commodities are determined through supply and demand mechanisms. Government only issues indicative (nonbinding) prices.

In recent years, concern has been voiced at the local level at excessive sale and exports of maize and other staple commodities. In order to improve food security, district officials have called for increased regulation of trade, particularly in the northern part of the country where maize is regularly exported to Malawi. While not authorized by the government, incidents of informal restrictions on exports of maize and other staple foods have occurred, largely motivated by the need to ensure local food supplies. Limitation of maize exports has also been mitigated through the provision of credit to local traders to buy maize during surplus periods, allowing them to sell again during shortage periods.

South Africa

South Africa currently trades in an open market environment that is characterised by a relatively high transmission of world prices to domestic markets, a situation that is expected to continue over the outlook. With the deregulation of agricultural markets in the mid-nineties, many non-tariff trade barriers and some direct trade subsidies to agriculture were replaced by tariff barriers. In the case of maize, variable import tariffs were introduced. The reference price that activates the variable import tariff was set at US$ 110 and has not increased since. This implies that tariffs are only applied when the world price falls below US$ 110 and consequently, over the past decade, the import tariff has been irrelevant.

Although South Africa is a net exporter of maize in most years, with prices typically trading closer to export parity levels, there is a large degree of variation within a season as the market frequently switches between import and export parity. Prices typically trade at or even below export parity during harvest time, which is then followed by a period of substantial export volumes, until stock levels are reduced significantly. On the back of a weakening exchange rate, input costs are rising rapidly, putting profit margins under pressure. Therefore, productivity gains are essential for South African maize farmers to remain sustainable. As part of the productivity gains, farmers have adopted more conservation or no-till practices, as well as rotational cropping patterns with for example soybeans. This has contributed to the rapid expansion in soybean plantings.

Zambia

Zambia's agricultural sector is dominated by maize production, with more than 90% of maize produced by farmers cultivating less than 20 hectares (Crop Forecast Survey, 2014). The Zambian government has intervened significantly in the maize sector over the last decade. Interventions occur through two major agricultural programmes namely, the Farmer Input Support Programme (FISP), which is an input subsidy program for small-scale farmers, as well as the operation of a Strategic Grain Reserve called the Food Reserve Agency (FRA), which has purchased over 70% of marketed maize output in some years. The cumulative effect of these policies has been a rapid increase in maize cultivation by small-scale farmers; the crowding out of the private sector in input and grain trading markets; a decline in area under maize by large commercial farmers; as well as a fiscal drain on the national treasury (Kuteya & Sitko, 2013; Mofya-Mukuka, Kabwe, Kuteya & Mason, 2012).

Zambia is signatory to the COMESA and Southern African Development Community (SADC) trade protocols and, therefore, adheres to these Free Trade Areas (FTAs). Hence imports originating from within SADC and COMESA, including maize grain, are duty free. However, Zambia applies an import tariff rate of 15% for maize grain imports origination from countries outside COMESA and SADC (Zambia Revenue Authority, 2013). Despite these trade agreements, Zambia still regulates maize trade, especially with regard to exports. In years of maize shortages, the Zambian government has been known to impose export restrictions on maize. Formal export bans were introduced between 2012 and 2013, with the most recent one having been in place from September 2013 to April 2014. During these periods, only government-to-government exports were allowed (Sitko & Kuteya, 2013; Kuteya, Chisanga & Sitko, 2014). With the recent announcement of the bumper maize harvest, the export ban has been revoked by the Zambian government, opening its borders for exports. However, since most neighbouring countries also produced a good crop this year, export opportunities have not been forthcoming, resulting in a significant drop in maize prices.

Central Africa

Democratic Republic of the Congo

Within the Democratic Republic of Congo (DRC), maize accounts for the bulk of cereal consumption, reflecting its importance in food security. Maize is produced widely throughout the DRC, but the most prominent production regions are Katanga, Kasai, Bandundu and Northern Ecuador.

Over the past two decades, maize production in the DRC has not benefited from government intervention through the development and implementation of supportive policies. Nevertheless, the DRC remains a net importer of maize, while tighter technical leadership and improved availability of inputs has the potential to increase production levels substantially.

Recognising this, the government has initiated the establishment of ten agro-industrial parks across the DRC, the first of which was launched in July 2014. Bukanga Lonzo in Bandundu province, in partnership with the South African private sector, has allocated 5,000 hectares of newly planted maize with a projected yield of between 6.2 and 9 tons per hectare.

Macroeconomic assumptions

The baseline simulations presented in this outlook are largely driven by the projections for a number of key macroeconomic indicators. Projections for these indicators are mostly but not exclusively based on information provided by the OECD, the IMF, the World Bank and Global Insight. Below a brief discussion of macroeconomic indicators and their projection across the region is presented.

Global context

Based on IHS Global Insight projections, the global population is expected to rise by nearly 700 million between 2014 and 2023, or approximately 10%. Nevertheless, the rate at which the population expands is expected to decline. Real GDP per capita is projected to grow at an average of 2.4% per year.

Kenya

The Kenyan population is expected to expand at a rate of approximately one million people per annum, approaching 57 million by 2023.The Kenyan economy is expected to grow continuously at an average annual rate of 6.6% per annum over the next decade, with the highest growth rate of 7.43% being achieved in 2018. Over the outlook period, the exchange rate is projected to depreciate gradually against the US dollar, implying that the cost of imported products, both inputs and outputs will increase.

Table 1: Key macro-economic assumptions: Kenya

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of Kenya	44.4	45.7	47.1	48.5	49.9	51.4	52.4	53.5	54.6	55.7	56.8
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
KES / Foreign currency											
Exchange rate (KES/USD)	86.1	88.5	88.5	89.8	91.2	92.5	93.9	95.3	96.8	98.2	99.7
Exchange rate (KES/Euro)	114.3	119.9	115.3	119.4	123.7	126.8	130.0	133.3	136.6	138.7	140.8
Percentage Change											
Real GDP per capita	4.91	5.30	5.72	6.49	7.07	7.43	7.01	6.91	6.81	6.71	6.61
GDP deflator	5.33	6.29	5.54	5.54	5.59	5.09	5.65	5.59	5.54	5.48	5.43

Tanzania

Tanzania's population is expected to grow at an average of 3% annually over the next 10 years, reaching 68.21 million by 2023.This implies an additional 15.47 million mouths to feed over the outlook period. The economy is expected to grow steadily at an average rate of 7.28% over the outlook period, while the average inflation rate is projected at 8.43%. The Tanzania Shilling (TZS) is projected to weaken steadily and reach 1881 TZS/US$ in 2023. This trend suggests that maize exports are expected to become more competitive in the global market. However, continuous population growth and urbanization will increase domestic demand, limiting the surplus for export.

Table 2: Key macro-economic assumptions: Tanzania

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of Tanzania	50.8	52.3	53.8	55.5	57.1	58.8	60.6	62.4	64.3	66.2	68.2
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
TZS / Foreign currency											
Exchange rate (TZS/USD)	1605.4	1653.6	1686.7	1720.4	1754.8	1789.9	1807.8	1825.9	1844.1	1862.6	1881.2
Exchange rate (TZS/Euro)	2131.6	2240.3	2197.3	2286.9	2380.3	2452.4	2502.0	2552.5	2604.1	2630.1	2656.4
Percentage Change											
Real GDP per capita	7.08	7.14	7.39	7.40	7.82	7.69	7.57	7.46	7.37	7.27	7.18
GDP deflator	9.57	6.03	7.23	8.53	9.22	10.23	9.31	8.84	8.40	7.90	7.42

Malawi

Malawi is a small, densely populated and land-locked country in Southern Africa. The country's population has been growing at an average of 2.8% per annum and is projected to approach 22 million people by 2023. The economy is projected to expand at a rate of 5.7% per annum over the next decade, however the Kwacha is projected to depreciate against the US$ due to continued low auction floor tobacco prices and returns coupled with a weak manufacturing and mining sector.

Table 3: Key macro-economic assumptions: Malawi

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of Malawi	16.4	16.9	17.4	17.9	18.4	19.0	19.5	20.1	20.7	21.3	22.0
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
MWK / Foreign currency											
Exchange rate (MWK/USD)	369.5	385.0	427.4	453.0	475.6	494.7	514.5	535.0	556.4	573.1	590.3
Exchange rate (MWK/Euro)	490.5	521.6	556.7	602.2	645.2	677.8	712.0	747.9	785.7	809.3	833.6
Percentage Change											
Real GDP per capita	5.00	5.58	6.00	6.39	6.03	5.68	5.67	5.66	5.64	5.63	5.62
GDP deflator	38.94	31.54	3.47	10.13	7.40	6.80	6.46	6.27	6.02	5.72	5.49

Mozambique

Over the next 10 years, the Mozambican population is expected to grow from 25.8 million in 2013 to 31.49 million by 2023, an average annual growth rate of less than 2%. Expansion of the Mozambican economy slowed from 2012 to 2013 mainly due to political instability, however economic growth is expected to rebound strongly over the outlook period, averaging above 8%. The Mozambican Metical is expected to depreciate against the dollar, which implies that the parity prices for imported or exported maize will increase, while the costs of inputs are also expected to rise.

Table 4: Key macro-economic assumptions: Mozambique

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of Mozambique	25.8	26.4	26.9	27.4	28.0	28.5	29.1	29.7	30.3	30.9	31.5
US $/barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
MZN/Foreign currency											
Exchange rate (MZN/USD)	30.1	30.7	33.5	35.1	36.2	38.0	39.5	41.1	42.8	44.5	46.2
Exchange rate (MZN/Euro)	40.0	41.6	43.6	46.7	49.1	52.1	54.7	57.5	60.4	62.8	65.3
Percentage Change											
Real GDP per capita	6.90	8.10	7.90	7.90	8.00	8.00	9.00	9.06	9.82	7.03	6.43
GDP deflator	4.21	4.38	7.22	5.70	5.31	4.93	4.93	5.72	4.75	4.75	4.75

South Africa

South Africa's population has been increasing over the past decade, but at a decreasing rate. The population is projected to grow at less than 1% per annum over the outlook period and by 2023 it is estimated that the total population will reach 55.8 million. Whereas the economic growth rate in 2013 and 2014 has declined, mainly due to a number of labour strikes, South Africa's economic growth rate will recover, but is not expected to increase much higher than 3.5% per annum. The South African Rand is expected to depreciate against the US dollar, which implies that the parity prices for imported or exported maize will increase and the costs of inputs are also expected to rise.

Table 5: Key macro-economic assumptions: South Africa

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of SA	50.5	51.0	51.5	52.0	52.6	53.1	53.6	54.2	54.7	55.3	55.8
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
ZAR / Foreign currency											
Exchange rate (ZAR//USD)	9.2	10.7	11.0	11.4	11.7	12.3	12.7	13.1	13.4	13.8	14.2
Exchange rate (ZAR/Euro)	12.2	14.4	14.3	15.1	15.9	16.9	17.6	18.3	19.0	19.5	20.1
Percentage Change											
Real GDP per capita	2.50	1.50	2.50	3.30	3.60	3.66	3.57	3.51	3.49	3.56	3.52
GDP deflator	5.85	6.73	5.92	5.03	5.28	5.92	5.74	5.57	5.68	5.68	5.56

Zambia

The Zambian population is expected to grow by 34% over the next decade, reaching 19.5 million by 2023 and implying substantial growth in the demand for food. The economy is projected to expand by an annual average of 6.8%, with inflation declining over the outlook period to reach 5% in 2023, from 7% in 2013. The expected depreciation in the exchange rate will increase export parity prices, while the cost of imported inputs are likely to rise.

Table 6: Key macro-economic assumptions: Zambia

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of Zambia	14.5	15.0	15.4	15.9	16.4	16.9	17.4	17.9	18.4	19.0	19.5
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
ZMK / Foreign currency											
Exchange rate (ZMK/USD)	5.4	6.1	6.3	6.7	6.9	7.1	7.3	7.6	7.9	8.3	8.6
Exchange rate (ZMK/Euro)	7.2	8.3	8.2	8.8	9.3	9.7	10.2	10.7	11.2	11.7	12.1
Percentage Change											
Real GDP per capita	6.90	7.88	7.48	7.00	6.81	6.71	6.71	6.62	6.51	6.41	6.31
GDP deflator	6.98	7.26	6.17	6.66	5.99	5.99	5.51	5.02	5.02	5.02	5.02

Democratic Republic of Congo

The total population of the DRC is projected to expand by 34% over the next decade, surpassing 93 million by 2023.The economy is expected to grow at an average annual rate of almost 6%, implying rising demand. Continuous depreciation of the currency will increase the price of imported product, both maize and agricultural inputs.

Table 7: Key macro-economic assumptions: DRC

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Millions											
Total population of DRC	69.4	71.4	73.6	75.8	78.1	80.4	82.8	85.3	87.9	90.5	93.2
US $ / barrel											
Brent crude oil	109.7	111.8	113.9	116.1	118.4	120.6	123.0	125.4	127.8	130.2	132.7
CDF / Foreign currency											
Exchange rate (CDF/USD)	919.8	929.0	947.6	966.5	976.2	985.9	995.8	1005.8	1015.8	1026.0	1036.2
Exchange rate (CDF/Euro)	1221.2	1258.6	1234.4	1284.8	1324.1	1350.9	1378.2	1406.0	1434.4	1448.8	1463.2
Percentage Change											
Real GDP per capita	6.48	5.89	6.15	6.01	5.82	6.20	6.00	5.98	5.96	5.95	5.93
GDP deflator	6.13	8.28	8.69	7.65	7.11	6.26	9.51	9.23	8.95	8.68	8.42

Regional outlook

GLOBAL AND REGIONAL MAIZE SITUATION AND TRENDS

The recovery in global production in 2013 induced the expected decline in prices. Favourable weather, not just in the Mid-West, but also in other key producing areas in the world has caused a significant decline in world prices of grain over the summer of 2014, in expectation of bumper crops.

Global maize situation and trends

The U.S. drought of 2012 caused global maize prices to rise dramatically, coming as it did after two years of below trend yields for maize in the region. The recovery in global production in 2013 induced the expected decline in prices. Favourable weather, not just in the Mid-West, but also in other key producing areas in the world has caused a significant decline in world prices of grain over the summer of 2014, in expectation of bumper crops. Prices have fallen not only for maize, but also for other crops and their associated products. Table 8 displays the USDA's estimates of the global maize and soybean markets released in September 2014. Global maize area harvested for 2014/15 is expected to decline by nearly 2 million hectares, yet the decline in area is offset by the increase in yields and production levels are projected to rise, along with stock levels. Stock levels also rise for soybeans, despite a healthy increase in crushing levels. Actual areas and yields for the 2014/15 crops can still change from those indicated here, but would need to change significantly to alter the current outlook of prices well below the level of recent years.

Global prices used in the generation of this Outlook are from the FAPRI August 2014 Baseline Update, which was based on available information in mid-August. The representative world prices for grain are shown in Figure 1, with soybean complex prices in Figure 2. Maize prices fall from their 2012/13 peak and are expected to average less than $200 for 2014/15. Wheat prices also fall significantly. Both grain and oilseed prices are indicative of the general trend from the FAPRI Outlook, which indicates that crop price peaks were largely due to weather related issues, and in the future, average prices will be well below those peaks, but at a higher level than the averages of previous decades. The volatility that has characterized commodity markets in recent years is expected to continue, and the projections should be interpreted as averages, based on normal weather conditions and the macroeconomic projections outlined in the previous section.

Table 8: USDA estimates for global maize and soybean markets

	Maize			Soybeans		
	2012/13	2013/14 Estimate	2014/15 Projection	2012/13	2013/14 Estimate	2014/15 Projection
	Million hectares					
Area Harvested	177.2	178.2	176.4	109.4	113.0	118.1
	Tons per hectare					
Yield	4.9	5.5	5.6	2.4	2.5	2.6
	Million ton					
Production	868.8	968.7	987.5	267.8	283.1	311.1
Imports	99.4	121.2	112.9	95.9	108.9	112.5
Domestic Use	869.5	944.3	968.4	259.9	269.0	285.0
Exports	95.2	128.6	115.2	100.5	112.9	115.4
Stock Change	3.5	34.9	16.8	3.3	10.1	23.3

Source: USDA, World Agricultural Supply and Demand Estimates Report (WASDE), September 2014

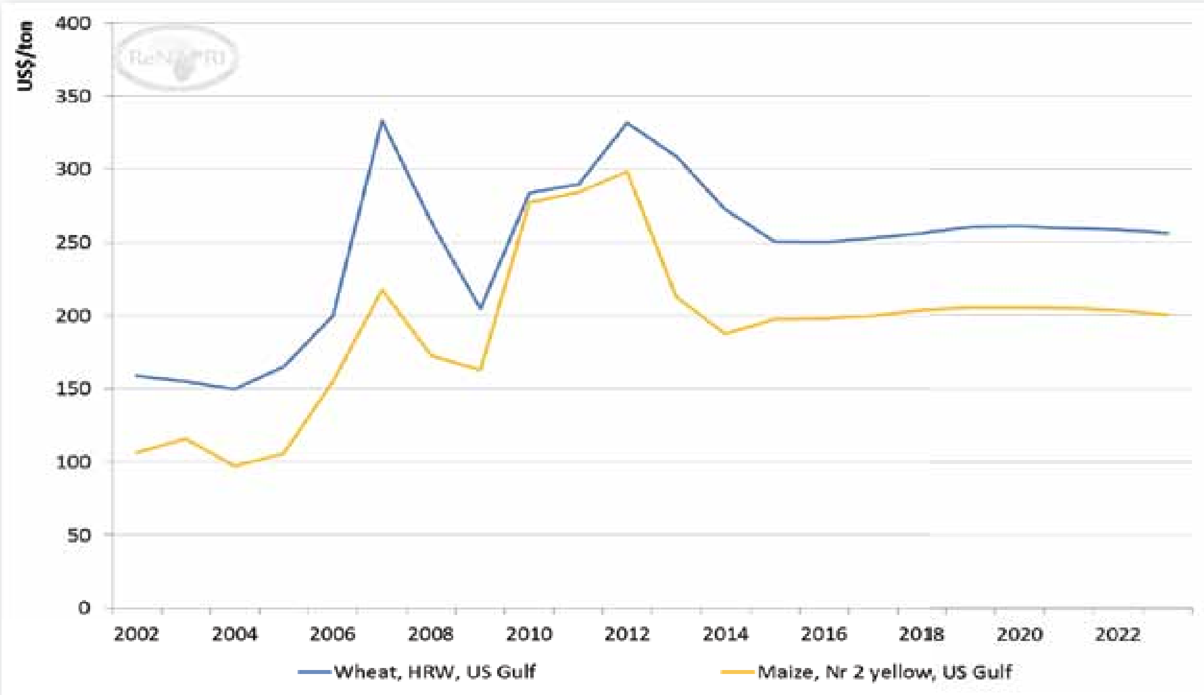

Figure 1: Representative global grain prices used in Outlook.
Source: FAPRI August 2014 Baseline Update

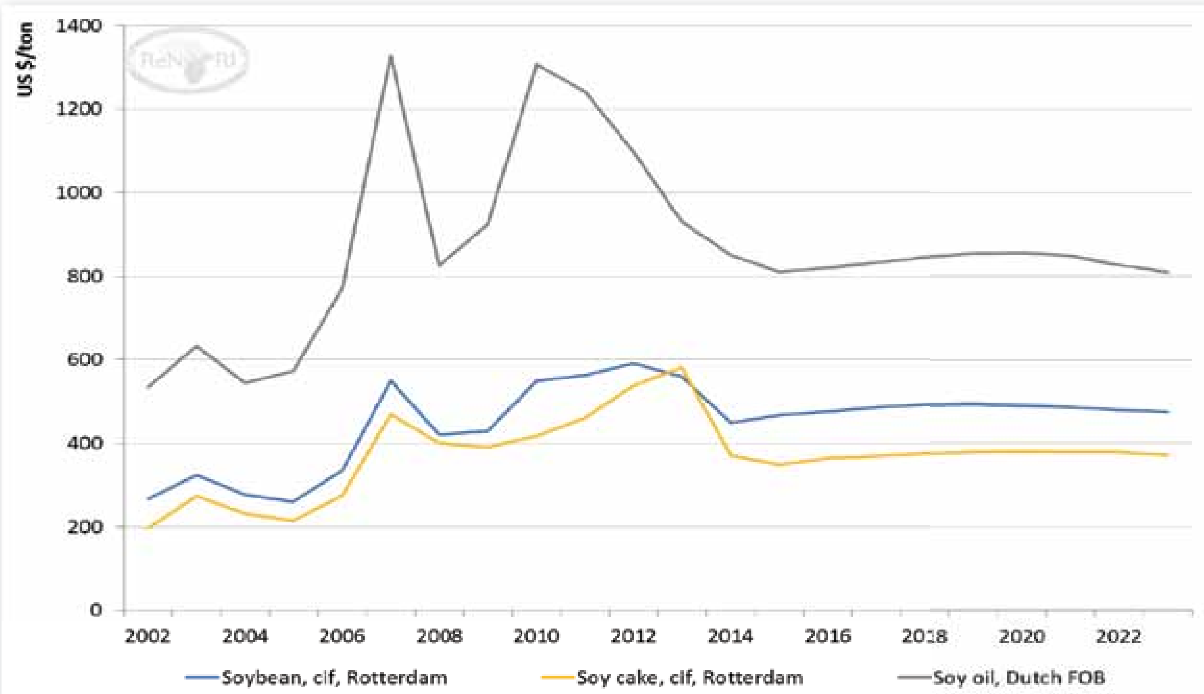

Figure 2: Representative global soybean and product prices used in outlook.
Source: FAPRI August 2014 Baseline Update

Within the context of rising income levels and growing population numbers, the resulting growth in demand will require a significant increase in agricultural output for staples, but also to supply growing demand for meat as populations become more affluent. Prices stabilize in the projections however, on the expectation that production keeps pace with demand. World maize yields are projected to increase at an average close to 1% per annum which, along with an increase in maize area (to 104 million hectares), results in an increase in maize production of 185 million tons.

Policies that have been introduced to increase the use of biofuels as a source of energy have been a major contributor to increases in demand for grain (mostly maize), sugar and vegetable oils. The U.S. and the EU, along with Brazil, have grown into the major players in the industry. However, it is assumed that there is limited potential growth in these markets given the issues with the "blend wall" in the U.S. and general resistance to using more biofuels from food crops in the EU. Maize use for biofuels over the projection period is expected to remain constant.

Meat prices in key markets around the globe have increased as feed prices rose and put pressure on margins. In the U.S., the after effects of the drought on cattle numbers, coupled with disease concerns in the pork sector have restricted meat supplies. Falling feed prices will spur production and increase feed use, but in the short term at least it is expected that there will be favourable margins for both livestock and dairy producers.

Regional maize situation and trends

Since the rise of the biofuels industry in the US, increasing integration of world food and energy markets has subjected African countries to greater instability in food prices. Several of the world's largest economies, including India, Indonesia, and China have implemented food marketing and trade policies that effectively stabilize their domestic food sectors while at the same time raising the volatility of world market prices (Anderson, 2012). Many African countries are open economies with respect to food trade and have low trade barriers *vis a vis* international markets. Therefore, the recent rise in world food price volatility has contributed to heightened instability in African food prices. Coastal areas have experienced this heightened instability the most, with inland areas less vulnerable to world price instability due to their natural insulation resulting from high transport costs.

However, still the largest proportion of the cereal price volatility experienced in most African countries over the past decade is due to domestic supply shocks, not world market volatility (Minot, 2014). And, perhaps ironically, the Eastern and Southern African countries experiencing the greatest cereal price instability are those most actively intervening in their markets through cereal trade and marketing board operations (Chapoto and Jayne, 2009; Minot, 2014). Few countries in the region have moved to a rules-based form of intervention in agricultural markets that provide predictable signals for the private sector about the specific conditions that will trigger government's intervention in food markets. For the purpose of the baseline the current trade policies are assumed to be maintained, with no export bans being implemented.

Figure 3 illustrates the outlook for country specific maize prices (in US dollars). Similar to the global outlook,

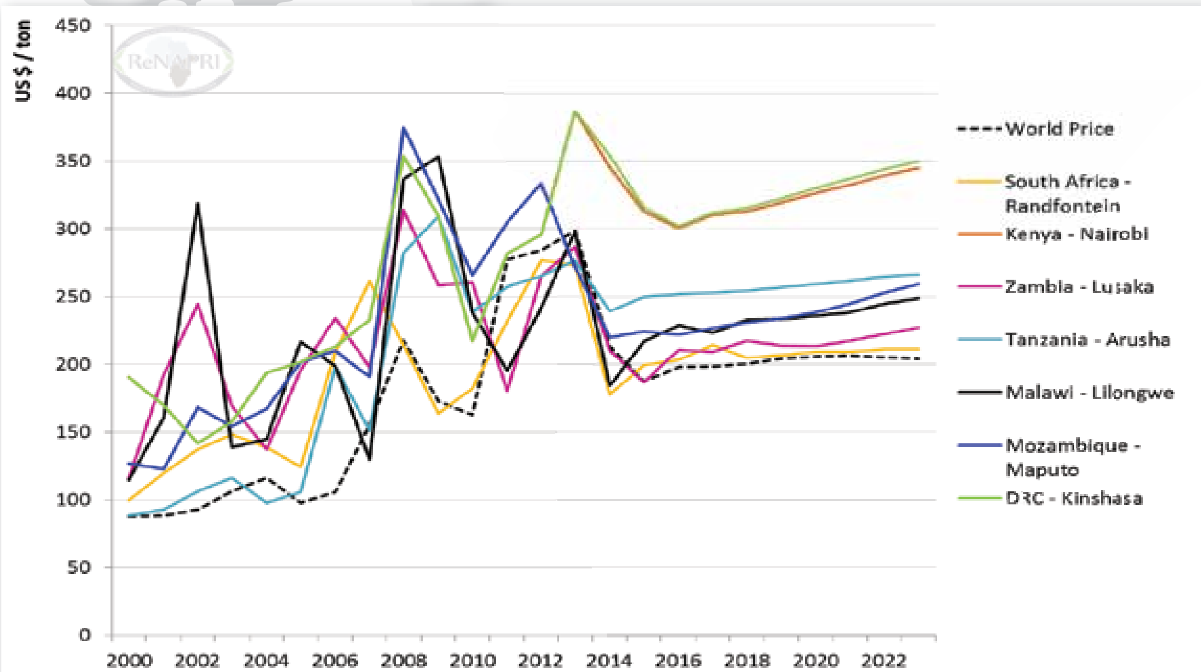

Figure 3: Country specific maize price outlook 2004 to 2023

maize prices have declined sharply in all of the countries in 2014. Over the baseline, prices are projected to increase, but the rate of increase is slower relative to the past decade. In the specific country outlook section, price trends are presented in local currency. In general, the principle still holds that in countries that are net importers, such as Kenya and the DRC, maize prices are generally trading on a higher plateau closer to import parity levels and are projected to continue on this pathway over the outlook period.

Kenya is a major player in the Eastern-Africa maize market and prices in Kenya drive much of the variation in prices within this region. This is evident in the projected price trend for Tanzania in Arusha. Despite the fact that Tanzania is expected to remain self-sufficient in maize production and still produce small surpluses in the main production regions. Arusha prices are expected to trade at a higher plateau, as surpluses are traded across the border into Kenya. The projection of maize prices in Malawi is even more complex as accurate information on the maize balance is hard to come by and prices differ across the country. For the purpose of this baseline, however, it is assumed that the level of integration between the Malawi and Zambian maize markets will be maintained due to Zambian surpluses continuing to flow into Malawi. Therefore, maize prices in Malawi are expected to follow similar trends to the maize prices in Zambia, but on a higher plateau based on the transportation costs between Zambia and Malawi.

Zambia is expected to remain a net surplus producer of maize and apart from maize prices in South Africa, prices in Lusaka are expected to be the lowest in the region. Zambian maize prices will also have a meaningful impact on prices in neighbouring markets like Harare and the Northern parts of Mozambique and the competition between Zambian and South African maize exports will intensify in these markets, with Zambian maize having a non-GM advantage. Hence, under the assumption of less government intervention in Zambia, there should be a higher level of market integration between South Africa and Zambia over the outlook period.

The South African Futures Exchange (SAFEX) market price for white maize can be regarded as a market leader in the Southern African region and with South Africa expected to remain a consistent surplus producer of maize under the assumption of normal weather, the SAFEX white maize price will remain the lowest maize price on the African continent. In cases where official trade is registered on a regular basis, for example South African maize exports to the Southern parts of Mozambique (Maputo), the markets are relatively well integrated and the level of price transmission is high.

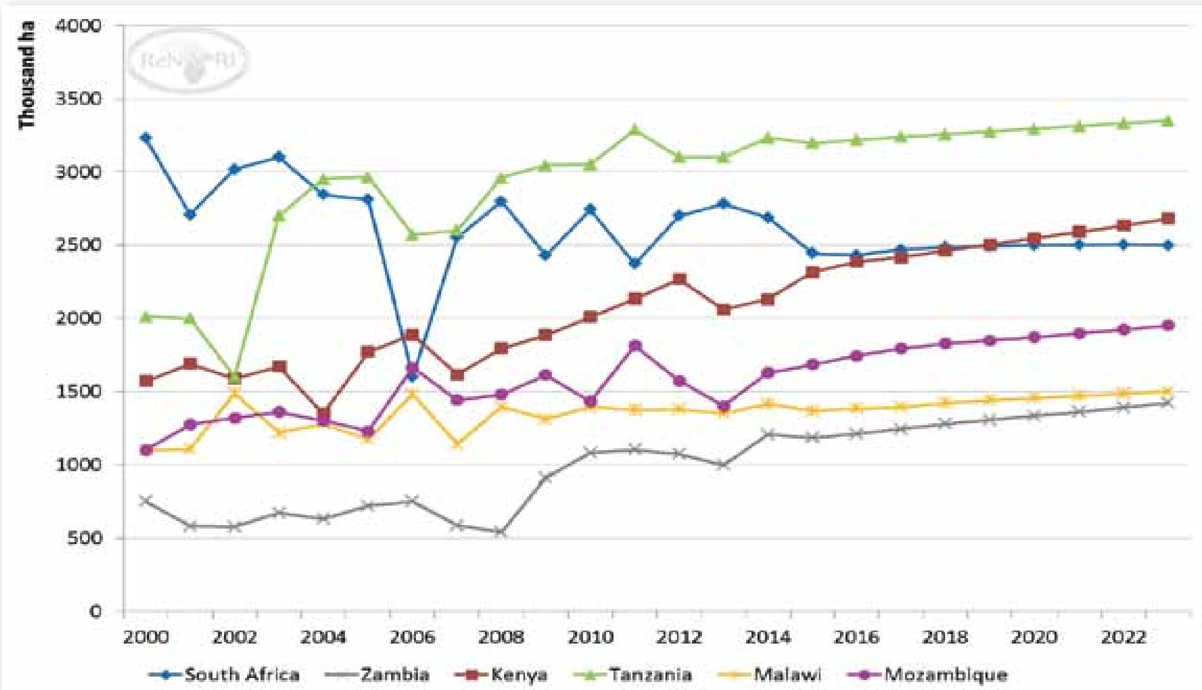

Figure 4: Maize grain area harvested

In response to rising commodity prices, producers are expected to expand the area under production in all countries but South Africa, where area under production is projected to decline from current levels and Malawi, where area under production is projected to remain relatively constant (Figure 4). The largest area under maize production for a single country is Tanzania with more than 3 million hectares planted to maize. In South Africa, there are a number of exogenous factors that impact negatively on the area harvested, for example the expansion in mining operations and land reform. By 2018, Kenya could become the country with the second largest area under maize production. The total maize area harvested in the seven countries represented in this outlook will increase from 14.1 million hectares in 2014 to 15.2 million hectares in 2023. Growth in maize area in some countries reflects increased cropping intensities of existing farmland, i.e., more continuous cultivation of fields and a reduction of fallows and crop rotations (Fuglie and Rada, 2013), consistent with findings of increasing land degradation and declining yields in densely populated smallholder farming areas experiencing land scarcity (Jayne et al., 2014).

Figure 5a presents the maize balance sheet for the region. In 2014, an all-time record maize harvest is expected with a sharp increase from 26 million tons in 2013 to 32 million tons. This sharp increase is driven by favourable weather conditions. Under baseline assumptions, production in the region is projected to increase to 38 million tons over the outlook period. Total consumption is currently estimated at 27 million tons and will grow over the baseline by an annual average of 3% to reach 36.3 million tons by 2023. This implies that the region is currently producing a net surplus of approximately 1.7 million tons per annum, but over the baseline, this surplus will shrink as the growth in demand exceeds that of production.

South Africa is projected to provide a substantial share of total exports from the region and given the shift towards yellow maize in South Africa, which is generally exported into the global market as opposed to the regional market, Figure 5b presents the regional balance sheet with South African deep sea exports excluded, which results in the region moving into a deficit situation. This scenario would reflect a substantial increase in domestic price levels given the general trend of depreciating exchange rates within the region.

Maize feed demand will make up

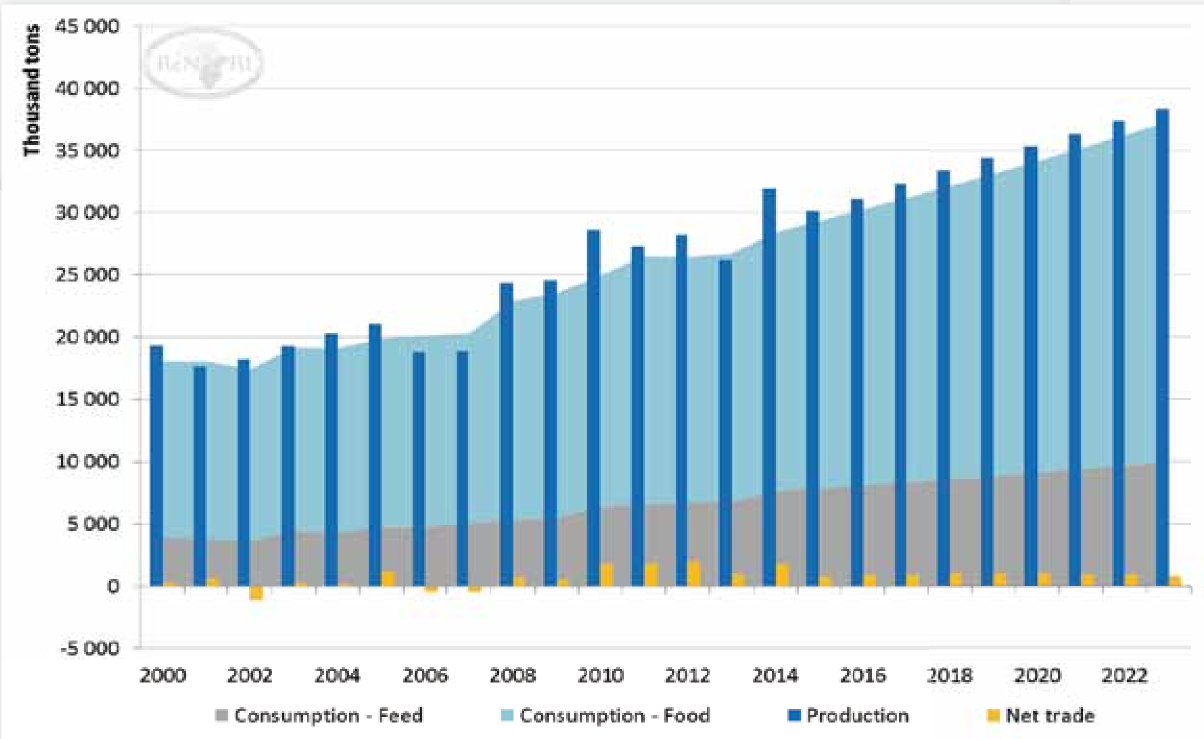

Figure 5a: Maize regional supply and demand

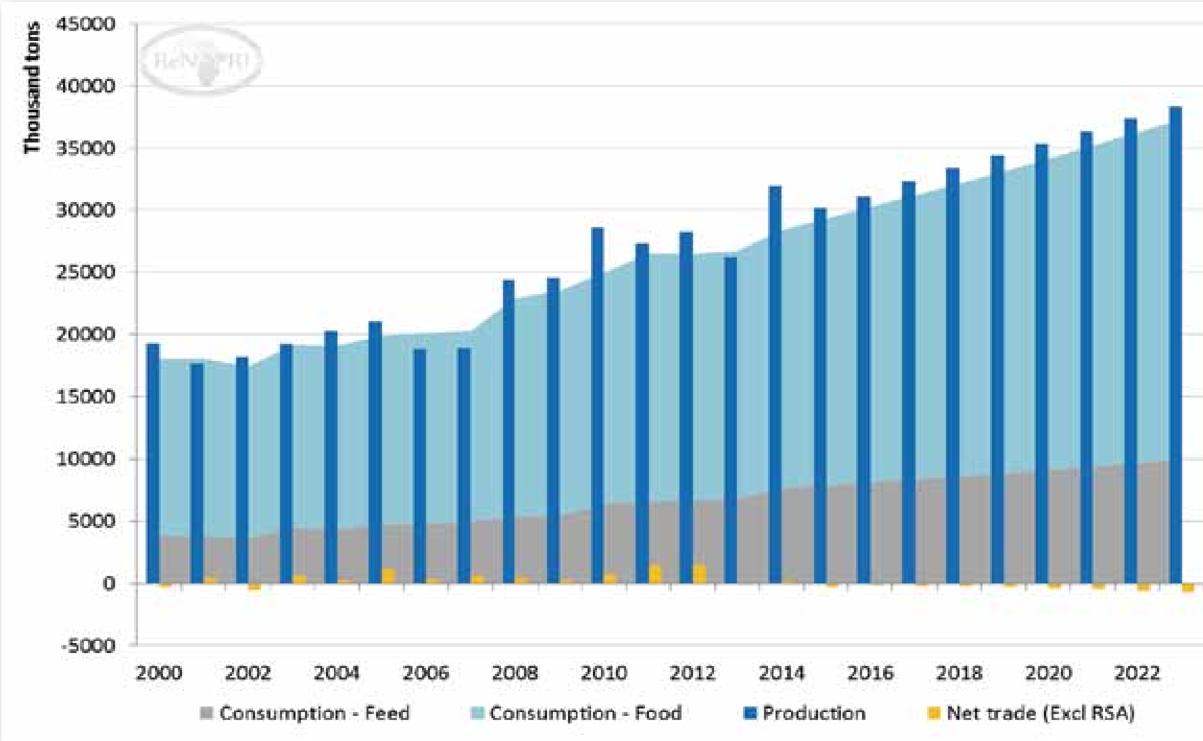

Figure 5b: Maize regional supply and demand

one third of total maize consumption by 2023, which implies that whereas white maize production is currently dominating the regional maize markets (except for South Africa), it is a plausible future scenario that yellow maize production will gradually gain market share. The largest share of this growth will occur on commercial farms linked vertically into value chains like broilers.

Kenya Maize Outlook

Over the next decade, nominal prices are expected to trend upwards, as the depreciating exchange rate increases import parity levels, despite stagnant world prices.

Poor market access, high cost of production, particularly due to high input costs, low relative maize prices and the devastating maize lethal necrosis disease (MLND) led to some farmers shifting away from maize production to horticulture and other cereals like wheat in recent years. Kenya's 2013 maize harvest was already 22% below average, which led to an increase in maize prices towards the end of 2013 and in 2014, poor rainfall resulted in reduced yield levels and consequently, production is expected to decline by a further 10% relative to 2013 levels.

Despite the reduction in production levels in 2014, prices have declined somewhat from 2013 peaks, mainly due to sufficient availability of imports from Tanzania and Uganda, both of which produced bumper crops. Firm prices recorded in 2013 and 2014 are projected to induce an expansion in area under production in 2015 (Figure 6) and under the assumption of normal weather conditions, this would drive prices down in 2015. In addition, the liberalization of the Kenyan maize market has improved price transmission from the world market and over the next two years, the price of maize is expected to decline in line with the world price, which has already fallen in response to bumper harvests. Over the next decade, nominal prices are expected to trend upwards, as the depreciating exchange rate increases import parity levels, despite stagnant world prices. Accounting for general inflation however results in relatively stable real prices from 2016 onwards.

Figure 6: Kenya maize area harvested and price

Relatively stable real prices, combined with marginal improvements in productivity over the outlook period implies rising gross income per hectare and consequently, the area planted to maize is projected to expand by 25% over the 10 year period. This combination of area expansion and productivity growth results in continued growth in production of 43%.

Maize consumption is expected to increase by 1.7 million tons, or 44% over the next ten years; a trend which is attributable to both population growth and rising income per capita. The middle income class in Kenya continues to grow and as income levels rise, the demand for pig and poultry products is projected to expand. While only a small portion of total maize is consumed in the feed market at present, increasing demand for meat and dairy products is expected to result in growing demand for maize in the feed market over the next decade. With consumption growth continuously outpacing production growth over the next 10 years, imports are projected to remain a significant share of domestic consumption, approaching 1 million tons by 2023. The bulk of import demand is expected to be met from within the Eastern and Southern African region, where production is projected to expand by almost 40% over the 10 year period.

The Kenyan government has recently announced plans to expand the area under irrigated maize production by more than 200 thousand hectares. The successful implementation of such plans could alter the production outlook significantly post 2017.

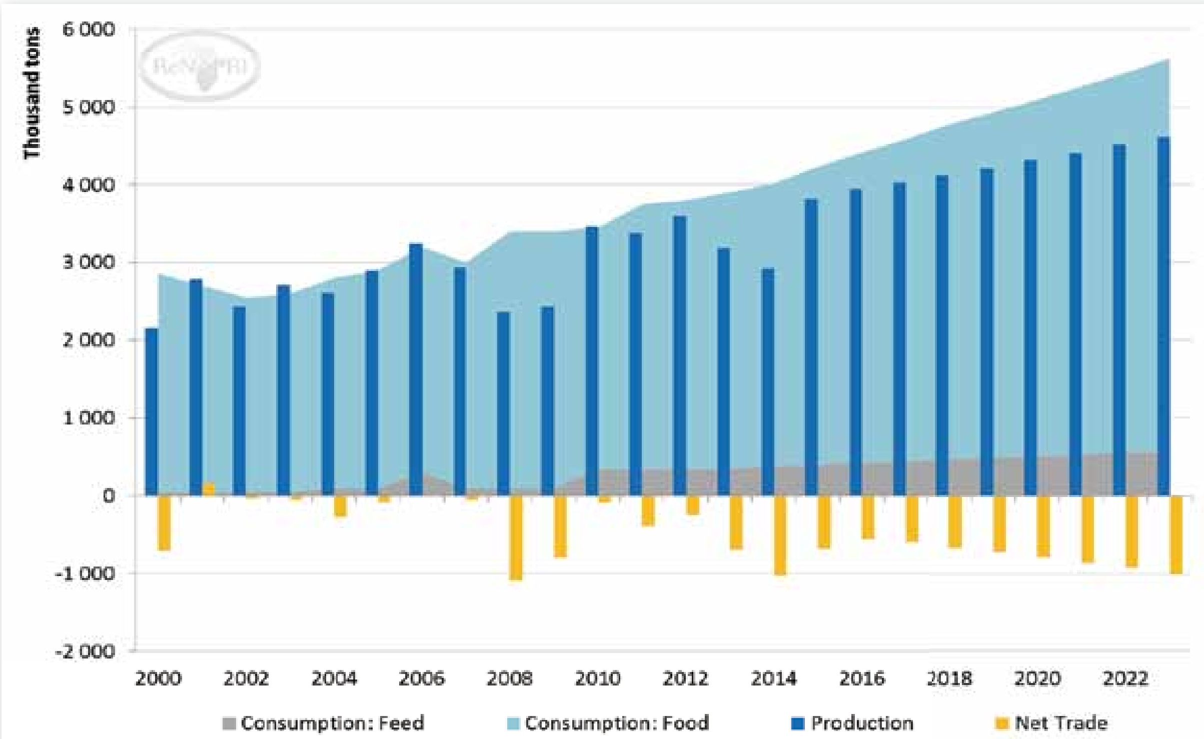

Figure 7: Kenya maize production, consumption and trade

Tanzania Maize Outlook

Continued surpluses in the market and falling world prices which transmit into the Tanzanian market through the Kenyan price resulted in a substantial decline in prices from 2013 levels.

Following relatively stable production levels since 2011, Tanzania recorded a bumper harvest of 5.17 million tons in 2013/14 due to favourable climatic conditions. Substantial export volumes into Kenya have helped to reduce surplus stock to some extent; however continued surpluses in the market and falling world prices which transmit into the Tanzanian market through the Kenyan price still resulted in a substantial decline in prices from 2013 levels. The prospect of good short rains between October and December 2014 has created the expectation of another above average crop in 2015; however growing domestic demand in the long run, along with the steady depreciation of the exchange rate underpins rising prices over the outlook period in nominal terms. Accounting for general inflation however results in marginally declining prices in real terms.

Area under maize production is projected to expand only marginally over the next decade; however continuous improvement in yield levels still results in production growth of 45% over the 10 year period, with production surpassing 6.6 million tons by 2023. As a result, Tanzania is expected to continue to be self-sufficient in maize production, with intermittent exports into the East African region under favourable weather conditions.

On a per capita basis, continued growth in income levels is likely to reduce the rate of consumption growth for maize as a staple compared to the past decade, as consumers switch to rice, however rising affluence will increase the demand for meat and dairy products and hence a growing share of total maize will be consumed in the animal feed market. Combined with the effect of continued population growth,

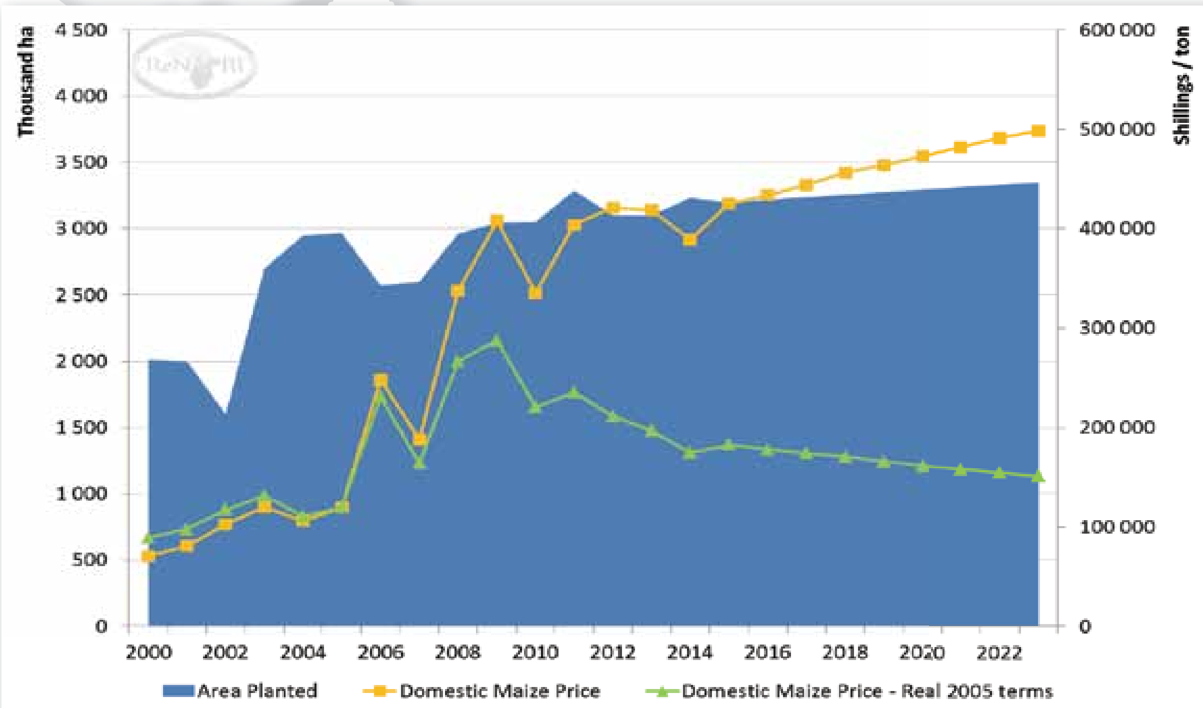

Figure 8: Tanzanian maize area harvested and price

this underpins the projection of total maize consumption expanding by 44% over the outlook period.

High exports volumes in 2014 are due to a bilateral arrangement between the governments of Tanzania and Kenya to clear stocks in response to the bumper harvest of the 2013/14 season, however war-torn countries such as Southern Sudan and the Democratic Republic of Congo are also potential importers of surplus maize from Tanzania. With expanding production outpacing domestic consumption growth only marginally over the 10 year period, exports are projected to approach 50 thousand tons by 2023. The disincentives from non-tariff barriers may also hinder the realization of the potential benefits from open trade.

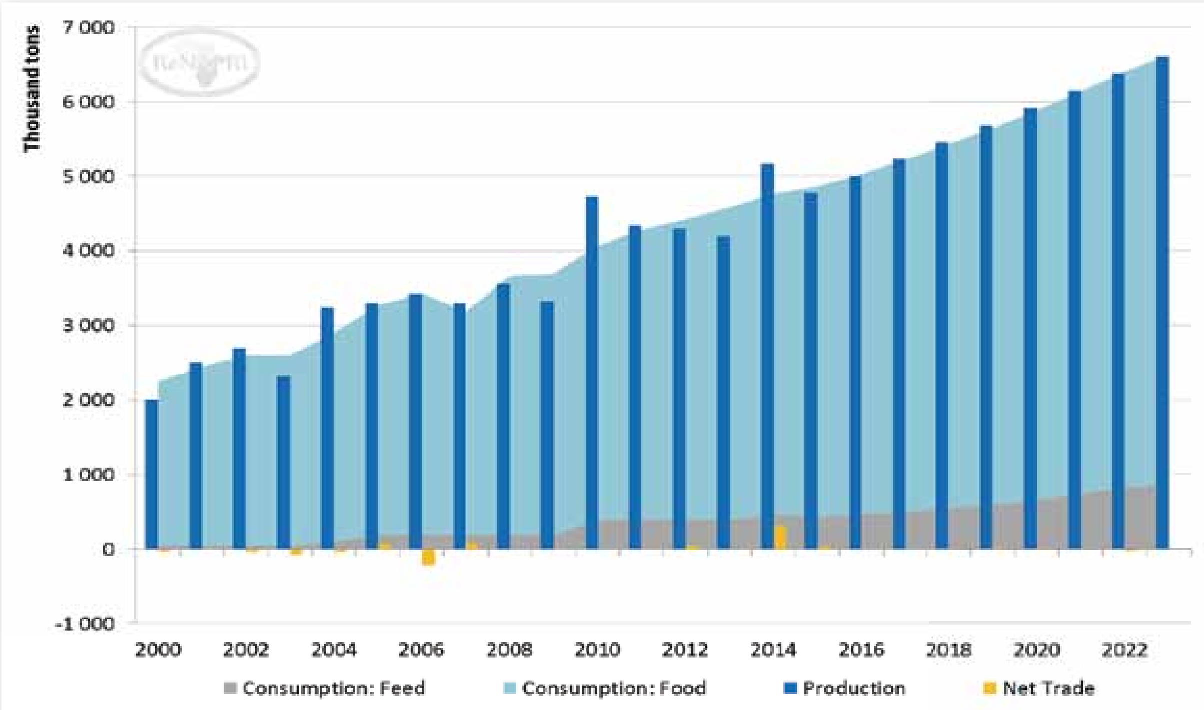

Figure 9: Tanzanian total maize production, consumption and net trade

Malawi Maize Outlook

Maize consumption per capita is currently estimated at approximately 130kg and nearly all households engaged in agriculture grow maize. As a result, food security in Malawi is associated with maize production. Maize is grown on over 50% of the available arable land.

In Malawi, agriculture is responsible for 85% of total employment and contributes approximately 39% to GDP (Future Agricultures Working Paper 039). Maize consumption per capita is currently estimated at approximately 130kg and nearly all households engaged in agriculture grow maize. As a result, food security in Malawi is associated with maize production. Maize is grown on over 50% of the available arable land (Jayne *et al.*, 2010).

Prior to 2010, the area under maize production showed significant fluctuations, due to profitability and expansion of other crops. In 2014, 1.4 million hectares was planted to maize and assuming that current policies such as FISP and controlled maize pricing and marketing policies remain unchanged, the area is projected to remain relatively constant to 2023.

Despite its dominance both in terms of acreage and government support, the rate of maize production growth has not kept pace with population growth. Average yields stagnated marginally above 1 ton/ha during the 1980's, before dropping below 1 ton/ha in the 1990's and rising once more to approximately 2 tons/ha from 2006 to 2010. The reasons for low yields are multi-faceted, including poor agronomic practices, use of unimproved seed varieties and poor access to fertilizers. Crop harvest and soil erosion accounts for 70% of all N loses, about 90% of all K losses and 100% of all P losses (Drechsel, et al., 2001). In addition, most farming systems cannot have a fallow period to reduce nutrient mining. Although soil conservation is vital, the soil conservation measures do not lead to a noticeable yield impacts unless other inputs are simultaneously applied. Malawi has high soil erosion rates and severe nutrient mining due to its topography.

This being the case the Malawi government introduced the Farm Inputs Subsidy Program (FISP) in 2005/06 season in response to a severe food shortage of 2004/05. The aim was to increase smallholder productivity and therefore achieve food security at both household and national levels. Despite implementing the FISP over the years, the average yields of about 2 tons/ha

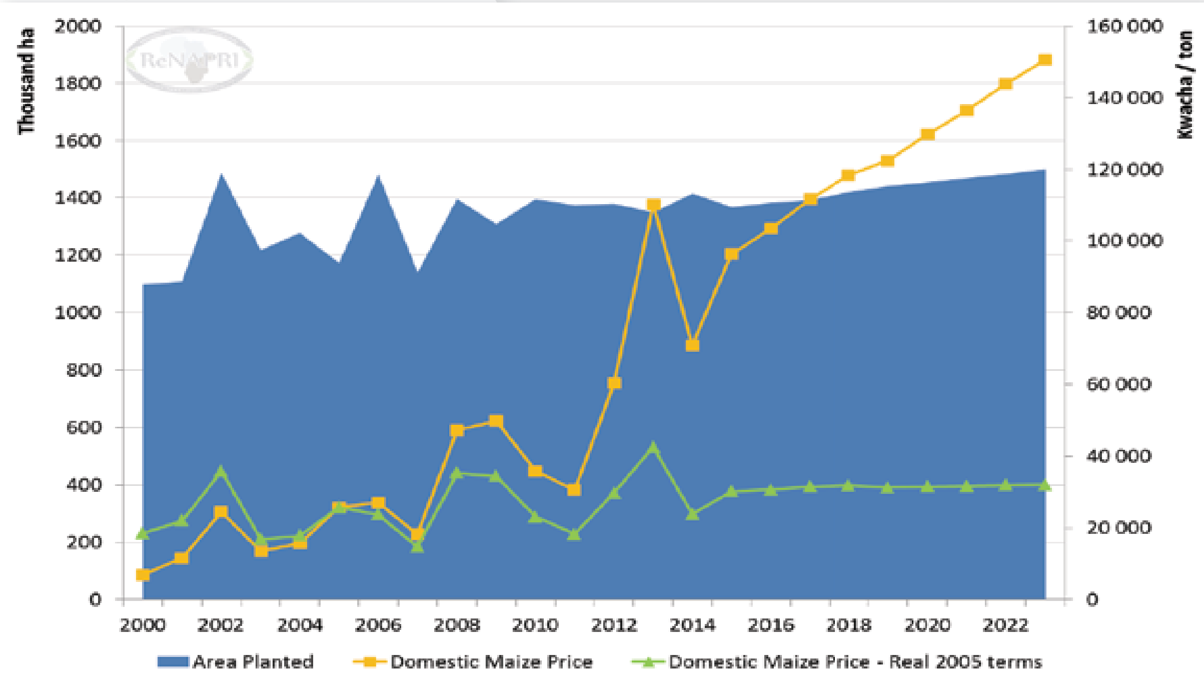

Figure 10: Malawi maize area harvested and price

achieved by smallholder farmers are far below the estimated potential of 5 to 15 tons/ha for some of the varieties. Furthermore the increases in maize production seen over the years have come from expansion of area under production as opposed to significant yield improvements. The low maize productivity implies that over 50% of the cultivable land be devoted to subsistence maize production thereby affecting area available for cash crop production. Realistic ways of increasing maize output in Malawi depend on two major factors: use of high yielding varieties and maintaining and enhancing the fertility of the soil (most of which are heavily depleted) particularly through efficient use of fertilizers (Ministry of Agriculture and Food Security, 2011).

Nominal domestic maize prices have generally revealed an upward trend and are projected to continue trending upwards to 2023.The price is supported by growing domestic consumption (feed and food) arising from population growth and increased demand from manufacturing. Accounting for general inflation however results in only a marginal increase in the domestic maize price from 2014 onwards.

From 1961 to 1991, maize production in Malawi increased by about 1.8% per annum or a total of 55% over the entire period. Almost 75% of this resulted from area expansion, with yields increasing by only 0.4% per annum. The 1993/94 season was characterised by adverse weather conditions, political uncertainty and the collapse of the smallholder credit system. Despite some dips, production has generally followed an increasing trend from 2000 and it is projected that maize production will surpass 3.3 million tons by 2023. This is due to continued implementation of the FISP, which allows farmers to have access to improved varieties of maize and fertilizer. The main maize varieties are hybrids, OPVs and traditional varieties.

Over 95% of the maize produced in Malawi is for domestic consumption, with approximately 54% of smallholder farmers still buying in maize. The bulk of the marketed maize comes from a small percentage of farms (around 20%) and the marketed volumes are a small proportion of total production (13.6% to 15.7%). The greatest demand for maize is in rural areas, where around 88% of the population resides and where 60% to 70% of the households buy maize. Many urban households grow their own maize.

Demand for maize by brewers, livestock and poultry feeders and maize millers is about 30 000 tons in a normal year, 40 000 tons in a year of low prices and 20 000 ton in a year of high prices. Although some modest formal exports to neighbouring countries have been recorded by Malawi from 2006 onwards, informal imports from Mozambique remain significant and FEWSNET data indicates that Malawi remained a net importer of maize until 2010. Volumes remain a small percentage of national consumption and similarly, net exports recorded since 2010 remain below 10% of domestic production. Exports are projected to dwindle to almost zero by 2016 with import demand rising marginally thereafter. This is due to increased projected population, poor agronomic and land husbandry practices, limited potential for cropland expansion, increased use of marginal areas and restricted use of external inputs such as improved seeds and fertilizers. Malawi price estimates presented in this outlook remain sensitive to specific policy assumptions and in this regard, changes to current policies such as the FISP or trade policy can have significant effects on future price projections.

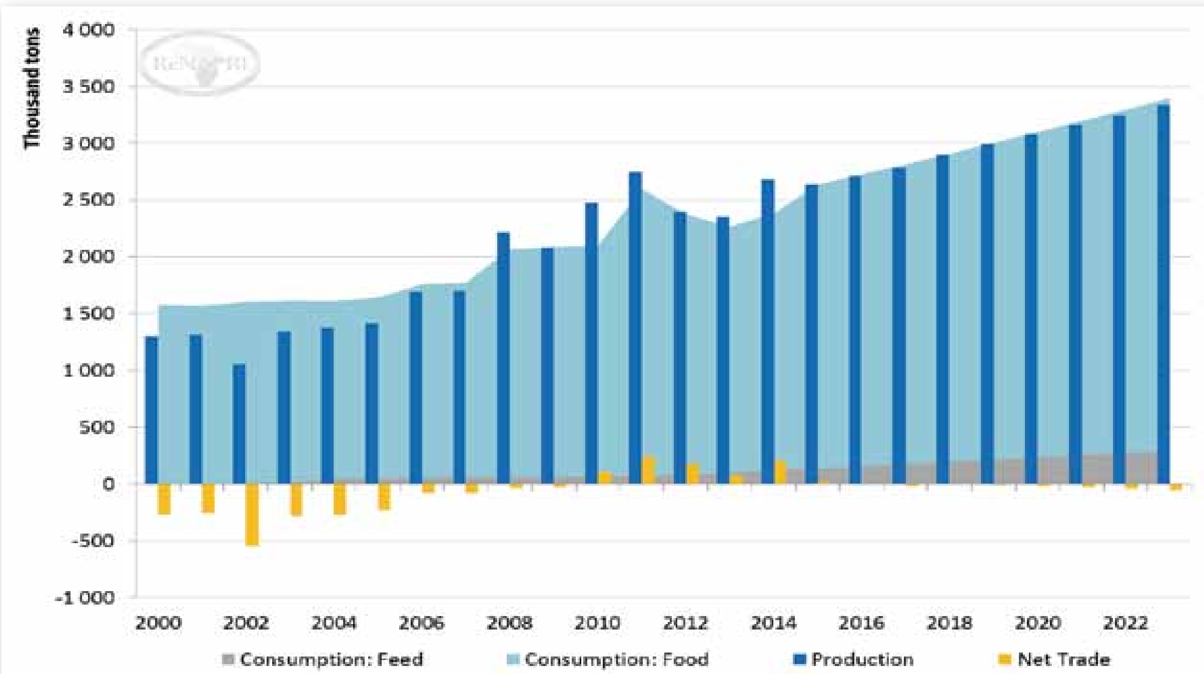

Figure 11: Malawi total maize production and consumption

Mozambique Maize Outlook

Following two years of reduced output resulting from poor weather conditions, maize production in Mozambique recovered in 2014.

Following two years of reduced output resulting from poor weather conditions, maize production in Mozambique recovered in 2014. Increased area under production and improved yields following favourable weather conditions resulted in an expansion of output from 1.6 million tons in 2013 to 2 million tons in 2014. Marginal improvement in yield levels and expanded area under production is projected to increase maize output by 46% over the next decade. Yields are expected to increase from 1.2 tons per hectare in 2013 to 1.4 tons/ha by 2023, driven by increasing fertilizer use and the adoption of improved varieties. Over the next decade, the total area planted to maize is expected to increase by 24%, approaching 1.9 million hectares by 2023.

Despite rising output levels, the nominal maize price is expected to increase from 6 600 MT/ton in 2013 to 10 014 MT/ton by 2023 (Figure 12). This represents an increase of 58% over the 10 year period, which is in line with general inflation levels and hence real prices remain relatively stable from 2014 onwards, in line with the South

Figure 12: Mozambique maize area planted and prices

African price, which is where the bulk of Mozambican import originate from.

Anticipated population growth, as well as improved income per capita over the next decade results in increasing demand for maize, consumed as a cereal, but also as animal feed due to growing demand for meat and dairy products. Over the coming decade, domestic demand is expected to increase by 45%, rising from 1.9 million tons in 2013 to approximately 2.9 million tons by 2023 (Figure 13).

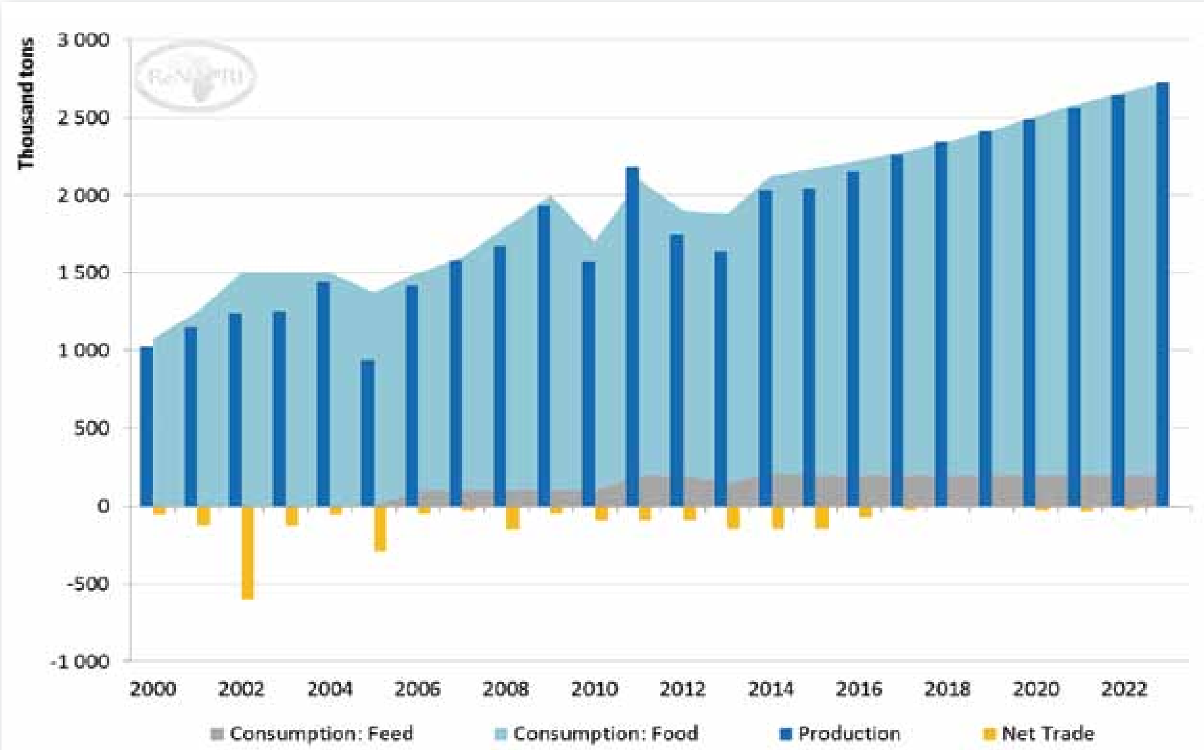

Figure 13: Mozambique total maize production and consumption

South African Maize Outlook

Over the past decade the maize area continued to decline from 3 million hectares to the current level of 2.6 million hectares. However, over the same period of time, yields have increased by 63% bringing the national average yield to 5.3t/ha.

In the eighties, South Africa produced maize on more than 4 million hectares, with government subsidies allowing for a significant share of the maize being produced on marginal lands. With the deregulation of the market in the mid-nineties, much of the marginal land was taken out of production. Over the past decade the maize area continued to decline from 3 million hectares to the current level of 2.6 million hectares. However, over the same period of time, yields have increased by 63% bringing the national average yield to 5.3t/ha. Apart from taking marginal land out of production, the sharp rise in yields was not only driven by the introduction of GM varieties, better rotational and conservation cropping practices but also by a rapid expansion in hectares under irrigation. Over the outlook period, this trend will continue with the total area under maize declining to 2.3 million hectares by 2023 and yields increasing to 6.1t/ha. Although the split between white and yellow maize is not illustrated in this baseline, the Bureau for Food and Agricultural Policy (BFAP) shows in its latest agricultural outlook for 2014 that the total area under yellow maize production will exceed that of white maize production by 2018 as the sharp rise in local demand for feed will have to be satisfied. Some of the area lost to maize production will fall under soybean production as the area under soybeans is expected to double over the next decade.

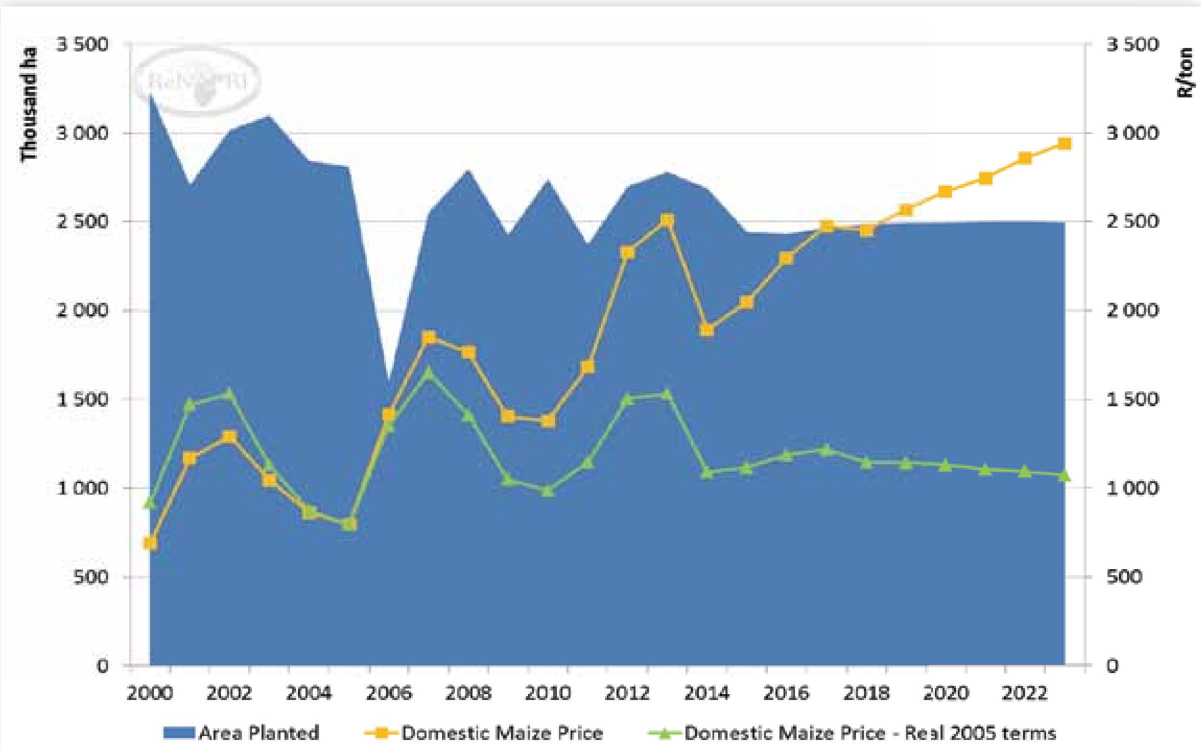

Figure 14: South Africa maize area harvested and SAFEX price

Figure 15 illustrates that South Africa will remain a net surplus producer of maize under the assumption of normal weather patterns. This implies that the local maize price (SAFEX) will continue to trade closer to export parity levels. Since South Africa is trading under a free market environment, on average there is a high level of price transmission between global and domestic prices. Naturally, this level of transmission is constantly changing as regime switches over the short run occur, but over the long-run the general transmission is high. Therefore, over the next two years, the SAFEX maize price is anticipated to increase from its current low levels of R1800/ton to around R2000/ton. Over the long run the gradual depreciation in the exchange rate is the underlying driver behind the increasing trend in the SAFEX maize price. The increase in feed demand will outpace the increase in human consumption by a significant margin and by 2023 almost 7 million tons of maize will be consumed in the feed market.

Although the South African maize price is expected to remain the lowest price in the region, the regional trade dynamics have changed in recent years and more structural changes are anticipated. For example, whereas South Africa was the dominant exporter of white maize to Zimbabwe, Zambian maize surpluses are now entering the Zimbabwean market at very competitive prices. In addition, Zambian maize is non-GM maize and the majority of maize in SA is GM. Despite the fact that the importation of GM maize is banned by countries like Zimbabwe, maize still crosses the border. The deep-sea export markets for white maize are limited, which implies that in years of growing surpluses like 2014, white maize trades at a discount to yellow maize and enters the feed market, while more yellow maize is exported. These structural shifts will also accelerate the shift from white maize to yellow maize production in South Africa.

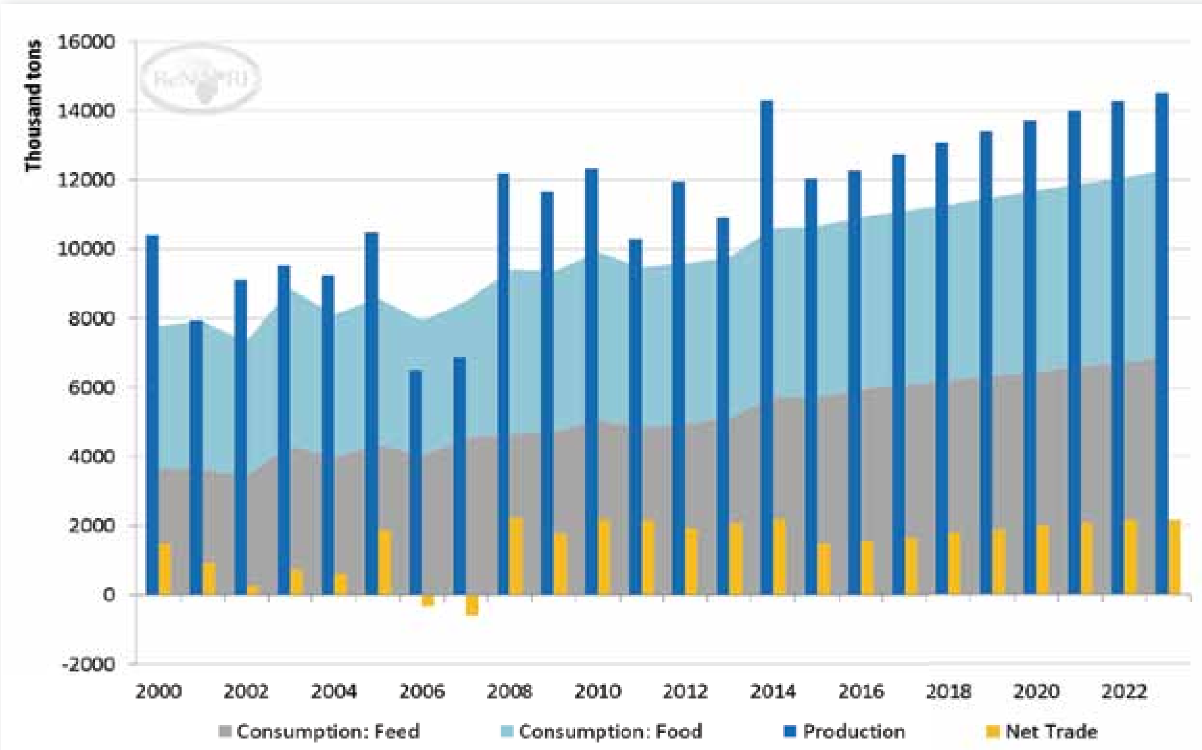

Figure 15: South Africa maize production and consumption

Zambia Maize Outlook

Given the high maize production and carry over stock of almost 600 thousand tons from the previous season, the current maize surplus is in excess of 1.15 million tons.

Zambia recorded the highest maize harvest in its history in the 2013/14 production season, amounting to 3.4 million tons against the annual national requirement of about 2.8 million tons. Given the high maize production and carry over stock of almost 600 thousand tons from the previous season, the current maize surplus is in excess of 1.15 million tons. The high maize availability in the current marketing season has depressed maize prices in the domestic market. Figure 16 indicates that the domestic maize price is currently trading around ZMW 1 280 (US$ 213) per ton, a substantial decline from last year's price of ZMW 1 540 (US$ 285).

The expansion of maize area planted in the 2013/14 marketing season was largely in response to the high maize price from the 2012/13 season. The nominal domestic maize price is expected to recover from the current low in 2015, rising steadily to reach ZMW 2 300 (US$ 268) by 2023. In real terms however, this translates to relatively stable prices from 2014 onwards. Area under maize is likely to be maintained at about 1.2 million hectares in the 2014/15 production season, rising steadily thereafter, to reach 2.3 million hectares by 2023. Corresponding to the increase in maize area planted, production is expected to increase from the current levels to about 4.6 million tons by 2023 (Figure 16).

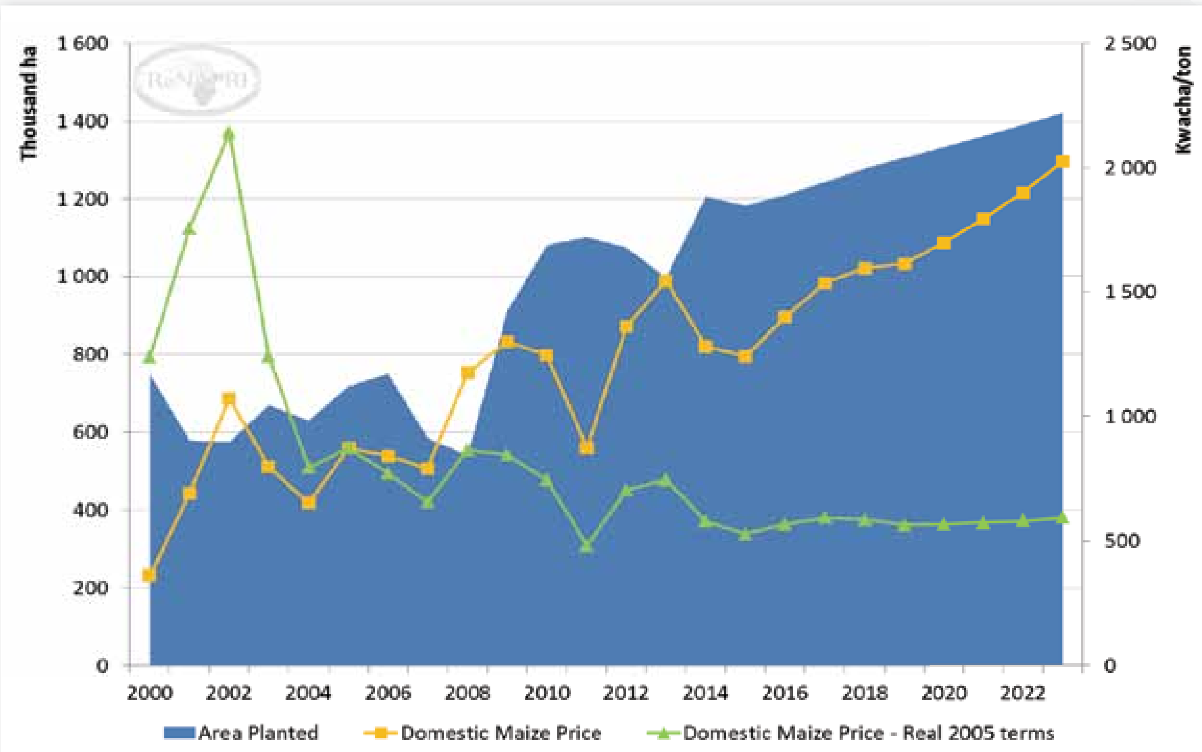

Figure 16: Zambian maize areas harvested and prices

Figure 17 illustrates that maize for human consumption is expected to rise rapidly, by approximately 50% by 2023, as a result of both population and income growth. Rising affluence is expected to stimulate the demand for meat and dairy products and hence the demand for feed is expected to rise even more rapidly by approximately 75% over the next decade.

Zambia is expected to remain a net exporter of maize throughout the outlook period, exporting around 480 thousand tons per year. However, the export growth remains flat throughout the outlook period. By implication, this suggests that domestic demand drivers will be more significant in accounting for the expected growth in the maize sector compared to trade dynamics. Consistent maize exports will position Zambia as a reliable source of maize for deficit countries such as the DRC and Zimbabwe, a position that can only be attained by ensuring that its trade policies on maize remain consistent and transparent.

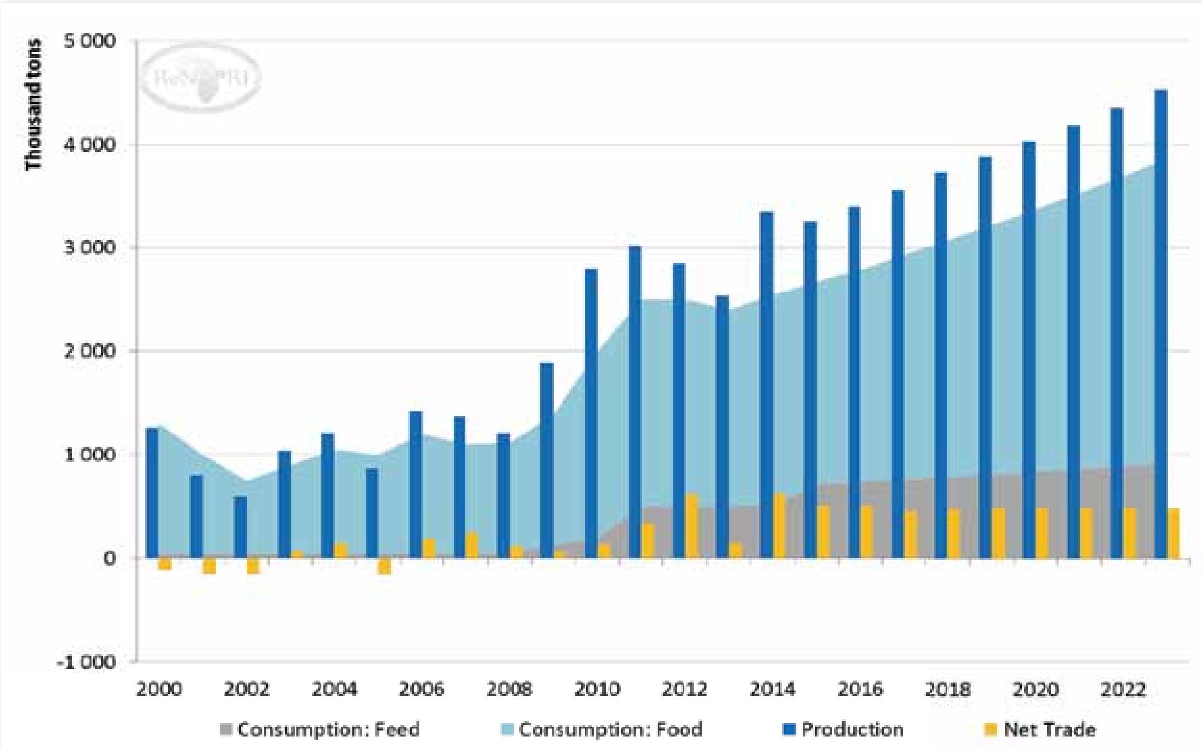

Figure 17: Zambian maize production, domestic use and net trade

DRC Maize Outlook

Following the maize price spike in 2013 which resulted from regional shortages of maize, the maize price in DRC is expected to decrease in 2014, due to stabilization of regional supply.

Following the maize price spike in 2013 which resulted from regional shortages of maize, the maize price in DRC is expected to decrease to 278 thousand Congolese francs (US$ 299) per ton in 2014. This decline is largely attributable to stabilization of regional supply levels, following a marginal increase in area planted to maize in 2014.

Over the next decade, continued depreciation of the currency, combined with firm demand will result in continuously rising maize prices when considered in nominal terms (Figure 18), however accounting for inflation results in prices that decline marginally over the 10 year period. Consequently, productivity increases will be required for maize producers to remain profitable. Nevertheless, maize remains a key crop for food security reasons and production; particularly at subsistence level is projected to expand.

Area planted to maize is projected to expand by 24% over the next decade, surpassing 2.1 million hectares by 2023. In 2014 maize production will rebound to 1.5 million tons of maize, stimulated by the increases in both maize yield and area. Over the outlook period, maize yields are projected to increase only marginally, from 0.82 tons per hectare in 2013 to 0.95 tons per hectare by 2023, however expanding areas will drive production continuously higher.

With maize feed use projected to remain rather constant over the 10-

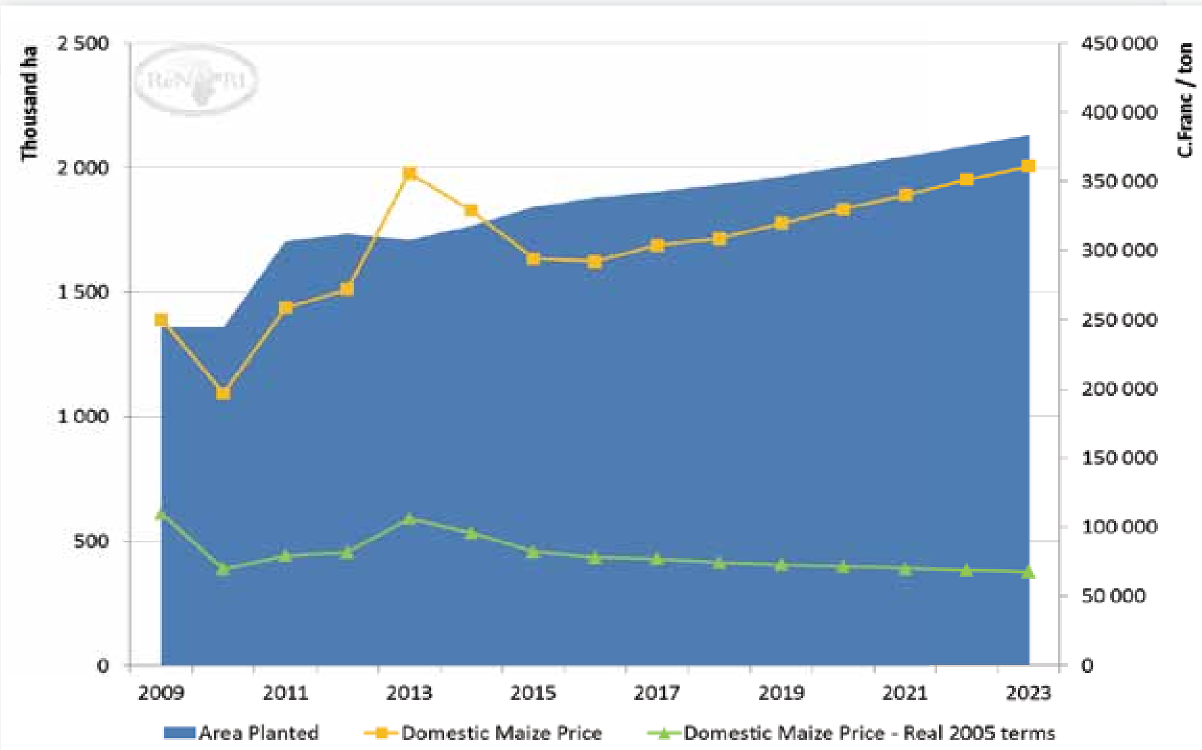

Figure 18: DRC maize area harvested and price

year period, growth in the consumption of maize as a food cereal will be the driving force for the increasing demand for maize. Overall, food consumption is expected to increase by 51% over the next decade. The drivers behind such growth are growing per capita demand for maize due to the increases in incomes, combined with overall growth of the population in the DRC.

Despite rising areas under production, the demand for maize is projected to outpace the supply response, resulting in increased maize imports, from 470 thousand in 2014 to approximately 770 thousand in 2023.

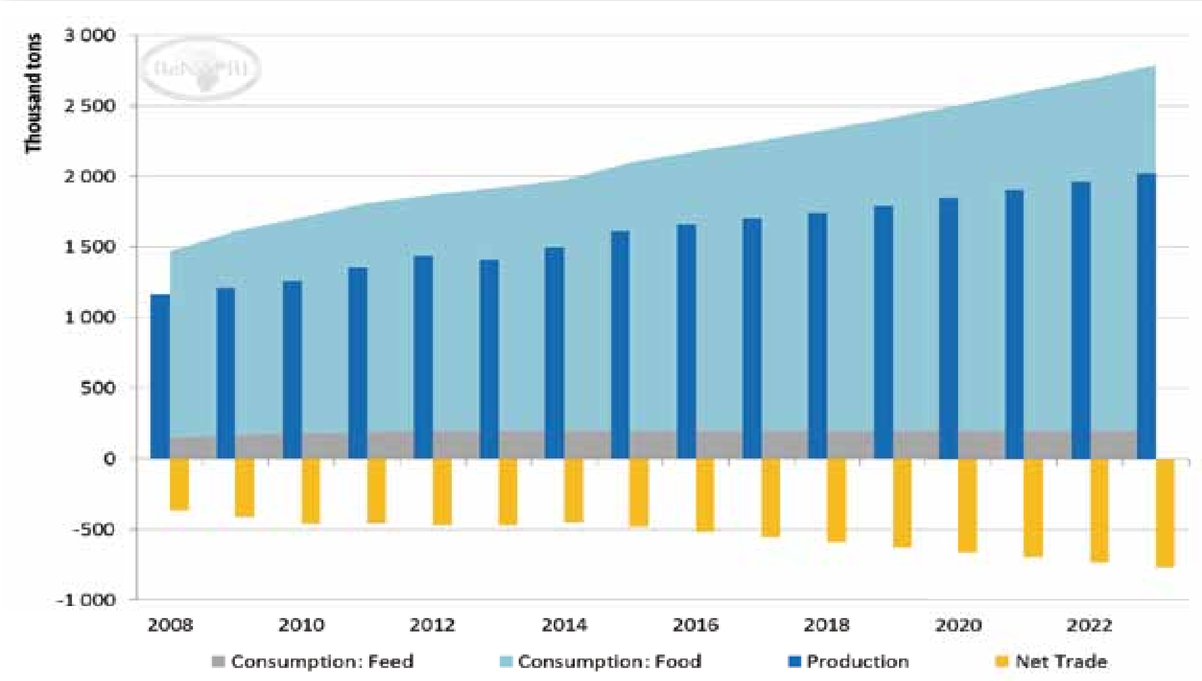

Figure 19: DRC total maize production, consumption and net trade

Farm Level Analysis

Production costs are the basis of competitiveness. Production cost information can play a valuable role in informing critical agricultural policy issues and guiding policy makers' decisions. However, to date, there is a paucity of consistently collected information on crop production costs in Africa. Cross-country comparisons are inhibited by their sporadic collection, and lack of comparability in methods and timing.

In order to overcome these knowledge gaps, the Regional Network of Agricultural Policy Research Institutes (ReNAPRI) conducted a Cost of the Production (COP) study between 2013 and 2014 in Kenya, Tanzania, Malawi, the Democratic Republic of the Congo, Zambia, Mozambique and South Africa. The scope of the study involves two complimentary approaches;

1. the agri benchmark approach, which utilized a consistent methodology for measuring costs of production for vastly different maize production systems in the region; and
2. the Survey-based approach, which complemented the agri benchmark approach by constructing estimates of maize production costs and marketing margins for specific regions and production systems using detailed farm survey data.

This report presents ReNAPRI's first findings on the cost of maize production

Production cost information can play a valuable role in informing and guiding many national policy issues; particularly in commodity markets, which receive public support through government input subsidies and/or buying programs.

KE2TNZ	Kenya, 2ha, Kitale	KE50TNZ	Kenya, 50ha, Kitale
TZ2IR	Tanzania, 2ha, Iringa	TZ500IR	Tanzania, 500ha, Iringa
MW3LADD	Malawi, 3ha, Lilongwe	MW650LADD	Malawi, 650ha, Lilongwe
DRC5KAT	Democratic Republic of the Congo, 5ha, Katanga	DRC1000KAT	Democratic Republic of the Congo, 1000ha , Katanga
MZ1MD	Mozambique, 1ha, Moamba	MZ25MD	Mozambique, 25ha, Moamba
ZM7SP	Zambia, 7ha, Kalomo	ZM1050CP	Zambia, 1050ha , Mkushi
ZA5TKZN	South Africa, 5ha, KwaZulu Natal	ZA1600NFS	South Africa, 1600ha, Bothaville

Figure 20: The ReNAPRI network of proto-type farms

Source: ReNAPRI Agribenchmark farm locations based on the agri-benchmark approach, which is then compared to estimates derived from the survey-based approach. The objective of the agri benchmark initiative is to create a national and international database on farm level information through collaboration between the public sector, agribusinesses and producer organisations. The link between the local and international network provides the means to benchmark Eastern- and Southern African agriculture with global farming systems. From 2013, the agri benchmark methodology was applied within Eastern and Southern Africa through the identification of proto-type farms in the key maize producing regions within the ReNAPRI network. Regions are pre-selected based on the prevalence of maize cultivation within countries included in the network. The standard operating procedure (SOP) used to identify proto-type farms, their respective regions, their prevailing production systems, size, management level and labour structure allows for standardised and comparable farm-level datasets across the globe. The proto-type farms presented in this analysis represent the modal production features of specific growing regions selected for the study, however they cannot be considered strictly representative of an entire country. Intra-regional variations in production costs arise due to variations in farm sizes, yield levels, output prices, crop response rates to fertilizer, and other technical parameters.

It should be noted that the first agri benchmark proto-type farm findings refer specifically to the 2011/12 season, which implies maize planted in 2011 and then harvested and marketed in 2012. In this regard, it must be acknowledged that the reported crop performance is specific to the season in question, which in some instances represented an exceptional season. Performance therefore does not necessarily represent the normal/regular performance for all the regions. As future annual updates continue for these identified proto-type farms, the availability of time-series data will identify variations related to climate and hence provide a more comprehensive picture of what can be expected from these modal farms and their respective regions. Furthermore, these proto-type farms are considered above average producers, which will most-likely outperform the mean or median producer in a specific district or growing region. Integrating the agri benchmark proto-type farm approach and household survey data allows for production cost information and their respective variations to be captured on a more frequent basis.

Figure 20 represents ReNAPRI's farm-level network of proto-type farms across Eastern and Southern Africa (ESA). Presently the network includes two farms in each country; representing a small- and large scale proto-type farm representative of modal conditions in two specific maize-producing regions.

Description of proto-type farms in Eastern- and Southern Africa, performance and challenges

Kenya

Maize represents the most important cereal crop in Kenya and it forms an integral part of the food and feed system, contributing significantly to national food security and income generation for rural households. As the main staple food for the people of Kenya, it provides more than a third of the caloric intake and it represents the primary ingredient used in animal feeds (Kirimi et al, 2011).

The major maize producing areas are located on the Western side of the country, mainly the Rift Valley region; which includes the Trans Nzoia, Uasin Gishu, Nakuru and Bungoma counties. In these areas, maize is produced in conjunction with other high-valued crops such as beans, potatoes, groundnuts and bananas.

agri benchmark proto-type farms in Kenya

The proto-type farms developed in Kenya, both large- and small-scale maize farms, are situated in the Trans Nzoia County in the Rift Valley region; the bread basket of the country. Set in the slopes of Mt. Elgon and Cherangany hills, Trans Nzoia County is the largest maize producer in the region. It is characterised by a cool, temperate climate with average annual temperatures ranging from 10°C to 27°C. Rainfall is well distributed throughout the cropping period and typically falls within the range of 1000 to 1300mm per annum. Maize is the dominant crop produced in the county but the climate is also suited to the production of other crops such as coffee, beans, bananas and groundnuts.

Production System

In 2012, the small-scale proto-type maize farm, situated in the Cherangany sub-county within Trans Nzoia had access to 2.2 hectares of land; with 2 hectares utilized for agricultural production while the homestead occupied the balance. In general, the pro-type farmer owns 1.8 hectares and rents-in 0.4 hectares. Maize, as a staple commodity, is planted on 80% of the arable land within the region; The balance is used for dairy, sheep, horticulture and poultry production, which, in 2012, generated an additional KES 75 750 (US$ 896) in farm revenue; with dairy accounting for 56% of this additional revenue. Maize is intercropped with beans on the small-scale proto-type farm, and given the latters' shorter growing period, beans are harvested twice for a single maize harvest. For the large-scale proto-type producer, maize is produced in an intensive, mono-cropping system, which entailed two consecutive ploughing operations followed by harrowing prior to planting.

In terms of mechanisation, the small scale proto-type maize farm in Trans Nzoia did not own a tractor, but rather hired in tractor services for ploughing, harrowing and shelling. Weeding, harvesting, plant protection and post-harvest dusting are all performed manually by household members and hired labour, using hand hoes and/or machetes (pangas). In contrast, for the large-scale proto-type farm, several farming activities are mechanised which include ploughing, harrowing, planting, harvesting, shelling and transportation. Seed application rates vary amongst producers, depending on several factors that include crop type, crop architecture, soil fertility levels, precipitation and farmer preferences. The small-scale farm applied Bulldock, a pesticide to protect against maize stalk borer, commonly found in Cherangany sub-county. Bulldock is applied manually at the nodal sections of maize stems using a backpack sprayer. Other plant protection practices include two weeding's, performed using hand hoes before and after the pesticide spray.

In terms of fertilizer application, the small scale proto-type farm applied 185 kg/ha Di-ammonium Phosphate (DAP) during planting, 185 kg/ha Calcium Ammonium Nitrate (CAN) and 2.47 litre/ha of foliar feed as top dressing. In all, this translates to 67 kg/ha of Nitrogen (N) and 37 kg/ha Phosphate (P) on maize. In monetary terms, the cost was KES 483 (US$ 5.71) and KES 1 339.67 (US$ 15.81) per kg, for Nitrogen and Phosphate respectively. According to the Ministry of Agriculture, Livestock and Fisheries (MoALF), the soils in Trans Nzoia county are generally acidic as a result of continuous use of DAP without liming. The acidity hinders nutrient availability to the crops and also leads to Aluminium (Al) toxicity thus depressing maize yields directly and through relatively low crop response rates to DAP fertilizer application.

Given the increase in global fertilizer prices, the Kenyan government embarked upon a National Accelerated Agricultural Input Programme (NAAIAP) as a farm support system that would promote food security, agricultural input use, input market development and agricultural productivity. Initially designed to provide subsidized fertilizers and maize seed for a limited number of districts, it was subsequently expanded to national

Figure 21: Map of Kenya
Source: Africa Turismo (2014)

coverage to provide 2.5 million farmers with maize seed and fertilizers for 0.4 ha each. The targeted farmers were issued with vouchers, which they were to redeem from private input sellers.

The general subsidy program was later initiated by the government to cushion farmers from escalating fertilizer prices. This was implemented through a partnership with the National Cereals and Produce Board (NCPB). Price support was given to poor farmers on DAP and CAN. In 2012, farmers received a 35% subsidy on fertilizers (DAP and CAN) and a 17% subsidy on maize seed. The subsidy was mostly accessed by the large-scale farms and was not readily accessible for the proto-type small-scale producers.

Several local banks and other financial institutions have developed financing packages designed to offer credit to farmers at an average interest rate of 14.6% per annum. The service is available to all farmers, with collateral in most cases being land. The small scale proto-type farm did not use this service and instead self-financed the farm operations using capital from the previous season or other off-farm activities. In contrast, the large scale proto-type farm borrowed money to finance most of the farm operations.

Maize is marketed through a number of outlets in Trans Nzoia county. Buyers include assemblers or brokers (external and internal), small traders, large traders or wholesalers, other farmers, millers and the National Cereals and Produce board (NCPB). Even though the county is endowed with about 59.2 km of tarmacked roads, about 135 km of gravel surface roads and about 306.5 km of earth surface roads, most farmers consider transport cost to the markets as high and prefer to sell to the traders at farm gate.

Labour structure and costs

Both the small and large scale proto-type farms are labour intensive. In the small-scale farm, a total of 35 workers were employed for a total of 1 494 hours. This labour force is inclusive of both the hired and family labour; of which family labour accounted for 67% of total labour hours. Family labour does not represent an actual expense on the small-scale proto-type farm; however the opportunity cost, estimated as the hired equivalence, amounted to KES 30 000 (US$ 355) out of the KES 56 550 (US$ 669) spent on labour.

For the large-scale, commercial proto-type farm, hired labour on maize accounted for 78% of the total labour costs (52% contractual and 26% seasonal labour) while family labour accounts for 21%. In 2012, the wage rate for most of the farming activities was KES 200 per worker per day with the exception of shelling and transportation, which is compensated on a per bag basis. Table 9 provides an overview on different labour wage rates for various activities.

Overview of the 2011/12 production performance

Over the past five years, approximately 2 million hectares of cultivated land has been under maize annually, with total production ranging from 2.3 and 3.1 million tons per annum. In 2012, the total production peaked at 3.6 million tons due to the favourable weather. In terms of total production, small- to medium-scale farmers typically produce approximately 75% of the nation's maize crop, while the large-scale farmers produce the other 25%. However, the marketed proportion from producers is estimated to be 60% from the small- and medium-scale and 40% from the large scale.

Factors limiting production expansion and efficiency

Maize production in Kenya faces various challenges including falling productivity, decreasing land sizes occasioned by rising rural population density and subsequent land fragmentation, the land tenure systems, limited availability and affordability of farm inputs and climate variability, coupled with poor irrigation technologies. Unaffordable credit and inappropriate crop husbandry practices also affect maize production adversely. Continuous use of certain fertilizers has also led to soil acidity and soil degradation (Mwangi et al., 2003). This has hindered maize farmers (small, medium and large scale) from achieving their desired levels of yields and from using inorganic fertilizer as productively as possible.

Kenya has been grappling with the challenge of keeping maize prices high enough to stimulate production

Table 9: Wage rates per activity in Kenya (2012)

	agri benchmark	Survey data
Type of activity:	**Wage rate: US$ per hour**	
Men: Median for Kitale district	-	US$ 0.25
Woman: Median for Kitale district	-	US$ 0.25
Transportation	US$ 0.59	-
Fertilizer application	US$ 0.30	-
Cutting	US$ 0.37	-
Husking	US$ 0.26	-

Source: agri benchmark results database (2012) & Kenyan Agricultural Household Survey (2010).

incentives for farmers, while at the same time keeping them low enough to ensure poor consumers' access to food despite the liberalization in maize marketing. The Kenyan government faces the challenge of ensuring price stability, which is a major impediment to smallholder productivity growth and food security. High maize prices affect most households' welfare given that over half of small scale maize farmers are net buyers of maize (Kirimi et al, 2011; Ariga and Jayne 2010).

Tanzania

Maize is the main staple food in Tanzania and contributes up to 33% of total caloric intake in the country. Maize is grown country wide, however the five Southern Highlands regions (Iringa, Njombe, Rukwa, Mbeya and Ruvuma) are considered Tanzania's maize basket area (Figure 22). Maize occupies 70% of the total area planted to cereals in Tanzania (Tanzania Agriculture Sample Census, 2007/08), however productivity levels are low, ranging from an average of 0.6 to 1.5 tons/ha, compared to a potential of 4.0-8.0 tons/ha for maize (URT, 2000).

agri benchmark proto-type farms in Tanzania

The proto-type farms in Tanzania are located in the Iringa region, characterized by semi-loam soils and a tropical savannah climate. The region receives an average of 1100 mm of rainfall per annum, normally from November to April, with the peak months being February and March. The area is accessible through paved earth roads which are ultimately connected to the Iringa – Dar es Salaam highway. On average, farmers travel between 2 and 3 kilometers to find a small-scale miller ('posho' mill) whereas maize bulking markets and/or medium scale processors are found within a distance of 60 – 80 kilometers from farm-gate. The area is characterised by undulating and hilly terrain and during the rainy season, roads are often impassable due to muddy terrain.

Most farmers in customary tenure areas own their lands through inheritance or allocation by village authorities. However, few farmers have title deeds to the lands and village-allocated land cannot be sold. Villages are now in the process of changing this system to allow for titled ownership (using customary laws) on these farms in order to improve access to financing. In general, smallholders in Tanzania do not have the same access to credit as large-scale commercial farmers. Limited access to finance is the result of many factors, which include a lack of collateral, absence of a land bank, bureaucratic loan application procedures, high interest rates and recalcitrant commercial

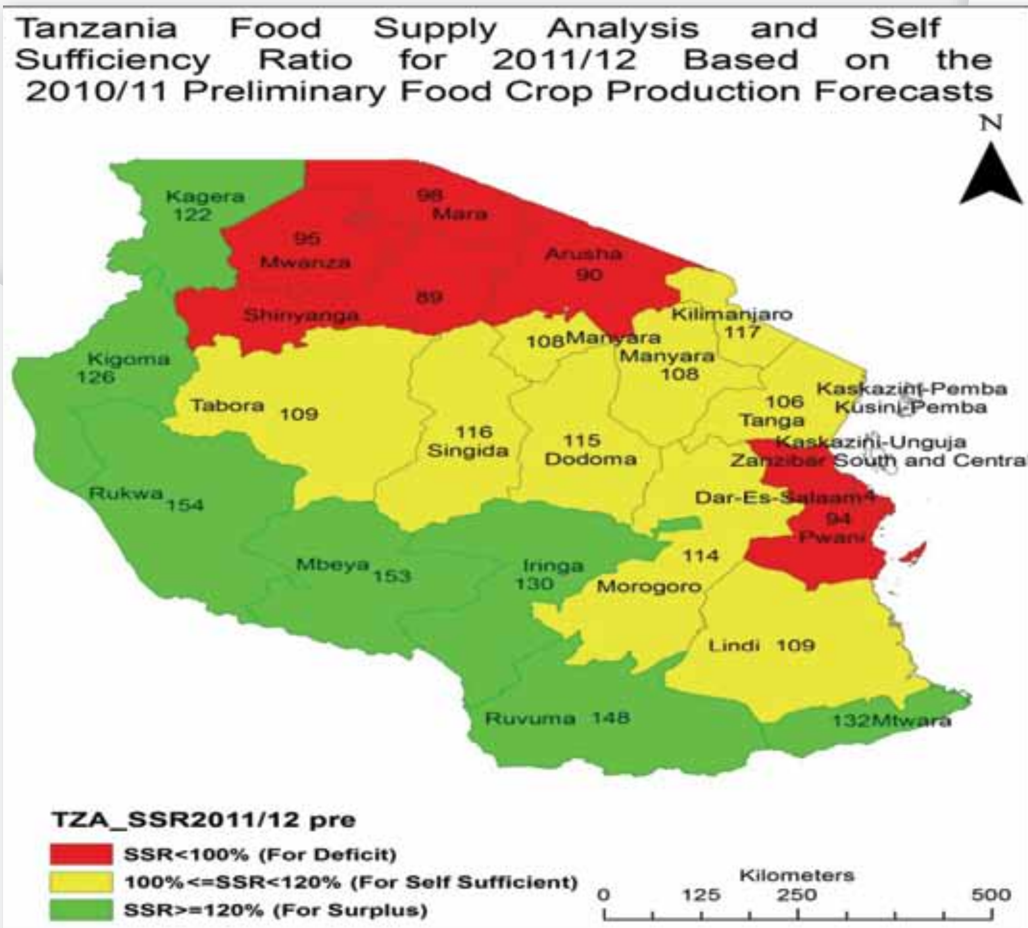

Figure 22: Tanzania maize production map

Source: Ministry of Agriculture Food Security and Cooperatives (2012) banks (Katinila et al. 1998). In general, the large-scale commercial proto-type farmer borrows from non-domestic banks due to favourable interest rates relative to the domestic rates which range from 18% to more than 20% per annum.

Production system

The small-scale proto-type maize farm in the Iringa district comprises 1.6 hectares, of which 1.2 hectares are farmer-owned under customary land law and 0.4 hectares rented-in from neighboring farms. Land rental rates vary, depending on the type of crop the land is suited to; with land suitable for maize production normally more expensive. Rental rates are dependent on maize producer prices and new rates are typically announced in September-October. The large scale proto-type farm comprises 500 hectares, which is normally owned through outright purchase, with rental land not commonly used by commercial farmers.

On the small-scale farm, maize is produced in a rain-fed system, intercropped with beans and sunflower. The farm is characterised by undulating and hilly terrain, necessitating the use of a tier-system for planting. Horticultural crops are grown by some farmers, especially in areas where irrigation is feasible, on 0.2 hectares, which accounts for less than 5% of the cultivated area on most farms. Livestock production, agricultural labor on others' farms, and informal sector business activities also contributes to the total households' income.

The production system is labor-intensive for the small scale proto-type farm, with minimal use of animal draught during ploughing. The established seeding rate in the 2011/12 production season was 11kg/ha, which is marginally higher than the nationally recommended rate of 8 – 10 kg/ha (Maradu et al., 2014). Fertilizer application rates were recorded at 81kg/ha, 49kg/ha and 0kg per hectare for Nitrogen (N), Phosphorus (P), and Potassium (K) respectively. The recommended rates for the Southern highlands zone are 40-90kg/ha for Nitrogen (N), 20kg/ha for Phosphorous (P), and 0kg/ha Potassium (K). High fertilizer application rates in Tanzania's maize basket area indicates that producers are becoming increasingly accustomed to fertilizer use, reflecting the impact of governmental subsidies, but also the growing commercialization of the crop's value chain.

Small-scale producers have access to fertilizer and seed input subsidies given the government's objective of financing up to 50% of the price for all small-scale farmers. However, these objectives are not always met, and as a result, only 30% of fertilizer and seed prices are in fact subsidized. Furthermore, not all farmers had access to the subsidy. The subsidy is allocated to specific households based on their ability to meet the costs of inputs and is offered to the beneficiary households for 3-years in succession. Subsidies are delivered through the National Agricultural Input Voucher System (NAIVS), which provides access to 2 bags (50kg) of basal application, 1 bag (50kg) of top dressing and 10kg seed. In the 2012/13 season, coupons of Tshs 10 000 (US$ 6.32) and Tshs 20 000 (US$ 12.63), equivalent to 30% subsidy on inputs, were issued, for which beneficiary farmers were to make-up the difference. The rate of subsidy on the inputs was 35% in the 2013/14 season and effectuated only on fertilizers (Minjingu Mazao and Urea) but zero on seed. NAIVS has been rescinded effective from 1 July 2014 and a new system of subsidy delivery through loan financing to farmer groups has been announced by the Ministry of Agriculture and Food Security in Tanzania. Effectively the new system aims to discount the borrowing rate to ensure that farmers will manage to obtain loans from designated banks at a maximum rate of 4% per annum.

Labour structure and costs

With the exception of ploughing, which entails contractor costs, all operations for the small-scale proto-type farm are carried out by family labour – normally a team of four members comprising of husband, wife and children. Farm labour compensation in Tanzania is normally based on work piece meals rather than a wage rate per hour. However, valuation of family labour is based on the opportunity cost incurred; hence the cost attributed to family labour is comparable to the rate of hired labour for similar activities. The total labour hours per hectare per annum in Iringa have thus been calculated at 287 and 345 hours during the 2011/12 and 2012/13 seasons; respectively. Therefore, total family labour cost per hectare is estimated at US$ 139 in 2011/2012 and US$ 200 respectively. Table 10 illustrates the wage rate in Tanzania

Table 10: Wage rate per hour in Tanzania

Type of activity:	agri benchmark	Survey Data	
	Iringa	Iringa (median)	National (median)
	Wage rate: US$ per hour	US$/ha	US$/ha
All activities	US$ 0.69		
Planting		US$ 17.54	US$ 16.30
Weeding		US$ 16.59	US$ 14.85
Ridging/Fertilizing		US$ 2.60	US$ 5.92
Harvest		US$ 9.37	US$ 10.38

Source: agri benchmark results database (2012) & Tanzanian National Bureau of Statistics (2011)

Factors limiting production expansion and efficiency

Similar to other Sub-Saharan African (SSA) countries, low soil fertility and the increasing area of infertile soils are the key constraints to increased agricultural production and food self-sufficiency in Tanzania (Turuka and Kilasara, 2002). Maize farmers are faced with different challenges which reduce yields. Variable rainfall often leads to low farm yields, compromising both household income and food security. Poor seed quality poses further challenges to maize cultivation, as the majority of small-scale farmers use farm saved seed due to either their inability to afford improved seed or inaccessibility of improved seed in the region. Recycled seed produce low yield as it cannot tolerate poor climatic conditions and pestilence (Katinila et.al. 1998).

Malawi

Malawi is a landlocked country situated in Southeast Africa and bordered by Zambia, Tanzania and Mozambique. The economy is largely agro-based with more than 85% of rural people deriving their livelihoods from agriculture. Maize is Malawi's staple food commodity and is largely grown by small-scale farmers. In terms of Agricultural administration, Malawi is sub-divided into eight agro-ecological zones known as Agricultural Development Divisions (ADDs). An ADD covers several districts and is subdivided into Extension Planning Areas (EPAs) which are further subdivided into sections. Kasungu Agricultural Development Division (KADD) and Lilongwe Agricultural Development Division (LADD) are the key maize producing regions in the country compared to the other ADD's of Blantyre (BLADD); Machinga (MADD); Mzuzu (MZADD); Karonga (KRADD); Salima (SLADD); and the Shire Valley Agricultural Development Division (SVADD).

agri benchmark proto-type farms in Malawi

The agri benchmark proto-type farm is located in Ukwe EPA, approximately 30 km North West of Lilongwe city. Ukwe EPA is one of the major producing areas of maize in the Lilongwe district, which falls under the Lilongwe Agricultural Development Division (LADD). The EPA covers a total land area of 38 801 hectares with an estimated total arable land of 33 401 hectares. Out of the arable land, 32 297 hectares is customary land with 30 296 hectares estimated to be under smallholder cultivation while 1 104 hectares are under estate farming and 5 400 hectares are considered non-arable.

The EPA lies at an altitude of 1 025 meters and is characterised by a tropical climate with warm summers and cool winters. Soils are predominantly sandy loam with an average rainfall of 900mm per annum. The most common crops grown in the area include maize, soya beans, groundnuts, tobacco, cassava and tomatoes. Different types of livestock are raised in the area, including cattle, goats, chickens, ducks and sheep (GoM, 2011). The area is well served by a network of tertiary rural earth roads constructed in the 1970s under the Lilongwe Rural Land Development Programme funded by the World Bank.

Production system

Small-scale production in Malawi is characterised by large numbers of very poor farmers, heavily dependent

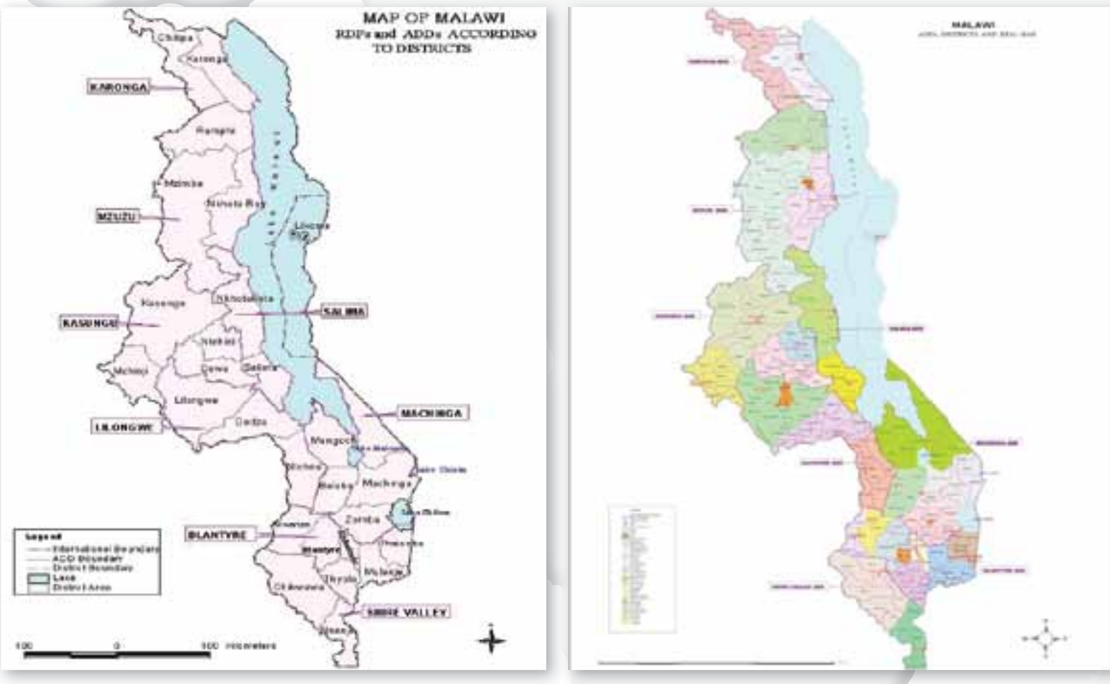

Figure 23: Agricultural development divisions in Malawi

Source: Lilongwe ADD (2014)

on low input maize production on small nitrogen deficient land holdings. Maize production by these farmers is not normally sufficient to meet annual household consumption requirements and the smallholder farmers depend upon casual labouring and other income earning opportunities to finance the purchase of the balance of their food requirements. Average land holding size for Lilongwe district is estimated at 1.27 ha (Lilongwe district council, 2011) and for the study area, landholding size is estimated at 1.4 ha. Land in the region is typically classified as either customary land, which is managed by and under the supervisory role of TAs, chiefs, clan leaders, headpersons and family heads, or leasehold estates, which is land created out of government land or any private land including customary estates. The leasehold, which is recognized as a legitimate source of land title, is a private contractual right subject to the enforcement of development conditions imposed by the owner. The lease grants exclusive use rights and hence a leasehold estate is also regarded as private land held by the leaseholder. Smallholder farmers' access to credit is limited by a number of factors, including the inability to meet collateral requirements by some financial institutions. In addition to lack of collateral, Malawi does not have specific agricultural financing institutions which serve the interests of the farming community. Prevailing interest rates in the range of 25% or more are also considered prohibitive to the farming community.

Predominant inputs used by small-scale farmers are different varieties of maize seed (hybrid, local and open pollinated varieties (OPV)), as well as fertilizers, predominantly NPK, CAN and Urea. The use of farm saved seed (OPV and local maize) is common amongst small-scale producers, especially those that do not have access to the subsidized inputs. Plant protection is mostly applied in storage to guard against post-harvest pests.

Agricultural input subsidies were scaled down and totally abolished under the Structural Adjustment Programmes (SAPs) during the mid-1980s and early 1990s. However, due to continued hunger and food insecurity at national and household levels, the Malawi government re-introduced agricultural input subsidies during the 2005/06 farming season. The Farm Input Subsidy Program (FISP) is a targeted intervention with the overall objective of improving access to improved agricultural inputs by resource- poor smallholder famers' in order to achieve household and national food self-sufficiency and to raise famers' incomes through increased food and cash crop production. The major inputs under FISP include basal and top dressing fertilizers for maize; improved maize seeds (hybrids and Open Pollinated Varieties OPVs) and legume seed (groundnuts or soya beans). Each beneficiary in the FISP is entitled to 50kg bag of basal dressing fertilizer (NPK: 23:21:0 +4S); one 50kg bag of top dressing fertilizer (Urea (46% Nitrogen) or CAN); 5kg maize hybrid seed or 7kg composite/OPV seed; and 2kg of legume seed (either groundnut or soya beans).

Labour structure and costs

Due to poverty amongst most of the smallholder farmers, over 80% of farm activities are performed using family labour. Hired labour and contractors are used to a lesser extent. The farmers predominantly use the hand hoe for most of the activities and very little machinery; however estate farmers have mechanised to some extent in the form of tractors, ploughs, planters, sprayers

Table 11: Wage rate per activity in Malawi (2012)

	Agribenchmark	**Survey Data**	
	Lilongwe	**Lilongwe (median)**	**National (median)**
Type of activity:	**Wage rate: US$ per hour**	**US$/ha**	**US$/ha**
Bush clearing	US$ 0.56		
Weeding	US$ 0.35		
Cutting	US$ 0.20		
Shelling	US$ 0.05		
Man		US$ 1.45	US$ 2.46
Woman		US$ 1.48	US$ 1.98
Child		US$ 0.83	US$ 1.85

Source: agri benchmark results database (2012) & Malawian National Statistics Office (2010) and combine harvesters. The rural wage rate for Malawi is currently at MK551/day (Malawi Ministry of labour, 2014). Rates for family labour were calculated as opportunity costs, applying shadow prices. The cost varies according to the type of farm activity.

Overview on the 2011/12 production performance

The 2011/12 production season was characterised by good, consistent rainfall, resulting in strong production. However, during the 2012/13 agricultural season, rainfall was generally delayed and erratic. Cumulative rainfall performance by 20 January 2013 indicted a mixed picture, whereby some areas had received more precipitation than others compared to the same period in the previous season. Final production estimates by the Ministry of Agriculture Irrigation and Water Development (MoAIWD) indicated that Malawi had produced significantly less maize in the 2012/13 agricultural season relative to 2011/12.

Factors limiting production expansion and efficiency

Several key constraints to maize production have been identified in Malawi's agricultural sector which includes low and stagnant yields, over dependence on rain-fed farming which increases vulnerability to weather related shocks, low levels of irrigation development, and low uptake of improved farm inputs. Low profitability of smallholder agriculture is another constraint to increased agricultural productivity. The low profitability is influenced by a number of factors including weak links to markets, high transport costs, few farmer organizations, poor quality control and lack of market information.

Small land holding sizes, fragmentation and land degradation have also contributed to low agricultural productivity. In addition, cultivation methods on small land holdings among smallholder farmers have remained traditional and non-mechanised. The absence of widespread adoption of more productive agricultural technologies has resulted in land degradation due to continuous cultivation, soil erosion, deforestation and limited technology adoption on land and water management.

Mozambique

In compliance of its Comprehensive African Agriculture Development Program (CAADP) commitments, the Government of Mozambique

Figure 24 – Map of Mozambique

Source: Africa Turismo, 2014

developed their Strategic Plan for the Development of Agricultural sector (PEDSA). Under PEDSA, maize has been identified as a priority commodity due to its significant contribution to food security (Maculuve, 2011). Maize is produced in all regions of the country, accounting for 1/3 of the total cultivated land from which 95% is grown by small-scale farmers (Howard et al., 2000 and Maculuve, 2011). The majority (62%) of total maize production is from the central[2] region, while the Northern and Southern region contributes with 28% and 10% respectively (Dias, 2013). Mudema, Sitole and Mlay (2012) indicate that higher production in the central part of Mozambique reflects a greater number of farmers (44% of the national total), as well as higher yields (on average 945kg/ha) relative to the Northern region (734.2kg/ha) and the Southern region (413.4kg/ha).

agri benchmark proto-type farms in Mozambique

Based on the standard operating procedure for selecting proto-type farms in the agri benchmark network, the central part of Mozambique would have been the ideal location to select the proto-type farm due to its high density of maize production. However, political instability in the region in 2013 resulted in the selected farms being located in the Southern region, specifically the Moamba district at the administrative posts of Sábié and Moamba Sede for the small and medium farmers, respectively (Figure 24).

Moamba Sede is located in the northern part of the Maputo province, 75 km away from Maputo city and 30 km from the border with South Africa. Moamba is linked to Maputo city and South Africa through National road number 4, while a rail road which links Maputo city to South Africa also crosses through the district. Agricultural production in Moamba is dependent on climatic conditions and while soil quality is graded as good for agricultural production, the climate is typically dry with average precipitation varying from 580-590mm and average temperatures of 23-24 degrees (MAE, 2005). There are two main seasons: the dry and fresh season that falls between April and September, while October to March represents the hot and rainy season.

In Mozambique, land is state-owned, with operators' access granted through traditional/customary rights based on an inheritance system. Under the right to use land system, operators must apply to government for rights to use land and a certain individual can be granted the right to use land for up to 50 years renewable. Land owned under the traditional/customary system must be registered in order to secure legal ownership. However, the majority of land owners in Moamba have not yet registered their land (MAE, 2005). In addition to the two land ownerships described above, some farms operate under irrigation schemes, which use land belonging to farmers' associations. The 5 hectare irrigated land operated by the medium-scale proto-type farmer belongs to the farmers' association, with the remaining 20 hectares owned under the traditional/customary system.

Production Systems

The majority of smallholder farmers in Mozambique cultivate less than 5 ha of land with a median of 1.3 ha (Sitoe, 2005). MAE (2005) reports that smallholder farmers in the Moamba district cultivate on average 1.3 hectares and hence the land size of the small proto-type farm is 1.5 hectares, which falls within the range of the size operated by smallholder farmers in Moamba and in Mozambique in general. Of the 1.5 hectares, 1 hectare is allocated to maize production intercropped with beans, under a rain fed system during the summer season. Beside maize and beans, small farmers in Moamba also grow horticultural crops and raise animals, particularly cattle. Cattle are raised in open access communal land. The typical farm size of medium scale producers in Mozambique is higher than 10 hectares and lower than 50 hectares. The medium scale proto-type farm in Moamba district therefore comprises 25 hectares from which 7 hectares are allocated to maize production and 1 hectare to Irish potato. The remaining area is used for grazing cattle.

The majority of maize production operations are labour intensive for both the small and medium scale farms. Plowing, leveling and transport of commodities from the field to the house and market are the only activities that are not performed manually. A hired tractor is used for plowing and leveling, rented at a rate of 700 MZM (US$ 22.58) per hour. The cost of transporting the produced commodities varies by distance; however the average transportation rate for a car with capacity to load 2.0 tons from Moamba to Maputo market is 3 000 MZM (US$ 96.77). Seeding, plant protection (weeding) and harvesting are all performed manually. Plant protection (weeding) is done manually using hand hoes. For the medium scale farm, weeding is done at the same time as fertilizer application. The medium scale farmers also add manual irrigation activities.

Producers benefit from a number of government support programs. Technical advisory services are provided free of charge through the district extension service system. A district development fund established by Government funds different rural development projects, including agricultural production. However access to these funds is selective as farmers should apply following the established rules. The same procedure applies to access the agricultural development fund, which subsidizes the cost of agricultural inputs. A small fraction of farmers finance their production activities through these funds, with commercial banks providing an alternative. However the lack of collateral and the riskiness of agricultural production processes limit access to credit from commercial banks for the majority of farmers.

[2] The central part of the country is composed of the following provinces: Sofala, Manica, Tete and Zambezia.

In terms of input use, small scale producers typically do not utilize fertilizer or improved seeds in maize production in the Moamba district. Rather, farmers save seeds (local variety) from previous production seasons, while soil fertility is maintained by incorporating the remains of plants into soil during plowing. In contrast to small farmers, medium scale farmers use improved seeds (Matuba variety in rainy season and PAN 67 variety in the dry and fresh season). The PAN 67 variety is used to produce fresh maize (cobs) while the Matuba variety is used to produce grain.

Labour structure and costs

Family labour accounts for the bulk (61%) of the total labour requirement on the small scale farm, with hired labour providing the balance. On the medium scale farm, family labour accounts for approximately 21% of the total labour requirement, with remuneration rates for hired labour varying based on production activities. Remuneration rates vary by activity and are summarized in Table 12.

Overview of the 2011/12 production season

Maize yields achieved by small-scale farmers in Mozambique are far below potential relative to the medium scale farmers that typically use improved seed varieties (Matuba and PAN67). The use of improved inputs such as fertilizer and irrigation explain the higher yields achieved by medium scale farmers. However, the direct costs are higher for medium scale farmers compared to small farmers. The direct cost of dry season maize (PAN67) is also higher than the direct cost of rainy season maize (Matuba), due to the fact that dry season maize requires insecticide application as well as a larger amount of water supplement through irrigation compared to rainy season maize. In the 2011/12 season, calculated margins over direct costs are positive for the three analyzed varieties (Table 13). However, these results are not conclusive as direct costs include only establishment costs (cost of seed, fertilizer and pesticide) as well as contractor services (plowing and transport) and do not include labour and operating costs. The inclusion of these costs results in

Table 12: Labour rates per activity in Mozambique

	agri benchmark
Type of activity	**Wage rate: US$ per hour**
Seeding	US$ 0.35
Weeding	US$ 0.73
Harvesting	US$ 0.01

Source: agri benchmark results database (2012)

Table 13: Profit and loss calculation of the cash crop enterprise in 2011/12 crop season

Description	Local*	PAN67**	Matuba**
Yield	0.80	2.50	1.50
Revenues (USD/ha)	206.45	1,008.06	532.26
Seed cost (USD/ha)	5.16	56.45	24.19
Fertilizer cost (USD/ha)	0.00	159.68	72.58
Pesticide cost (USD/ha)	0.00	11.94	0.00
Contract work cost (USD/ha)	164.52	281.45	261.29
Total direct costs (USD/ha)	169.68	509.52	358.06
Margins over direct costs (USD/ha)	36.77	498.55	174.19

*Notes: * small scale farm; ** medium scale farm and 1USD=31MZM* negative margins, particularly for the small scale production system. This result of negative returns in Southern Mozambique for maize production in rain fed agriculture system is supported by Mudema, Sitole and Mlay (2005).

Factors limiting production expansion and efficiency

Maize is mainly produced for family consumption and as such marketing of maize remains limited in the Moamba district. Expansion of marketed maize might improve maize production practices. Value adding mechanisms are still lacking, which calls for investment in agro-processing technologies. Furthermore, technology adoption is a limiting factor for maize production in Moamba. The lack of fertilizer use is a result of small farmers growing maize under rain fed agriculture and there is huge variability of precipitation where extreme scenarios (floods and drought) are more common. As such, weather variability (floods and droughts) is another limiting factor in maize production. Although there is poor performance in terms of producing maize in Moamba, the food security in the region is at acceptable levels, due to diversification of agricultural enterprises characterized by intercropping production system and the production of other crops such as legumes and horticulture at different location, as well as raising animals (mainly cattle). The extraction of natural resources (vegetable coal) is another strategy used by Moamba producers to mitigate food insecurity.

South Africa

Maize is an important staple in South Africa, accounting for 13.5% of the gross value of agricultural production in 2012/13, more than any other field crop. A substantial proportion is produced by approximately 40 000 commercial farming units, who produce on large farming areas (DAFF, 2014). At a commercial level, more than 80% of the total area planted to maize in South Africa is situated in the Free State, North West and Mpumalanga. However, around another 2.9 million households situated in the former homeland provinces are engaged in agricultural activities (Agricultural Households Release, 2013). Figure 25 displays the proportion of households in the various provinces of South Africa that are engaged in agricultural activities. Of these households, an estimated 200 000 are small-holder farmers who are commercially orientated with the balance practising subsistence farming (Aliber & Hall, 2010). Given the fact that an estimated 20% of the population of approximately 53 million or 10.6 million people may face food insecurity in South Africa (du Toit et al., 2011), crop production by smallholder and subsistence farmers is vital for rural household food security but productivity of this sub-sector has been low (DAFF, 2012).

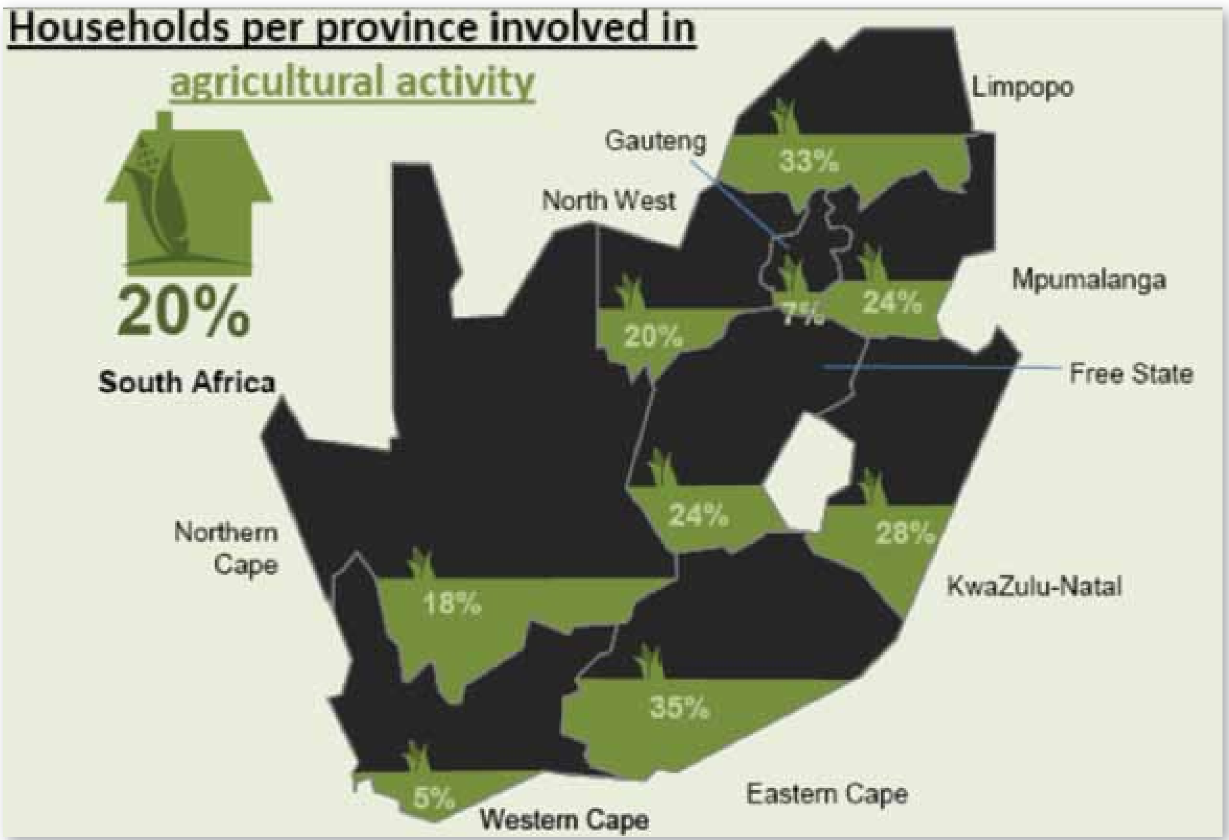

Figure 25: Households involved in agricultural activities in South Africa
Source: Statistics South Africa (2011)

agri benchmark proto-type farms in South Africa

The Bureau for Food and Agricultural Policy has been a member of the international agri benchmark initiative for a number of years and hence farm level data related to cost of production has been collected since 2008. The current network of commercial farms covers all the main field crops across 7 provinces. The network of proto-type farms consists of 30 farms in the key and diverse growing regions of South Africa. These farms comprises of maize, sunflower, soybeans, wheat, barley, canola, pasture crops, potatoes and sugarcane production in the North West province (maize & sunflower), northern- eastern and western Free State (maize, sunflower, soybeans, wheat & potatoes), the Northern Cape irrigation region (maize & wheat), Mpumalanga province (maize & soybeans), the Overberg region in the Western Cape (wheat, canola, barley & pasture crops), the Sandveld region in the Western Cape (potatoes), Limpopo province (potatoes), KwaZulu-Natal (potatoes and sugarcane) and the Midlands regions (sugarcane) of South Africa. The horticulture network further analyses apple and pear production in the Western Cape. As of 2012, 3 proto-type pork production farms have been established in the Western Cape Province, KwaZulu-Natal and the North West Province and central regions which forms part of the international pig network. Recently, small-scale maize production in KwaZulu-Natal was introduced to the network of typical farms. The food and agricultural environment is often volatile and typically characterised by high levels of uncertainty. The availability of time series data related to these proto-type farms, combined with the inclusion of these farms in the farm level financial simulation model has been an invaluable tool to inform decision making in this uncertain environment.

For the commercial producers included in the network, the 2012/13 production season was one of mixed fortunes in many respects. While weather conditions in certain areas like the Eastern Free State improved following drought conditions in 2011 and 2012, unfavourable weather conditions persisted in large parts of the country and at national level, the total maize yield fell below 4 tons/hectare for the first time in 5 years. The effect of adverse weather was more evident in white maize, reflected in a decline of 20% in yield levels compared to 2012, while yellow maize yields remained relatively stable. In the North West province, arguably the most affected by the unfavourable weather, 2013 maize yields reached only half of the historic 5 year average. Figure 26 illustrates the historic maize yields registered by the BFAP farm network in recent production seasons, illustrating the regional differences in yield levels, as well as the South African Crop Estimates Committee (CEC)'s projections on maize yields for the 2014 season.

The 2013/14 production season is expected to deliver a bumper crop,

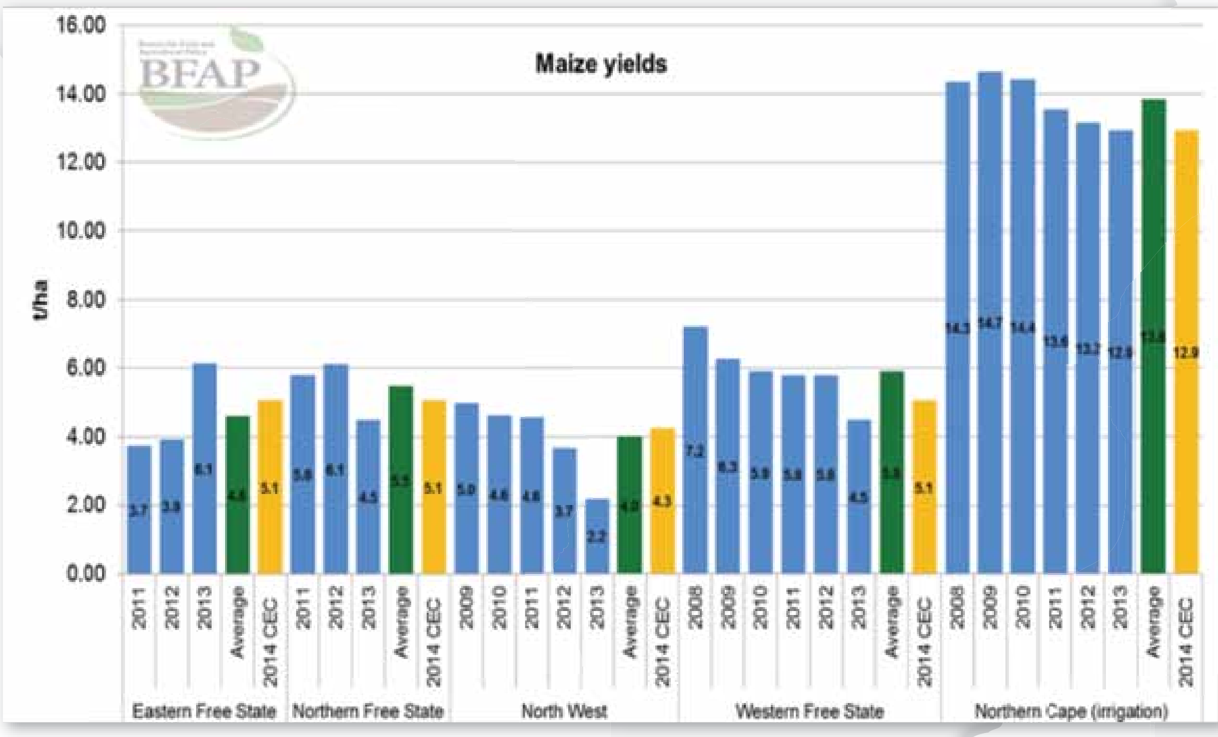

Figure 26: Maize yield trends in South Africa

Source: Bureau for Food and Agricultural Policy (2014) due in large to favourable weather conditions in the major maize producing regions of South Africa. High production levels are expected to reduce prices and in the face of rising input costs, producer margins are expected to come under pressure.

The 2013/14 production season marked the expansion of the farm level network in South Africa, with the first inclusion of small-scale proto-type maize producers situated in the Winterton area in Kwa-Zulu Natal. The Winterton area is characterised by a warm temperate climate, with an average temperatures ranging from 10 of 23 degrees and average annual rainfall of approximately 780mm, the bulk of which falls from November to March.

Production Systems

Grain South Africa (GrainSA), through their Grain Farmer Development Programme has been involved in the development of relatively large-scale sub-commercial farmers and small-holder farmers in South Africa. Through mainly mentorship programmes, emerging farmers are supported to increase farm output through improved management of crops and by timeliness of their operations. Over the past twelve months GrainSA have extended their development programme to improve systems of farm management amongst subsistence farmers in Kwa-Zulu Natal and Eastern Cape Provinces. In this regard, two proto-type farms were surveyed; one being a beneficiary of the mentorship program, whilst the other is not. Whole-farm analyses were conducted on subsistence farms that improved their systems of farm management. The key differences between the farmers who obtained support and those who did not can be highlighted as follow:

- Lime application of approximately one ton per hectare was conducted on the farm with access to the support program, with no lime application on the farm that followed traditional methods.
- Plant protection on the supported farms was done using chemical treatments or sprays while traditional methods included only the use of hand hoes with manual labour.
- A basal and top dressing fertilizer application was utilized on the farm that had access to support while the traditional approach only had a basal application. The amount of fertilizer being applied or total NPK was also less in the traditional approach as was observed on the farm who obtained support.
- The type and amount of land preparations differed between the two groups of farms.

The increase in net benefits provided by improved production trends were benchmarked against industry norms. A key objective was to financially simulate improved subsistence farms to better understand the impacts of increased expenditure on inputs, policy decision making and macro-economic and other fluctuations on subsistence farms in South Africa. The main objective was to address certain production and cost elements that influenced the profitability and sustainability of subsistence farms with particular reference to increases in food security of the farm households and eventually to national food security for South Africa.

Figure 27 illustrates the increases in net benefits for subsistence farmers who switched from the traditional system of farming, which include only

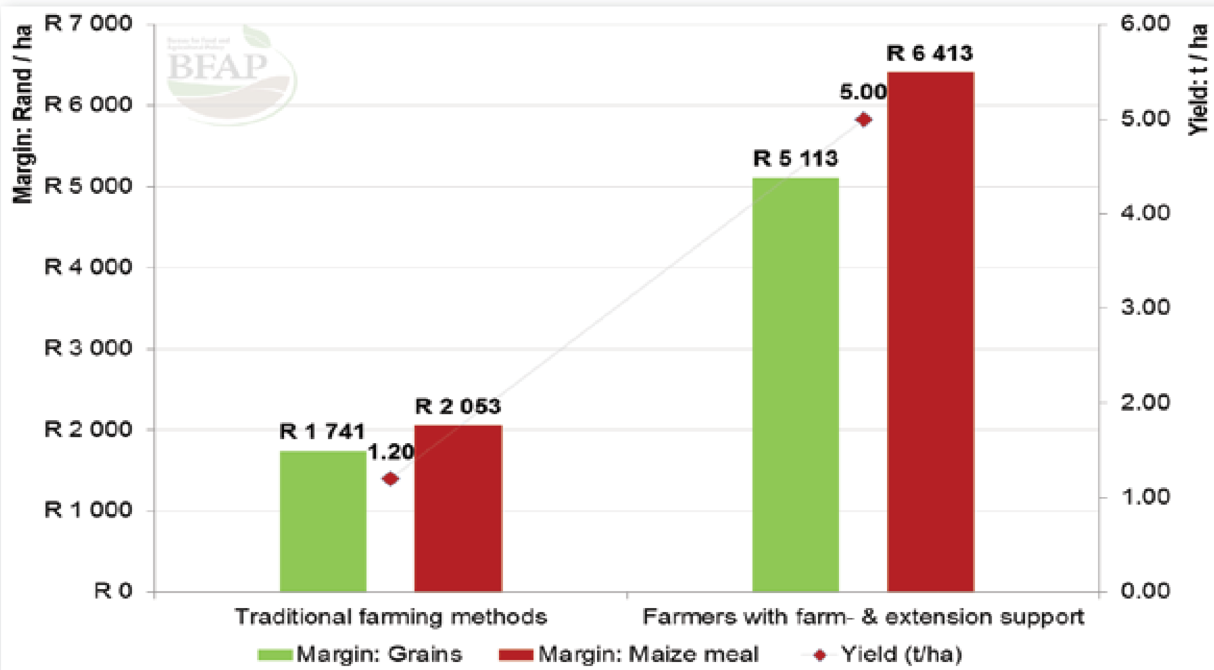

Figure 27: Difference in yield and gross margin per hectare for traditional farming versus the farming system recommended by GrainSA

Source: Bureau for Food and Agricultural Policy (2014) a single ploughing, seeding with low fertilizer application and harvesting to the system recommended by GrainSA for producers in the Winterton area of Kwa Zulu-Natal. For white maize, differences in yields per hectare and gross margin per hectare are illustrated for the two farming systems.

The mean yield for the improved farming system was 5 t/ha versus 1.2 t/ha for the traditional system. Where overhead costs were identical for the two farming systems, the higher gross margin for grain and maize meal indicated that the improved farming system was economically and financially superior to that of the traditional farming system.

The implication for food security was that for the total area of land for subsistence farming, a smaller area of maize could be grown to suit the needs of the family. The balance of land could therefore be used to grow nutritious crops such as dried beans, cassava, potatoes, pumpkin and spinach. The larger supply of food with a higher nutritional status for the mix of crops would prevent stunting of children that is prevalent in other areas of Sub-Sahara Africa.

Factors limiting production expansion and efficiency

Increases in food security for subsistence farmers remain limited by the rate of adoption of improved management practices on their farms. The success of the GrainSA extension programme aimed at increasing yields of crops through improvements in the management of farms has been pleasing. However, while this project is useful in improving food security for subsistence farmers and increasing the volume of food supplied to the South African economy by small-holder farms, the diffusion of innovations can often be a slow process (Rogers 1962, Guerin and Guerin 1994).

An unknown number of humans who face food insecurity included in the estimated total of 20% of South Africans, live in the major cities. The migration of people from rural areas to cities is a common trend that occurs globally. In 2000, the government formulated a strategy known as the Integrated Food Security Strategy for South Africa (van der Merwe 2011). The strategy has been partially successful in ensuring food security at the national and household level. At the national level there is a challenge for creation of economic conditions that would assist poor households suffering from food insecurity. Dealing with issues that create food insecurity must be a continued process by policy makers in government and civil society. Developing a structured system for dealing with disasters that affect food security such as droughts and floods that cause disruptions to the supply of food at the farm level would be a useful start (van der Merwe 2011).

Zambia

Maize is the main staple food crop grown by more than 80% of rural smallholder farmers in Zambia. It accounts for more than 60% of area under crop production. In normal production years, small scale producers account for about 80% of maize production, with the remainder produced by the large-scale farmers (farmers cultivating 20 or more hectares).

Zambia has continued to record maize production above the national annual requirement, except for the 2012/13 season. Maize production was almost 2,8 million metric tons in 2009/10 and more than, 3 million metric tons in 2010/11. However production of maize in the 2011/12 and 2012/2013 production seasons fell by 6% and 11% respectively. This lower than expected output level in these two seasons was due to poor rainfall in key maize growing areas. Despite this decline in maize production, the country continues to have surplus maize stock to meet the national annual requirement, for human consumption, brewing industry and stock-feed and strategic reserve after the addition of carry over stock from 2011/12 season.

agri benchmark proto-type farms in Zambia

The commercial agri benchmark proto-type farm in Zambia is located in the Mkushi district located in agro-ecological region II of the Central Province of Zambia. The average elevation of the district is 1 257 meters above sea level and it is characterised by sandy loam soils. Mkushi district has both small-scale and commercial farms, however, the district is well known due to the prominence of commercial farming in the Mkushi farm block. The agri benchmark proto-type small-scale farm is located in the Kalomo district, in agro-ecological region II of the Southern Province of Zambia. The average altitude of the district is 981m above sea level and it is characterised by sandy loam soils. The Kalomo district is the largest producer of maize in Zambia and in 2011/12 it accounted for 6.4% of all maize produced in the country (CSO 2012). The district has both smallholder and commercial farmers, but commercial farms are scattered around widely.

Climatic conditions are similar in the two regions, both being characterised by a southern dry and semi north tropical climate, with rainfall ranging from 700 to 950 mm per annum; mainly occurring between November and April. In some seasons the Kalomo district experiences intermittent seasonal droughts, while the temperature range is greater in the Kalomo district, where the minimum level is 2°C while the maximum is 40°C. In Mkushi, temperatures typically range from 7°C to 26°C.

The primary output markets for maize in the region include; the governmental Food Reserve Agency (FRA), small-scale and corporate maize traders. The FRA purchases maize from small-scale farmers at a pan-territorial price which is relatively higher than prevailing market prices. The FRA has storage facilities around Mkushi and Kalomo districts where part of the maize is stored in these facilities, while the excess maize is either transported to Choma or Lusaka storage facilities.

Figure 28: Map of Zambia

Source: Africa Turismo (2014)

Since there are no corporate maize processors in the district, the small-scale and corporate maize traders buy maize and transport it to Lusaka where it is sold to the processors (milling companies, brewing companies and stock-feed producers). Most of the maize is transported by road from Kalomo to Lusaka, a distance of about 280km at US$ 35 to US$ 40 per ton. The distance from Mkushi to the Lusaka is around 300km and from Mkushi to the Copperbelt province districts is around 250km. Transportation cost from Mkushi to Lusaka and Copperbelt Province districts is around US$ 25 to - US$ 30 per ton.

Production Systems

The total land holding size for the proto-type commercial farm is around 1050 hectares of which 700 hectares is arable land and 350 is grassland. In contrast, total land holding size of the small-scale proto-type farm is around 7.2 ha of which 6.0 ha is arable land. The small-scale farmer produces crops and livestock under rain-fed conditions, while a typical commercial farmer has some production under irrigation.

The three main crops typically grown on small-scale farms are maize, sunflower and groundnuts, with 3ha under maize and 0.5ha under sunflower and 0.5ha under groundnuts. Also, small-scale farmers rear animals such as cattle, goats, pigs and chickens, with cattle representing the major livestock enterprise. On the other hand, the main crops grown by the proto-type commercial farm are soybeans, maize and wheat. The average field sizes are 350 hectares for soybeans and maize, while the field size for wheat is around 220 hectares. The areas under the different crops are dependent on the anticipated price of the crops however, with soybeans and maize competing for the same land. Commercial farms would typically also rear cattle in a system characterised by robust disease control and bio-safety procedures at all stages of the value chain.

In terms of land ownership, smallholder farmers do not possess title to the land they farm but instead they have use rights under the customary land system, while commercial producers typically have title deeds to their land. Without collateral, small-scale farmers find it difficult to obtain finance for their agricultural activities from commercial banks in Zambia (Taylor 2009), while commercial farmers finance their production through capital obtained from commercial financial institutions at short term rates of approximately 18%. Small-scale farmers would usually not obtain financing through a financial institution. According to Taylor (2009), the major limiting factors include, amongst others: i) from the farmers perspective, credit is scarce, expensive and heavily skewed towards the large corporate sector, ii) loan terms are often too short to accommodate the long term nature of agriculture, iii) there is bureaucracy in the processing of the applications of loan by the banks, iv) from the bankers side, agricultural lending is considered both risky and expensive.

Zambia input and output market is liberalized with both government and private entities participating. Commercial farmers do not receive any government input subsidies. In contrast, approximately 60% of small-scale farmers are targeted to receive input support from the government under the Farmer Input Support Programme (FISP). The input package farmers receive from the government consists of 4 x 50kg bags of fertilizer (2 x 50kg bags of basal and 2 x 50kg bags of urea) and 10kg of hybrid maize seed. In order to access the subsidized inputs, a farmer pays 25% of the cost of fertilizer and 50% the cost of maize seed. In the 2011/12 production season, farmers were depositing about US$ 38 for 4 X 50kg bags and US$ 15 for 10kg bag of maize planting seed.

Land preparations on the small-scale proto-type farm in Kalomo are undertaken using ox-drawn ploughs, normally towards the end of November or early December depending on the onset of rain. Planting flows after land preparation, with weeding operations normally occurring in the months of January, February and March. Weeding is done with an ox-drawn cultivator, followed by a hand hoe used to cut the remaining weed. Crops are normally harvested at the end of May, extending to August. Other implements owned by the farmer include an ox-cart; which is used for transportation. The commercial farmer on the other hand is highly mechanised, with tractors ranging from 100 to 250 horse power used for the different operations. The commercial farmer owns a range of implements including disc ploughs of different sizes, disc harrows, chisel ploughs, planters of different sizes, boom sprayers, fertilizer spreaders and trailers. Pickup trucks ranging from 1ton to 10ton are used to transport grain to storage facilities. Crops on the commercial proto-type farm are irrigated with centre pivots.

To enhance crop production, both commercial and small-scale farmers apply fertilizers, typically basal and top fertilizer. Commercial producers apply 350kg of basal and 300kg of top dressing, while the small-scale producers in Kalomo typically applies around 100kg of compound D and 100kg of urea fertilizer, which is well below the recommended amount of 400kg of fertilizer for both basal and top dressing. In general, the national average application rates are very low, just over 170kg of fertilizer per hectare (Tembo and Sitko 2013). Small-scale producers typically plants both hybrid and local maize seed. Hybrid maize seed account for 90% of production, while local maize accounts for only 10%. The small-scale proto-type farm plants between 15 and 20 kg of maize seed per hectare. Early maturing varieties are popular, costing around US$ 2.3 per kg. Commercial producers use only hybrid seeds.

Labour structure and costs

Family labour is generally sufficient for most operations on the small scale farm, except for weeding and harvesting operations, where hired labour is used to supplement family labour. The total number of hired labour is around 15 people, for a 3 month period during weeding and harvesting. The wage rate for an individual is about US$ 38 per annum per work.

The commercial proto-type farm employs around 30 permanent labourers and 50 seasonal labourers to supplement permanent labour. Normally, seasonal labourers are engaged during the harvesting period of maize and soybeans. The average wage rate for seasonal and permanent labour is US$ 90 per person and US$ 500 per person respectively.

Performance in the 2011/12 production season

The small-scale proto-type farm in the Kalomo district reported an average yield of 2.20 t/ha in the 2011/12 production season, while the commercial farm performed exceptionally well with an average yield of 7 t/ha. The average farm gate price obtained by small-scale producers in the same season was US$ 204 per ton where commercial farmers only received US$ 170 per ton. The price and yield combination generated a gross revenue of US$ 449/ha for the small-scale producers and nearly US$ 1200/ha for commercial producers.

Table 14: Wage rate per activity in Zambia (2012)

	agri benchmark
Type of activity:	**Wage rate: US$ per hour**
General seasonal labourers	US$ 0.31

Source: agri benchmark results database (2012)

Factors limiting production expansion and efficiency

In largely agrarian societies such as Zambia, achieving the goals of rapid poverty reduction, national food security, and broad-based income growth will require major productivity growth in agriculture. Achieving productivity growth in agriculture will in turn require a marketing system that encourages smallholder investment in productivity-enhancing technologies and agronomic practices that encourages investment in the major agricultural commodity value chains.

Small-scale farmers are faced with many challenges affecting broad based agricultural growth. Key factors preventing farmers from expanding include, among others: a) low productivity among small-scale farmers, b) low utilization of fertilizer and hybrid seed; c) lack of access to credit due to no collateral. It has been noted that farmers accessing Zambian National Farmers Union lima loan are able to increase yields to over 4 t/ha compared to national average of 2 t/ha of small-scale farmers. d) Because of maize centric policies through Food Reserve Agency and Farmer Input Support Program (FISP), have resulted in small-scale farmers shifting their production from other crops to maize. The shift has affected production of other crops which are important for food security.

DRC

Maize remains an important crop in the DRC, where civil insecurity continues to hamper access to food in conflict affected areas. In 2014, the FAO estimated that 6.7 million people were in a severe food insecure state in December 2013. Maize production in 2012/13 remained relatively stable compared to 2011/12, increasing by only 0.02%. Nevertheless, domestic production remains below the consumption requirement and imports still constitute a significant share of domestic maize consumption.

Maize producers in the DRC do not have access to government support related to seed and fertilizer and the remoteness of certain production regions accessible only by poor rural roads discourage producers and other stakeholders from investing in maize production. This is particularly relevant in the Equateur province, where climatic conditions are ideal for maize production, implying significant potential, yet four other provinces (Katanga, Kasai Oriental, Bandundu and Kasai Occidental) account for almost 70% of maize production in the DRC.

agri benchmark proto-type farms in the DRC

Within the DRC, the most productive maize region is situated in the Katanga Province. The small- and large-scale agri benchmark proto-type farms are situated in the vicinity of the city of Fungurume in the Katanga Province. The city of Fungurume is 200 km north of Lubumbashi, a County town of Katanga Province. The region is characterised by a tropical climate, with sandy soils and an average rainfall which ranges between 1200 and 1400 mm per annum, distributed mainly between November and April. Maize represents the dominant crop in this area, however other crops like beans and soybeans are also cultivated.

According to the Bakajika law in the DRC, the soil and subsoil belongs to the state, but in practice, rural, traditional leaders proclaimed themselves into land chiefs. Small farmers lease the land from the chiefs for a fee in kind of 5% on production. In contrast, larger commercial farmers negotiate official documents for the land that they produce on.

During the 2011/12 production season, small scale producers in the Lubudi territory received support from the Rehabilitation Project for the Agricultural and Rural Sector (PRESAR), which involved training in seed multiplication and partial staffing of basic seed. Furthermore, they received support from World Vision with regards to agricultural inputs like seed and fertilizer, which they could repay at harvest time. Large commercial farmers however do not have access to support from government or international organisations.

Production system

The small-scale proto-type farm is part of an association of 25 farmers, formed with the objective of reducing poverty by sharing knowledge and resources. Nominated members of the association, generally about three members, perform the daily activities through manual labour. In contrast, the large scale proto-type farm operates as a private company and is fully mechanised.

The small-scale proto-type farm in the City of Fungurume comprised 16 hectares in the 2011/12 production season, all of which is customary land belonging to the chief. Land is rented from the chief in return for 5% of the harvest. Of the 16 hectares in total, 3 hectares were allocated to maize production, 3 hectares for soybeans and 2 hectares for beans where the balance of the land remained unused. Maize is produced in a rotational system with soybeans on the small-scale proto-type farm where the large-scale maize farm mainly followed a monoculture system.

On the small-scale farm, maize is produced in a semi-intensive system, with ploughing and harrowing performed with a leased tractor. Weeding, sowing, herbicide, fertilizer application and harvesting are all performed manually, using hand hoes and machetes. The small scale farm used experimental seed in 2011/12, received from the PRESAR project and applied at a rate of 25kg per hectare. Gliphosate pre-emergence is applied with a backpack sprayer as weed control, diluted at 1 litre chemical to 160 litres of water. NPK (17:17:17) fertilizer is applied at 200 kg per hectare, with costs amounting to 989 CDF per kg Nitrogen, 155 CDF per kg Phosphorous and 150 CDF per kg Potassium.

The large-scale farm is fully mechanised and used certified maize seed (PANNAR 69 and 53), applied at a rate of 20kg per hectare. Pre-emergence herbicides, as well as insecticides and fungicides are applied

Figure 29: Map of the Democratic Republic of the Congo
Source: Africa Turismo (2014)

using a towed sprayer. Fertilizer is applied as NPK (10:20:10) at a rate of 350kg per hectare and Urea (46) at a rate of 150kg per hectare.

Labour structure and costs

Both the small-scale and large-scale proto-type farms employ manual labour, however on the small scale farmer; family labour is employed from the members of the association, whilst the large-scale farm employed 16 hired labourers in 2011/12. Labour costs per activity are presented in Table 15.

Performance in the 2011/12 season

Maize production has a substantial role to play in improving food security in the DRC. Maize yields averaged only 0.8 t/ha in 2012 and despite more than 1.7 million hectares under cultivation, imports remain a significant share of domestic maize consumption. Yield levels achieved in the Katanga region are typically well above the national average, due to favourable production conditions and in 2011/12. The small-scale proto-type farm in the region achieved a yield of 2 t/ha in the 2011/12 production season, while the commercial, large scale proto-type farm recorded a yield of 5 t/ha.

Factors limiting production expansion and efficiency

In the DRC, the success of maize production has been constrained by a lack of policy interventions in the past twenty years, despite climatic conditions that are favourable for maize production. Farmer support policies, food insecurity and rural poverty have not been sufficiently addressed. In attempting to address these problems, government has partnered with foreign investors in establishing agricultural parks aimed at improving food security and reducing rural poverty.

Financing or the lack thereof presents another challenge to Congolese agriculture. Congolese financial systems (banks and microfinance institutions) do not grant credit to farmers, due to excessive risks related to agriculture. Furthermore, the institution that supports the Agricultural Credit Bank has fallen into bankruptcy over the past 20 years and hence financing options are very limited.

Table 15: Wage rate per activity in the DRC (2012)

Type of activity	US$ per hectare
Transportation	US$ 55.00
Seeding and basal fertilizer	US$ 101.20
Pre-emergence herbicide & insecticide	US$ 50.60
Post-emergence herbicide & insecticide	US$ 50.60
Harvest	US$ 22.00
Grand total	US$ 279.40

Source: agri benchmark results database (2012)

Measuring and comparing the *agri benchmark* proto-type farms' performance across the region

Policy-makers need accurate information on the efficiency of their maize production compared to other countries in the region and compared to global competitors.

Policy-makers need accurate information on the efficiency of their maize production compared to other countries in the region and compared to global competitors. If production costs were found to be abnormally high in certain areas of the region, such information could spark efforts to identify the sources of the inefficiency and begin to address them. However, it has been noted that African policy-makers have lacked access to accurate cost of production information that would have allowed them to even ascertain the degree of competitiveness of their agricultural sector. For a strategic food security crop such as maize, overcoming this lack of information could be considered a strategic priority.

This section summarizes the 2011/12 production season results, with reference to yield levels, technical parameters and the cost of production in Eastern and Southern Africa's agri benchmark proto-type farms. Proto-type farms should be considered as demonstrations of modal production costs prevailing in specific regions, but should not be interpreted as a mean for an entire country nor a specific region. Inter-region variations occur based on differences in farm sizes, management and skills, production input approaches and different seasons. As time series data is captured, averages for a specific growing region will become more meaningful.

Within the methodology and construction of agri benchmark proto-type farms, prices used are based on shadow values. Input and output prices in countries implementing subsidy programs and price supports are modified to reflect market prices. Therefore the production cost estimates reflect the position that farmers would have been in if subsidies were not implemented.

Yields levels

Figure 30 represents the agri benchmark proto-type farm's yield trend across the ESA region for maize production, benchmarked against a 10-year national average yield (2004-2013) and Household Survey results for Zambia (2012), Tanzania (2010), Malawi (2010) and Kenya (2010). For illustrative purposes, typical small-scale maize farms from China have also been included.

Figure 30 illustrates that certain proto-type farms performed substantially better in the 2011/12 production season relative to their respective 10 year national averages and in selective cases, to their district median yield levels obtained from household survey results. The second key observation is that the large-scale proto-type farms performed significantly better when compared to the small-scale farms. The latter is due to a combination of factors including; the degree of mechanization, effective- and efficient fertilizer and seed utilization, plant protection and the application of lime in selective cases. Figure 30 can be summarized as follows:

- The 2011/12 production season was an exceptional year for the Tranz-Nzoia or Rift Valley region in Kenya, with average maize yields exceeding 4 tons/ha while national averages amounted to 1.59 tons/ha (Tegemeo, 2014). In the same year, the Trans-Mara district reported yield levels of 2.22 tons/ha. According to the Kenyan Agricultural Survey in 2010, the median yield for the Kitale district was 2.64 t/ha. The mean yield in the same year was 2.77 t/ha, well above the national average yield of 1.97 t/ha reported in 2010.

- In Tanzania, the agri benchmark proto-type farm reported a yield of 1.70 t/ha in the 2012 production season; which is significantly higher than yield estimates from national survey data. The 2010/11 National Panel Survey for Tanzania reported a district median in the Iringa region of 0.74 t/ha for the 2010 long rainy season; however yield comparisons across different production seasons are also affected by different climatic conditions. The national median for 2010/11 was 0.61 t/ha on a median field size of 1.34 hectares. The district and national mean for the same year were 0.96 and 1.00 t/ha respectively
- The agri benchmark proto-type farm in the Kalomo district in Zambia reported an average yield of 2.20 t/ha which is equivalent to the 10-year national average yield reported by the USDA (2014). According to the Zambian Central Statistics Office's 2012 Rural and Agricultural Livelihoods Survey, the Kaloma district's median yield in 2012 was 1.58 t/ha. The national median in the same year was 1.85 t/ha.
- The regional average yield for the small-scale agri benchmark proto-type farm for 2011/12 was 2.13 t/ha, which is significantly higher than the 10-year average national yield across the ESA region of 1.43 MT/ha.
- The average large-scale proto-type farm maize yield for the region was 6.04 t/ha, approximately 3.91 t/ha more than their respective small-scale farms. In Zambia, the large-scale farm's yield was nearly 5 t/ha more than the small-scale farm.
- The Chinese small-scale maize producers outperformed yield levels in ESA, mainly due to a more intensive input use.

Regional market price trends

The average farm gate prices obtained for maize on the small- and large-scale agri benchmark proto-type farms are illustrated in Figure 31. These farm gate price levels represent the average prices obtained for the respective maize crops in 2012. The time period of maize marketing differs across the region, however in most cases a large portion of the maize crop was sold directly after harvest. However, the agri benchmark proto-type farm approach makes provision to consider a range of prices (low, average and high) throughout the season in order to take into consideration a price for a stored product.

To indicate the relative performance of maize in each country against a world and regional reference price, the average United States FOB gulf price, and the ESA Baseline 2012 prices are included.

From Figure 31, the average market price received by the ReNAPRI agri benchmark small-scale proto-type farmers was approximately US$ 257 per ton whereas large-scale producers obtained US$ 297 per ton. The average national maize price recorded for the region was US$ 275 per ton. The highest maize prices obtained in the sample space were the DRC and Mozambique, with average prices of US$ 396 per ton in DRC and US$ 317 per ton in Mozambique. The lowest reported maize prices on the proto-type farms were on the Zambian commercial farm with an average price of US$ 170 per ton and on the Malawian small-scale

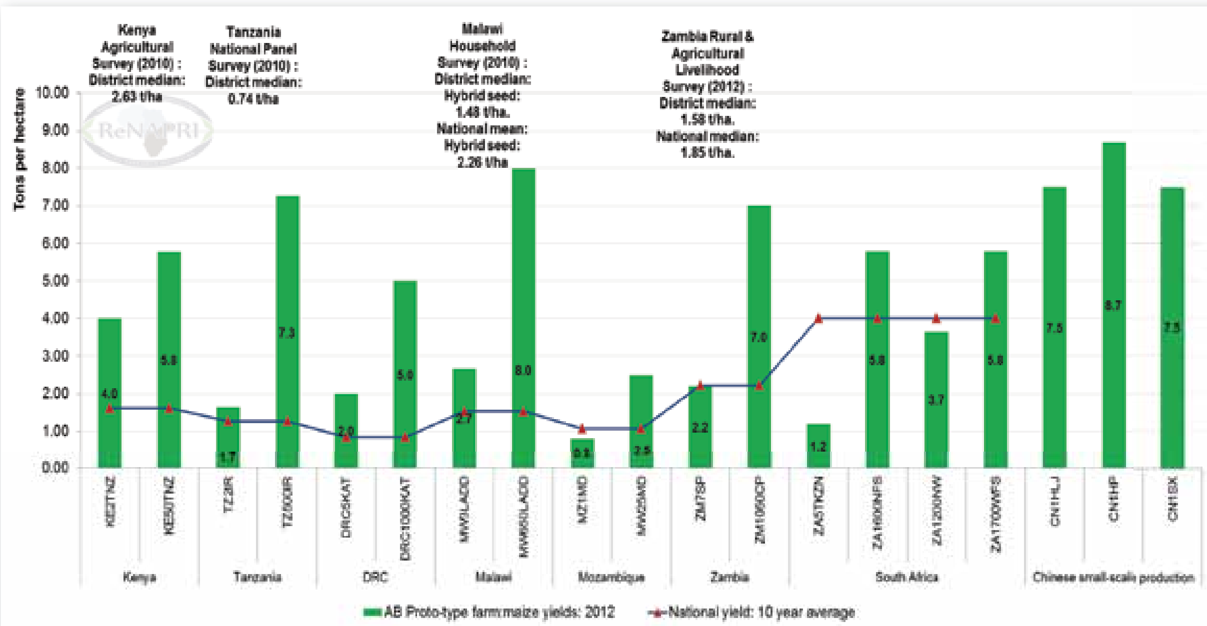

Figure 30: Maize yield (t/ha) – agri benchmark prototype farms & 10 year national average yield

Source: agri benchmark (2012) & USDA (2014).

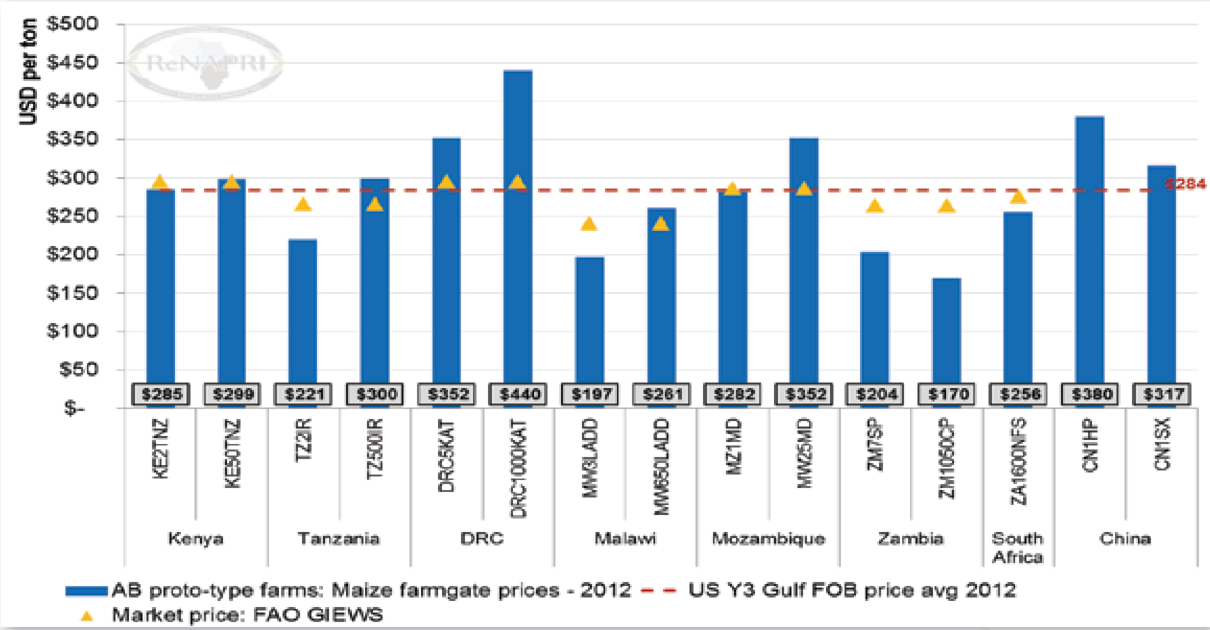

Figure 31 – Maize price comparison

Source: agri benchmark (2012) & FAO GIEWS (2014)

farm with an average price of US$ 197 per ton. The Agricultural Household Survey conducted in Kenya in 2010 reported an average maize price in the Kitale region of US$ 260 per ton. In the same year, the national median maize price was US$ 267 per ton.

In most cases, large-scale farmers obtained a better price than their respective small-scale counterparts. The need to generate a cash-flow and the lack of appropriate on-farm storage facilities remain a limiting factor for marketing and thus small-scale producers are forced to sell during the harvesting period, when prices are significantly lower.

Fertilizer application & cost structures

The utilization of fertilizers, in particular nitrogen, remains a key production factor in maize production. However, applying proper fertilizer that fills the requirement of the respective region's soil structure is costly and requires appropriate mechanization, seed

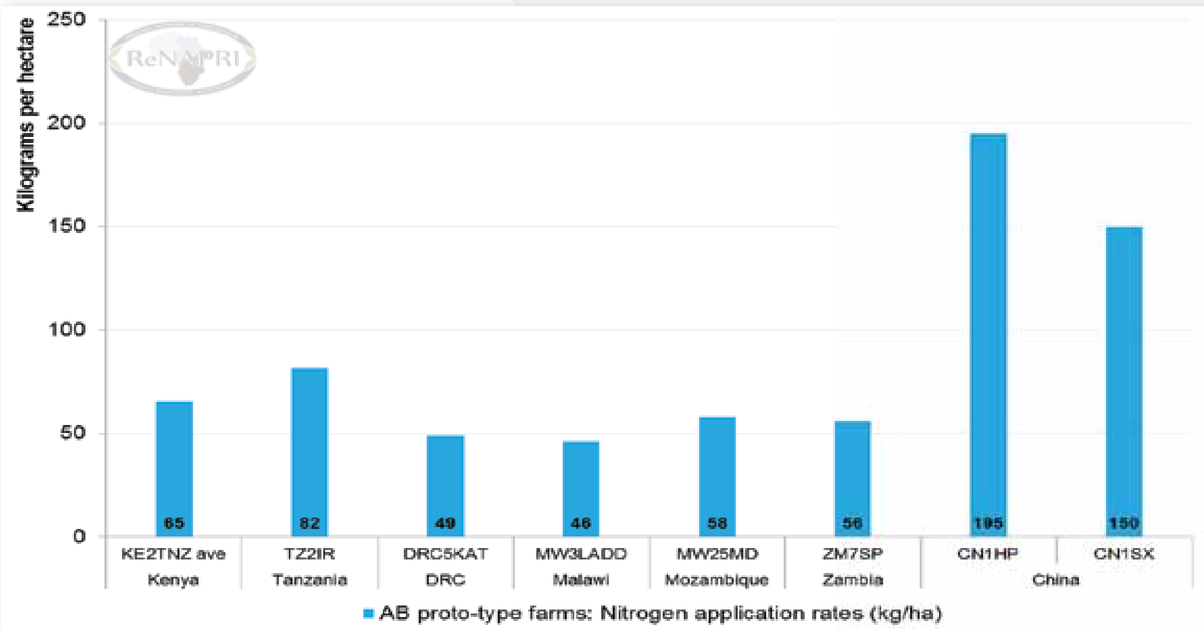

Figure 32 – agri benchmark proto-type farms: Nitrogen application rates for maize production in 2012

Source: agri benchmark (2012)

varieties, seedbed preparation and the usage of plant protection chemicals in order to generate a sufficient yields based on the potential of the soil and area.

Figure 32 illustrates the variances in nitrogen application rates for the agri benchmark proto-type farms. Figure 32 can be summarized as follows:

- According to the agri benchmark proto-type farm results in 2012, small-scale farms in Kenya, DRC, Malawi, Mozambique and Zambia applied similar amounts of nitrogen in the 2011/12 production season. These applications ranged from 46 kg/ha in Malawi to 65 kg/ha in Kenya.
- Fertilizer application on the small-scale proto-type farm in the Iringa region of Tanzania was 82 kg/ha of nitrogen, 25 kilograms per hectare more than the sample average (excluding China).
- According to the Malawian National Statistics Office (2010), the median nitrogen application on small-scale farms in the Lilongwe district ranged between 77 and 90 kilograms per hectare in 2009/10. This range is based on two applications, a basal and top dressing where farmers made mainly use of 23:21:0+4S Chitowe for basal application and CAN and Urea as top dressing fertilizers. However, the district mean (Lilongwe) indicated that it is common for small-scale producers to only make use of basal applications which would have amounted to approximately 43 kg/ha which corresponds with the agri benchmark field data for the 2012 production season.
- The Chinese farms fertilizer application was exceptionally high with 195 kilogram per hectare of Nitrogen in some cases, resulting in a nitrogen response rate that ranged between 45 and 50 kilograms of maize for every kilogram of nitrogen applied.

The cost involved in fertilizer application is generally high, which can be seen as a risk in the scenario of a complete crop failure. In addition, the use of fertilizer is essential; however, not the only contributor to higher yields. Figure 33 illustrates how the cost of fertilizer varies across the region. The figure reflects the true cost or shadow value of fertilizer and not necessarily what farmers actually paid. Government input support programs could have reduced the actual cost to farmers in certain countries. The light brown bars indicate the cost of nitrogen per kilogram and the blue line the cost of Urea (46) per 50 kilogram bag.

The cost of nitrogen and Urea in the region can be summarized as follow:

- The cost of nitrogen is greater on small-scale farms than on large-scale farms, due to the use of smaller packaging, which is more expensive than producers who purchase in bulk or larger size bags.
- Urea was the cheapest in Tanzania and Kenya with costs of US$ 36 per 50 kilogram bag in Kenya and between US$ 25 and US$ 38 per 50 kilogram bag in Tanzania.
- The cost of fertilizer in the DRC and Malawi is much higher compared to the rest of the region. The cost of Urea in Malawi went as high as US$ 59 per 50 kilogram bag. The average cost of Urea in the DRC was US$ 52.80 per 50 kilogram bag.

A combination of factors contribute to the high cost of fertilizers, especially if a country is a net importer of fertilizer or landlocked. Transportation cost (both deep see freight and inland transportation) is expensive which

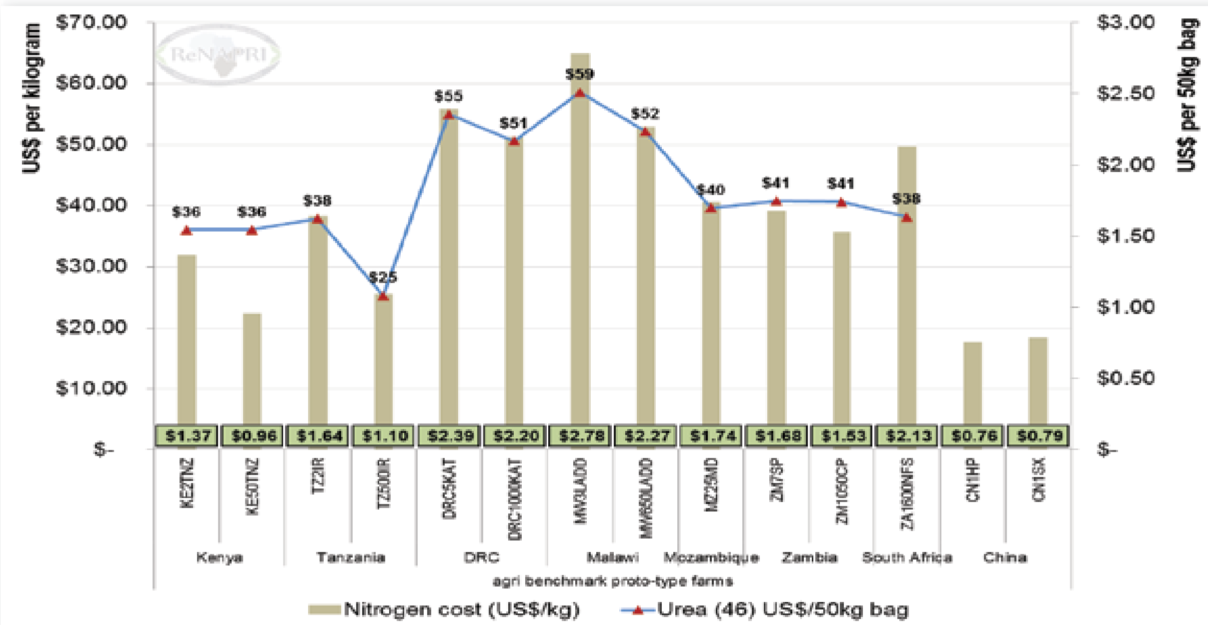

Figure 33 – agri benchmark proto-type farms: The cost of nitrogen and Urea (46) in the 2011/12 production season

Source: agri benchmark (2012)

drives the landed price higher. Secondly, weaker exchange rates against the United States dollar further cause higher domestic or landed fertilizer prices.

Seed application and cost structures

The seed utilization and costs across ESA are illustrated in Figure 34.The blue bars indicate the true cost per hectare (secondary axis), the red diamonds the seed application rate per hectare (primary axis) and the green line the seed cost per kilogram (secondary axis). The cost per kilogram will depend on the variety being planted where the lowest cost (Mozambique) illustrates a farm saved seed scenario and the higher cost, a case where seed technology such as hybrids are utilized.

Seed application and the respective costs in ESA can be summarized as follow:

- Seed application remained relatively stable over the region and varies between 20 kg/ha and 27 kg/ha in ESA (excluding South Africa). The highest application occurred on the Tanzanian small-scale farm with 27 kg/ha, which corresponds with irrigation farms in South Africa who apply approximately 25 kg/ha or a 90 000 plant population per hectare.
- The highest seed unit cost was recorded in Zambia (large-scale farm) and Tanzania (small-scale farm) with prices of US$ 4.47/kg and US$ 3.15/kg; respectively. Except for Mozambique, which utilizes farm saved seed, seed cost in the DRC was the cheapest (US$ 1.01/kg).
- The high application rate, together with a high seed cost on the Tanzanian small-scale farm results in the per hectare price being the highest in the small-scale sample space (US$ 86). The Zambian per hectare cost was the highest in the region.
- According to the Agricultural Household Survey conducted in Kenya in 2010, the average seed application on small-scale farms was 23.2 kg/ha. The district median amounted to 24.7 kg/ha.

Labour

The utilization of hired- and family labour on small-scale farms is an important production factor where production practices are labor-intensive. Figure 35 illustrates how wage rates differ across the region by observing

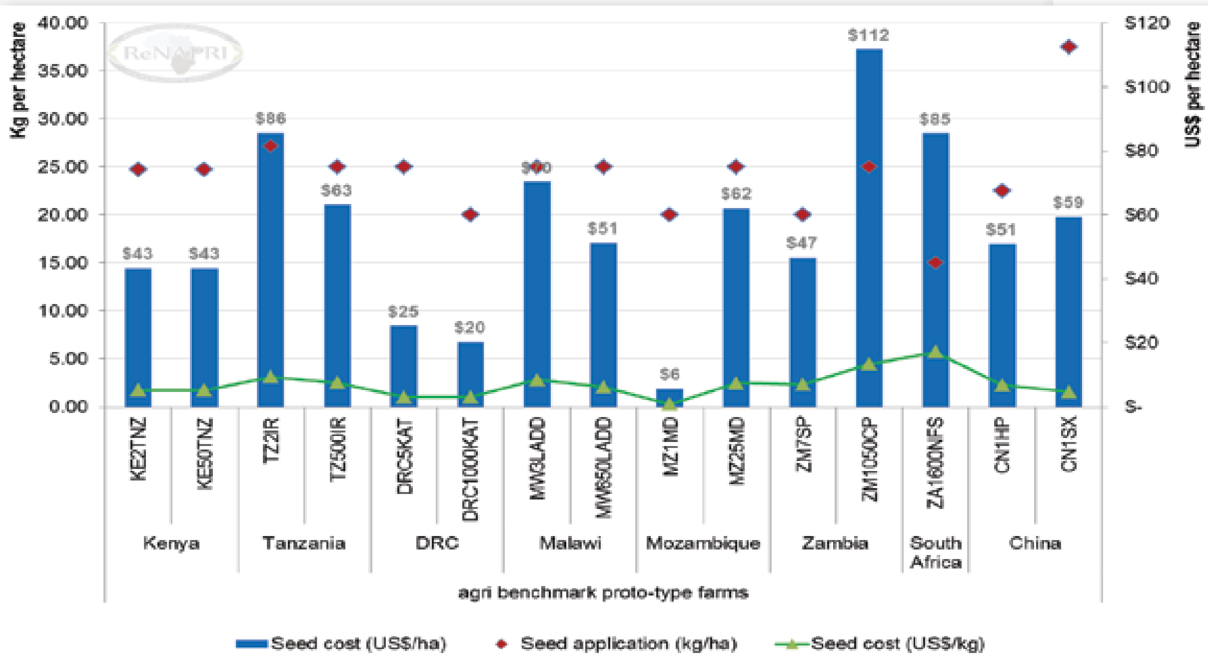

Figure 34 – agri benchmark proto-type farms: Seed application & cost of seed (2011/12): Maize

Source: agri benchmark (2012)

the per hour rate on small- and large-scale farms. For the purpose of this analysis, the assumption was made that a hired labour will work between five and seven hours per day over a certain period of time, for example 21 days for a land preparation activity. Thus, the light blue bars represent the wage rate per day for two types of working hour days.

The average wage rate per hour was approximately US$ 0.46, with the lowest rate in Zambia at US$ 0.29 per hour. The highest wage rate was recorded on the Tanzanian small-scale farm, with an average rate of US$ 0.69 per hour. These rates were calculated based on the cost for hired labour for certain activities such as seedbed preparation or harvesting of maize. Except for Zambia, all other small-scale farm workers earned more than on large-scale farms. The Kenyan Agricultural Household Survey conducted in 2010 indicated that a male would earn US$ 0.26 per hour and a female, US$ 0.25 per hour. The district median was calculated at US$ 0.21 per hour.

Establishing an average working day in the region is a complex task. Anticipation of a seven hour workday results in a daily rate which varies between US$ 2.06 to US$ 4.86 per worker per day.

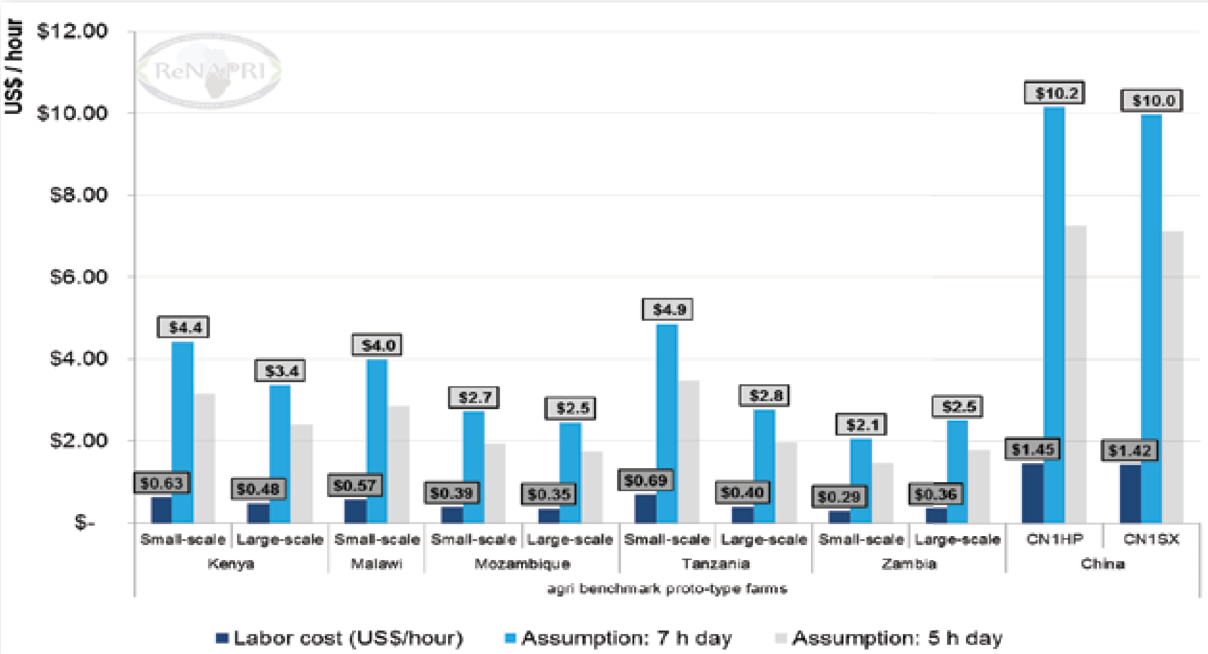

Figure 35: The cost of labour (2011/12): Maize
Source: agri benchmark (2012)

Establishment cost

Establishment cost refers to the key inputs needed for a maize production, which includes seed, fertilizer and plant protection. Figure 36 illustrates the shadow value or the real cost of production without support in terms of subsidies. The green bars indicate the cost of seed per hectare and the blue bars, the cost of fertilizer. The yellow triangles demonstrate the total establishment cost and the green diamonds, the total cost if subsidies are accounted for, in other words, the establishment cost at a subsidized rate.

From Figure 36, the average establishment cost for the region amounts to US$ 274/ha, of which fertilizer constitutes the largest component (US$ 204). The highest establishment cost was recorded in Tanzania, which totalled US$ 391/ha. The establishment cost in Kenya was the second highest with a total of US$ 322/ha. Zambian establishment cost was the lowest at US$ 157/ha.

Establishment cost in most of the ESA countries was significantly lower relative to Chinese small-scale production, and when subsidies such as fertilizer or seed coupons are taken into account, the establishment cost in some countries will decrease further. However, in some countries producers did not benefit from subsidies in the particular year. For instance, in Kenya, DRC and Mozambique, farmers did not have any support and had to bear the full cost of production. In Tanzania and Zambia, only a small portion of establishment cost was covered by subsidies from input support programmes. The support in Malawi was the highest where actual cost for the stipulated input variables amounted to US$ 185/ha compared to the actual cost of US$ 250/ha.

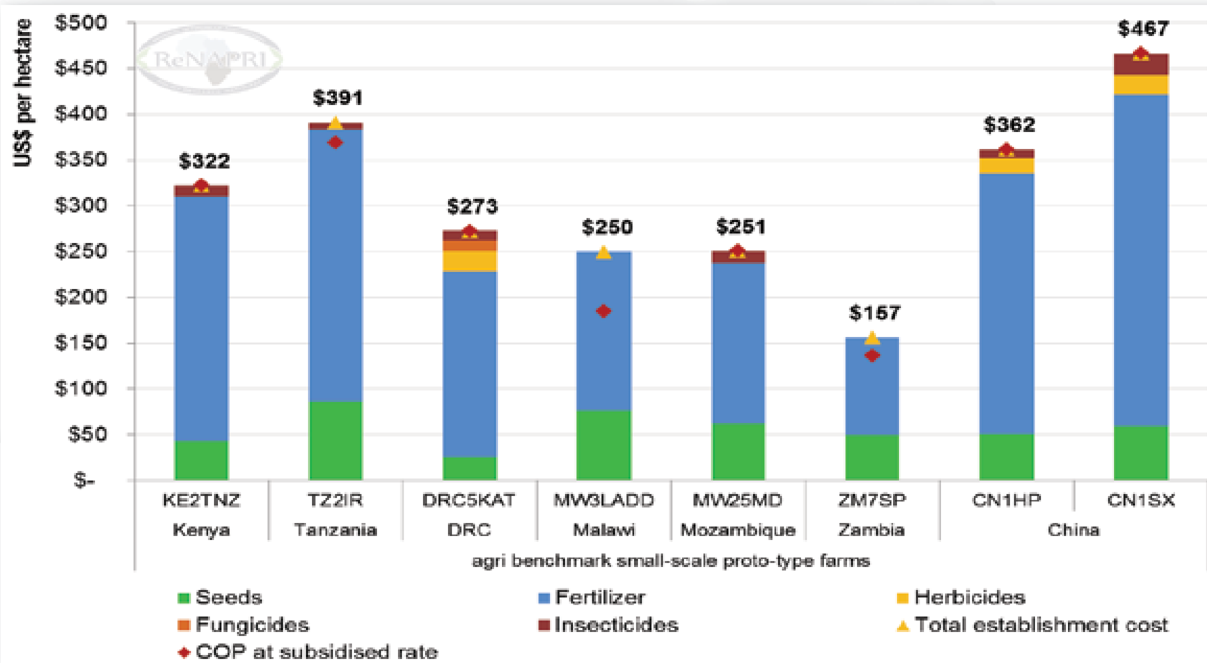

Figure 36 – Average establishment cost (2011/12): Maize

Source: agri benchmark (2012)

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Notes

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