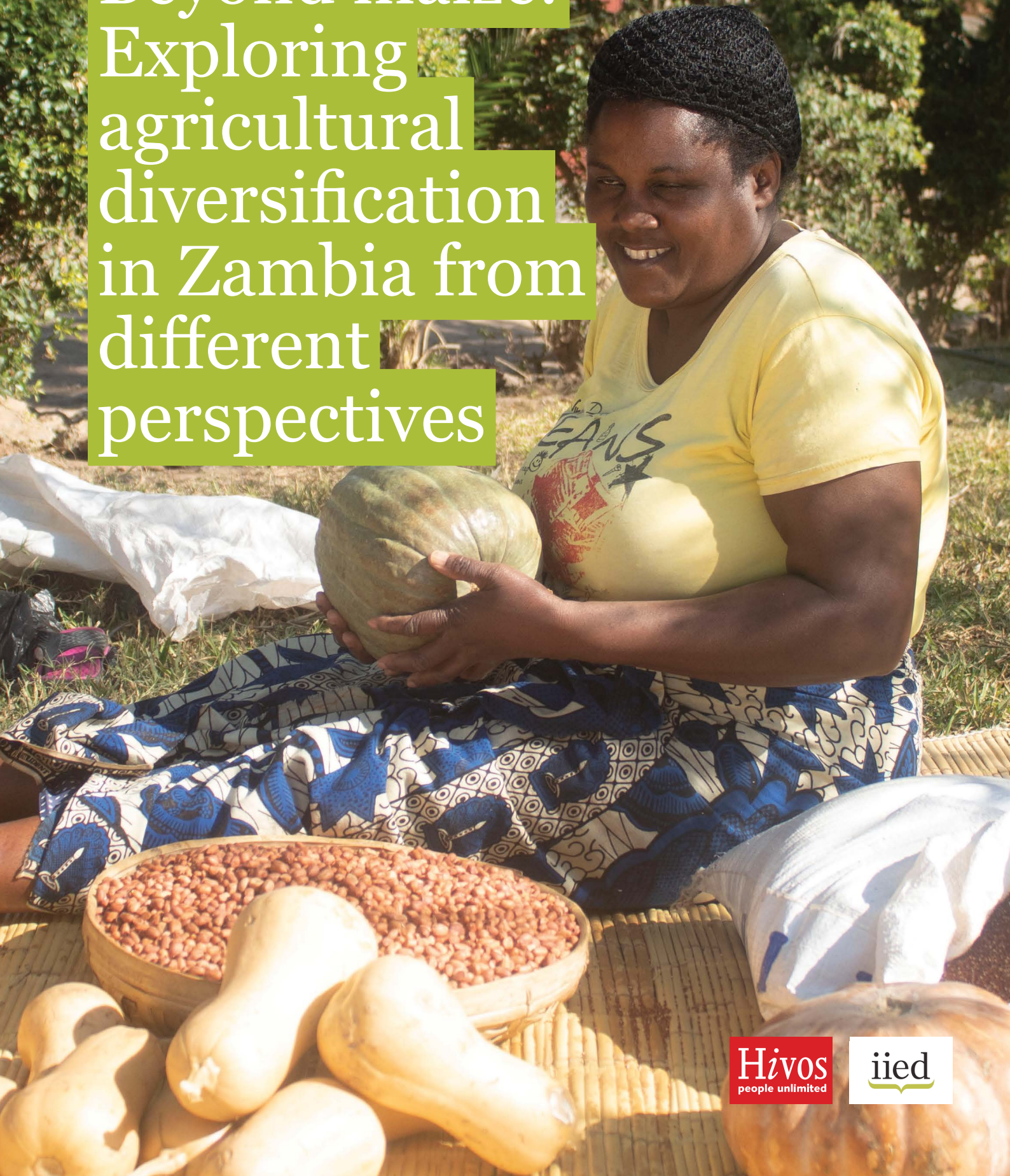


SUSTAINABLE DIETS FOR ALL

DISCUSSION
PAPER

Beyond maize: Exploring agricultural diversification in Zambia from different perspectives



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SUMMARY

Despite the Zambian Government's intention to diversify agriculture, the country is still heavily reliant on a narrow range of crops. Two-thirds of the total area under crop cultivation is devoted to maize. There has also been a shift in the food supply towards greater availability of root vegetables, eggs, cooking oil and sugar, and less availability of pulses, vegetables, fruit, meat, fish and milk. Consequently, the Zambian food system is not delivering enough affordable or nutritious foods for the majority of the population.

Diversifying agricultural production has the potential to increase the availability, affordability and accessibility of diverse and nutritious food, and is one of the major contributions the agricultural sector can make to food security and nutrition. In addition, diversification has positive impacts on income and creating more resilient communities.

This discussion paper explores the reasons for the lack of diversity from the perspectives of smallholder households, market actors and extension officers. It presents the results of the 'Beyond Maize' study, conducted as part of the Sustainable Diets for All (SD4All) project through a collaborative effort by the Indaba Agricultural Policy Research Institute (IAPRI), Civil Society for Poverty Reduction (CSPR) and Consumer Unity Trust Society (CUTS) and facilitated by Hivos. The study involved a cross-sectional survey of the perspectives on agricultural diversification of multiple stakeholders, including farmers, market actors and extension workers. The analysis shows that smallholder farmers understand the benefits of diversifying but find it difficult to implement. The key barriers are their limited

access to land, lack of a diverse range of agricultural inputs, inadequate finance, lack of small-scale irrigation equipment and the inadequate access to and absorption capacity of markets for diverse and nutritious foods. These challenges are worse for women and youth. A specific issue is that neither the public or private sector have made deliberate efforts to increase fruit production, despite its nutritional and income-generating potential.

The study clearly shows that diversifying agricultural production requires a holistic approach involving a range of stakeholders. Agro dealers are ready to support crop diversification, but their stock is driven by farmers' demands and input supplies; whilst traders are risk-averse, preferring to trade in crops with a known profitability, which may reduce the incentive to trade in a wider range of crops. Extension officers face challenges in changing the mindset of farmers to increase diversity, and also lack transport and adequate training materials on diversification.

Zambia's diversification agenda should be based on the priorities and requirements of farming households. To succeed it will require the collective efforts of key players, and a range of co-ordinated policy changes. Recommendations include convening a high-level policy process involving smallholders, consumers and civil society to bring about a sea change towards diversification; supporting market actors to pull towards more diverse agricultural production; stimulating demand for healthy and nutritious diets; and redirecting investments towards more diverse production and research and development that support agricultural diversification.

ABBREVIATIONS

CEEC	Citizen Economic Empowerment Commission
CSO	Central Statistical Office
CSO SUN	Civil Society Organisations for Scaling Up Nutrition
CSPR	Civil Society for Poverty Reduction
CUTS	Consumer Unity Trust Society
FAO	Food and Agriculture Organization
FDG	Focus Group Discussion
FISP	Farmer Input Support Programme
FRA	Food Reserve Agency
HDDS	Household Dietary Diversity Score
IAPRI	Indaba Agricultural Policy Research Institute
IIED	International Institute for Environment and Development
MoA	Ministry of Agriculture
MFL	Ministry of Fisheries and Livestock
MT	Metric tonnes
RALS	Rural Agriculture Livelihoods Survey
SD4ALL	Sustainable Diets for All
SID	Simpson Index of Diversification
SNAP	Second National Agriculture Policy
US\$:ZMW	United States dollar: Zambian kwacha (13.0, exchange rate 7-8-2019)

1. INTRODUCTION: EXPLORING OPTIONS FOR AGRICULTURAL DIVERSIFICATION

The agriculture sector in Zambia is the backbone of the national economy. It sustains livelihoods, ensures food and income for many rural households, and supplies food for the population. Currently Zambian agriculture is dominated by maize which covers two-thirds of the cropped area. The dominance of maize and the low diversity of crops is mirrored in the nation's diet, with 63% of total dietary energy derived from cereals (Mwanamwenge & Harris, 2017).

Diversity is a key principle of a healthy diet, which should consist of whole grains and at least 400 grams of fruits and vegetables per day, while less than 10% of overall energy intake should come from free sugars and less than 30% from fats (WHO, 2015). Low-quality diets are linked to a range of poor health outcomes, such as stunting, wasting and micronutrient deficiencies as well as obesity and diet-

related chronic and non-communicable diseases (GPAFS, 2016). Currently, the food system in Zambia is not delivering adequately on any of the elements of food and nutrition security (see Box 1).

Zambia is not alone in its lack of diversity in production and consumption. Globally, only 30 crops provide 95% of human food energy needs and just four of them – rice, wheat, maize and potatoes – provide more than 60% (FAO, n.d.). Globally, dietary patterns are becoming increasingly unhealthy, involving foods that are mostly high in calories and heavily processed, and animal based (Willett, et al., 2019). This is largely driven by rapid urbanisation, increasing incomes and the inadequate availability of nutritious foods (Willett, et al., 2019). Another contributing factor to dietary patterns is poverty, with availability, accessibility and

Box 1. State of food and nutrition insecurity in Zambia

The 2018 *State of Food Insecurity and Nutrition in the World* report lists Zambia among the countries with the highest rates of undernourishment (FAO, et al., 2018). Similarly, Zambia's hunger index remains among the highest in the world; 38% of the population is estimated to experience hunger (WHH & CWW, 2018). In absolute terms, nearly 960,000 Zambians were estimated to be at risk of food insecurity in the 2018/19 consumption year, a significant increase from about 210,000 in 2013 (Mofya-Mukuka, et al., 2018). Food security is based on four dimensions that must be fulfilled simultaneously: **food availability, economic and physical access, food utilisation, and stability** of these three dimensions over time (FAO, 2009). Good nutrition is inherent to food security, but is often overlooked in the drive for agriculture to produce enough calories. Zambia's high degree of food insecurity is reflected in prevalent symptoms of undernutrition, with 35% of children under five affected by stunting (CSO & MoH, 2019). At the same time, 24% of adult Zambians are either overweight or obese – with a Body Mass Index over 25 kg/m² (MoH, 2017). Levels of related non-communicable chronic diseases such as hypertension are high, with almost one-fifth of the population (19%) having raised blood pressure (MoH, 2017).

affordability of diverse and high-quality foods often limited in impoverished rural and urban areas (Cook, 2018). Securing adequate food that is healthy, diverse, safe, of high quality and grown in an environmentally sustainable manner is one of the world's greatest challenges (Bioversity International, 2011). A recently published EAT Lancet Commission report calls for collective efforts to support the production of diverse, healthy and environmentally sustainable foods as food systems are a major driver of poor health and environmental degradation (Willett, et al., 2019).

In line with these global trends, diets in Zambia are changing, and food supply and availability are broadly heading away from recommendations for diverse and healthy diets (Harris, et al., 2019). Zambia is currently developing its food-based dietary guidelines. The question is whether the current food system is able to deliver diverse and nutritious foods at an affordable price to allow all to adhere to these guidelines.

This discussion paper sets out to reflect on that question – with an emphasis on agricultural diversity – and to provide ideas that can improve the probability of success. Improving agricultural diversity does not automatically translate into improved diets, but it is an important element, and also contributes to resilience and resource conservation.

The paper is based on a review of academic literature and policy documents, as well as on the results of the 'Beyond Maize' study; a collaborative study conducted on behalf of Hivos. The 'Beyond Maize' study is a cross-sectional survey of perspectives on agricultural diversification from multiple stakeholders, including farmers, market actors and extension workers. Through these multiple perspectives, the research was able to uncover some of the factors that influence choices on cropping systems, and to look behind national data on crop diversity. Much of the literature for Zambia is based on the Rural Agricultural Livelihoods Survey (RALS), which is a panel survey based on national representative data from 8,839 households covering the 2011/2012 agricultural season, and 7,934 households covering the 2013/2014 agricultural season.

Section 2 summarises benefits of agricultural diversity for income, diets and resilience. Section 3 is an overview of the current status of diversification in Zambia and the related policy framework, while factors driving diversification are discussed in Section 4. Section 5 presents the results of the 'Beyond Maize' study and highlights the perspectives of farmers, market actors and extension workers on diversification. Section 6 concludes and highlights some recommendations.

2. WHY AGRICULTURAL DIVERSIFICATION?

One way for agricultural systems to promote both resilient production and positive nutrition outcomes is to diversify agricultural production (Box 2).

Box 2. What is agricultural diversification?

Diversification can occur in different forms, including genetic diversity in monocultures, field diversity with non-crop vegetation, crop rotations, mixed farming, polycultures and agroforestry (Lin, 2011). In Zambia, agricultural diversification is defined in the Second National Agriculture Policy (2016) as a shift away from dominance by one crop to include livestock and fisheries production. Crop diversification is referred to as a shift to the production of a number of crops. Other definitions from outside Zambia broaden this idea to an increase in the number of varieties that are grown, and taking into account how land is allocated among those crops and varieties (Aberman, et al., 2015).

2.1 Benefits for farm income

Several studies have shown that crop diversification is strongly associated with increased agricultural income (Pellegrini & Tasciotti, 2014; FAO, 2018). There is a complex interplay between diversification and specialisation. Both may enable farming households to generate income, but the specific context is important. Market demand and market access are crucial factors determining whether households can make an income from specific crops. Specialisation may be more beneficial when farming households are closer to functioning markets, while diversification is more beneficial in areas further from markets; diversification can also provide a buffer against price fluctuations (Heumesser & Kray, 2019). In addition, there are concerns that increased agricultural commercialisation weakens the role of women in decision making and controlling productive resources and income (Mofya-Mukuka & Sambo, 2018). A study based on the RALS data from Zambia showed that increased household

crop commercialisation subverted women's control over agricultural income, reducing the impact on dietary diversity as men took more control over income (Mofya-Mukuka & Sambo, 2018).

2.2 Benefits for diets and nutritional outcomes

Agricultural diversification has an essential role to play in ensuring food and nutrition security (Waha, et al., 2018). The causal pathways between agriculture and nutrition can be broadly divided into three routes: diversified production can (1) directly affect the food a household consumes; (2) increase income through selling high-value crops; and (3) strengthen the income pathway to nutrition by empowering women (Gillespie, et al., 2012).

Crop diversification can directly affect farm households' diets if the household consumes its own produce. Various studies, including in Zambia, show that production diversity is positively and significantly associated with household dietary diversity (Kumar, et al., 2015; Mazunda, et al., 2018; Mango, et al., 2018; Pellegrini & Tasciotti, 2014). However, a meta-analysis of 45 studies conducted in developing countries concluded that there is little evidence to support the assumption that increasing farm production diversity is a highly effective strategy to improve smallholder diets and nutrition in most or all situations (Sibhatu & Qaim, 2018). The research showed that more than half of the studies found an average marginal positive association between production diversity and dietary diversity for certain indicators, while the rest found no significant association at all (Sibhatu & Qaim, 2018). Disentangling the complex link between production diversity and nutritional outcomes requires more contextual analysis.

Over time, the typical diet in Africa has evolved from being mainly based on home produce to being based on purchased food to some extent, even among the rural poor. In East and Southern Africa purchased food accounts for 57% of all food consumption by value, and rural households rely on markets for 45% of their food (Tschirley, et al., 2015). However, it is expected that in contexts where markets do not function



Woman gathers vegetables from her garden (Stan Makumba)

properly, or where transportation costs are high or villages are remote, households have to rely mainly on their own production to satisfy their food needs (Kumar, et al., 2015; Pellegrini & Tasciotti, 2014). These findings are similar to another study (Mofya-Mukuka & Hichaambwa, 2016), which found that hours to the nearest urban centre were positively related to diversification at household level.

Income from agriculture can contribute to greater food security by allowing households to purchase food and other health supporting goods and services. However, increased income does not always mean nutritional improvements (Kirk, et al., 2018). Even if a household sees its income grow, better nutrition may take time to achieve and depends on the general nutrition knowledge and the degree to which women have the ability to influence purchasing decisions (Kirk, et al., September 2018). Women are key actors within the food system – in most societies they are the primary caregivers, responsible for food preparation and feeding young children (Janoch, et al., 2018). Women’s empowerment in agriculture is associated with better child nutrition as women are more likely to invest their income in food and nutrition (Smith & Haddad, 2000). The high control of men over agricultural income in Zambia could partly explain the current low levels of dietary diversification (Mofya-Mukuka & Sambo, 2018). Therefore, the extent of bargaining power and control that women have over decisions about what a household produces and consumes and how income is used will moderate the degree to which the above routes will lead to improved food and nutrition security (Mazunda, et al., 2018).

2.3 Benefits for resilience

The resilience of an agricultural system to climate change and its ability to recover from climatic shocks are important determinants of food and nutrition security (Arslan, et al., 2018). Crop diversification is also important from an agricultural perspective as heavy reliance on a narrow range of crops, crop varieties and animal breeds brings long-term risks for agricultural production, biodiversity and livelihoods while undermining the ability of agriculture to adapt to climate change (Cook, 2018). The average temperature in Zambia has steadily increased, at an approximate rate of 0.6°C per decade between 1980 and 2010, while there has been a declining rainfall pattern across the country with a trend towards late onset and early cessation of rains (Phiri, et al., 2013). Climate change is affecting food security, because it has a negative impact on the productivity of crops, forestry, livestock, fisheries and aquaculture. Maize is more vulnerable to drought than some other indigenous staple crops such as millet and sorghum.

Crop diversification can improve resilience in a variety of ways; by increasing the ability to suppress pest outbreaks and dampen pathogen transmission; buffering crop production from the effects of greater climate variability and extreme weather events; and improving soil fertility through diversifying into leguminous crops (Lin, 2011). An example of the importance of diversification is the major outbreak of the fall armyworms in Zambia in 2016, which affected maize to a much larger extent than other crops (ACAPS, 2017). In an effort to control the fall armyworms, the FAO promotes crop diversification as it reduces fall armyworm infestations and supports natural enemies (FAO, 2018).

3. CURRENT STATE OF AGRICULTURAL DIVERSIFICATION AND DIETS

3.1 Policy framework for agricultural diversification

The Government of Zambia, through its 7th National Development Plan (7NDP), expresses the aspirations of the Zambian people for the country to become a prosperous middle-income nation by the year 2030. The 7NDP provides a foundation for diversification. It contains a specific strategy on promoting agricultural diversification in crops, fisheries, livestock and forestry products based on the comparative and competitive advantage of each product and agro-ecological zone (GRZ, 2017). The focus is on improving production of high-value exports, such as cashew nuts, coffee, maize, wheat, tea, cotton, sugar, fish, and agro-forestry and livestock products. The 7NDP also includes a strategy to enhance food security and nutrition through the promotion of nutritious foods and household food security (GRZ, 2017). The revival of the fruit processing industry was identified as one of the quick wins for the accelerated creation of jobs.

The Second National Agricultural Policy (SNAP) is based upon the guiding principle of the right to adequate and nutritious food and contains an entire strategic objective of improving food and nutrition security (MoA, 2016). The policy aims to promote crop diversification through direct measures, as well as through some of the drivers of crop diversification (e.g. improving agricultural extension services). However, unlike the 7NDP, the SNAP does not make specific reference to reviving the horticulture or fruit sector. The National Agricultural Investment Plan (NAIP) 2014-2018 also has a strong focus on crops in general, livestock and aquaculture, but pays only scant attention to horticultural crops (MoA, 2013). The narrow definition of agricultural diversification in

the SNAP may limit the effectiveness of the policy to truly enhance agricultural diversification (see Box 2).

The dominance of maize production is driven by two large programmes that monopolise the budgetary allocation for the Ministry of Agriculture (MoA); the Farmer Input Support Programme (FISP) and the Food Reserve Agency (FRA). The FISP is an input subsidy aimed at improving the asset base of smallholder farmers, as well as promoting farming as a business. The FRA buys maize from farmers at guaranteed prices and forms a strategic grain reserve to modulate national grain prices. The FISP and FRA have played an important role in making Zambia a structural surplus producer of maize, but have failed to enhance productivity or food and nutrition security, and have not sustainably reduced poverty (World Bank, 2017). Following its commitments to increase agricultural diversification, the government has commenced a transition from the FISP to the electronic voucher system (e-FISP), which allows farmers to select agricultural inputs of their choice. This is an important step towards encouraging agricultural diversification, but will need to be accompanied by increased knowledge of the importance of diversification among all actors along the value chain. However, challenges in implementing the e-FISP meant that the government partially reversed its commitment to fully shift to the e-FISP during the 2018/2019 agricultural season. It reverted at least 40% of recipients back to the conventional FISP, providing fertiliser and maize seed only (Kuteya, et al., 2019).

The government reserves more than 50% of the MoA budget for input and output subsidies, mainly aimed at the production and marketing of maize (Chapoto, et al., 2015),



Women working in a cotton field (Edward Musosa)

whilst a mere 0.25% of the overall budget is allocated to crop diversification.¹ The already limited budget reserved for research and development for crop diversification in the national budget was removed for 2017 and subsequent years.

The government has introduced various strategies to promote aquaculture and livestock production in order to broaden diversification options for smallholder farmers. It allocated 652 million Zambian kwacha (50 million US\$) in the 2019 budget for their implementation.² Some of these strategies include the formation of the Ministry of Fisheries and Livestock; the development of fishery specific management plans, an aquaculture strategy and development plans; and financing mechanisms through the Citizen's Economic Empowerment Commission (CEEC) and the Aquaculture and Fisheries Fund (Kefi & Mofya-Mukuka, 2015).

The Comprehensive Africa Agriculture Development Plan (CAADP) includes a policy statement on the government's intention to explore social protection instruments in partnership with the private sector and civil society (MoA, 2011). The Ministry of Community Development and Social Services provides diverse agricultural inputs under the Food Security Pack (FSP) Programme as a social safety net for the most vulnerable farmers. The FISP/E-voucher programme, which reaches more farmers than the FSP, is not intended to provide a social safety net, as current targeting criteria do not include promoting inclusive agricultural development. Therefore, adjusting the targeting criteria for the FISP/E-voucher could further enhance social protection.

Extension services promoting productivity and enhancing technologies is influencing the level of crop diversification

by smallholder farmers (Mofya-Mukuka & Hichaambwa, 2016). The National Agriculture Extension Strategy addresses diversification through recognising the preservation of genetic diversity as a long-term strategy to mitigate the impact of climate change. The strategy also highlights the role of extension and advisory services in disseminating knowledge and skills on production and dietary diversity, food storage and processing, and seasonal food use. The strategy also addresses the specific needs of women, as men more frequently grow cash crops, whilst women are more frequently in charge of subsistence crops and require different services (World Bank, 2008).

Zambia is recognised as having perhaps one of the most coherent nutrition policy frameworks in the region, both within nutrition policy and across sectors (Harris, et al., 2017). However, the linkages between crop and agricultural diversification and improved access to affordable, diverse and nutritious foods need to be strengthened. While the country's policy framework for agricultural diversification addresses the need to produce different crops and livestock, the scope is limited. This paper will highlight some of the challenges that need to be addressed in order to increase agricultural diversification for improved resilience and diets.

3.2 National crop production

The agriculture sector in Zambia revolves around only a few staple crops: maize, cassava, millet, rice and sweet potatoes. Of these, maize is by far the most important, both in terms of production and consumption (Kumar, et al., 2015). Of the 1.5 million smallholder households in Zambia, an estimated 89% grew maize in 2015, ranging from 68% in Luapula province to 100% in the Copperbelt

1 Based on data from the national nutrition budget analysis conducted annually by the Zambia Civil Society Organisations for Scaling Up Nutrition (CSO SUN).

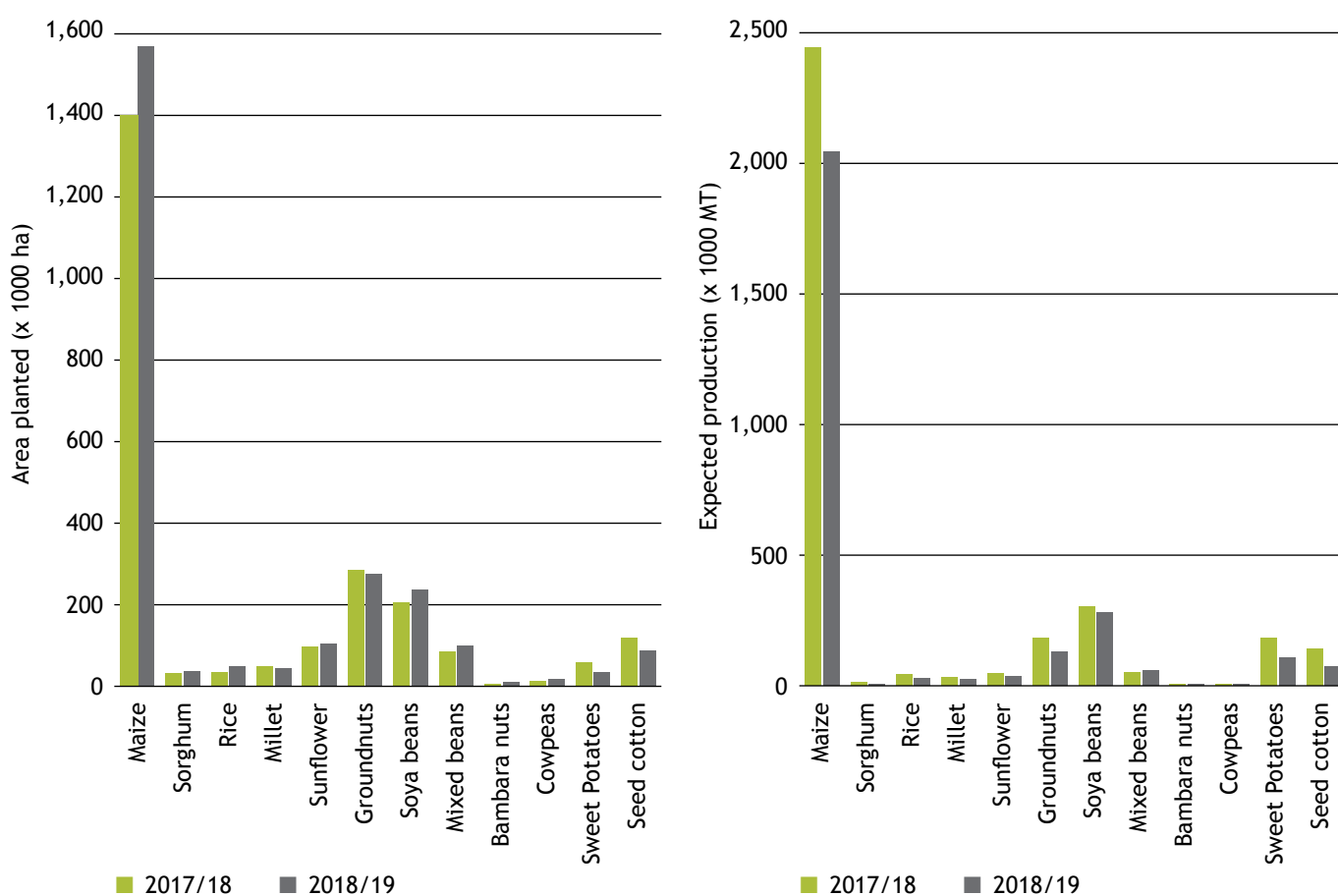
2 Based on data from the national nutrition budget analysis conducted annually by the Zambia Civil Society Organisations for Scaling Up Nutrition (CSO SUN).

and Lusaka province (CSO, et al., 2016). The Crop Forecast Survey (2018/2019) estimates a national average production of maize of more than 2 million metric tonnes (MT) in the 2018/2019 agricultural season, followed by 0.28 million MT of soya beans and 0.13 MT of groundnuts (CSO, 2017/2018 & 2018/2019). The high production of maize is also reflected in its share of the cultivated area (Figure 1) – five times higher than for groundnuts (the crop with the second highest area coverage).

The average maize yield among small-scale farms increased from 1.93 MT per hectare in 2004 to 2.24 MT per hectare in 2012 thereby contributing marginally to increases in

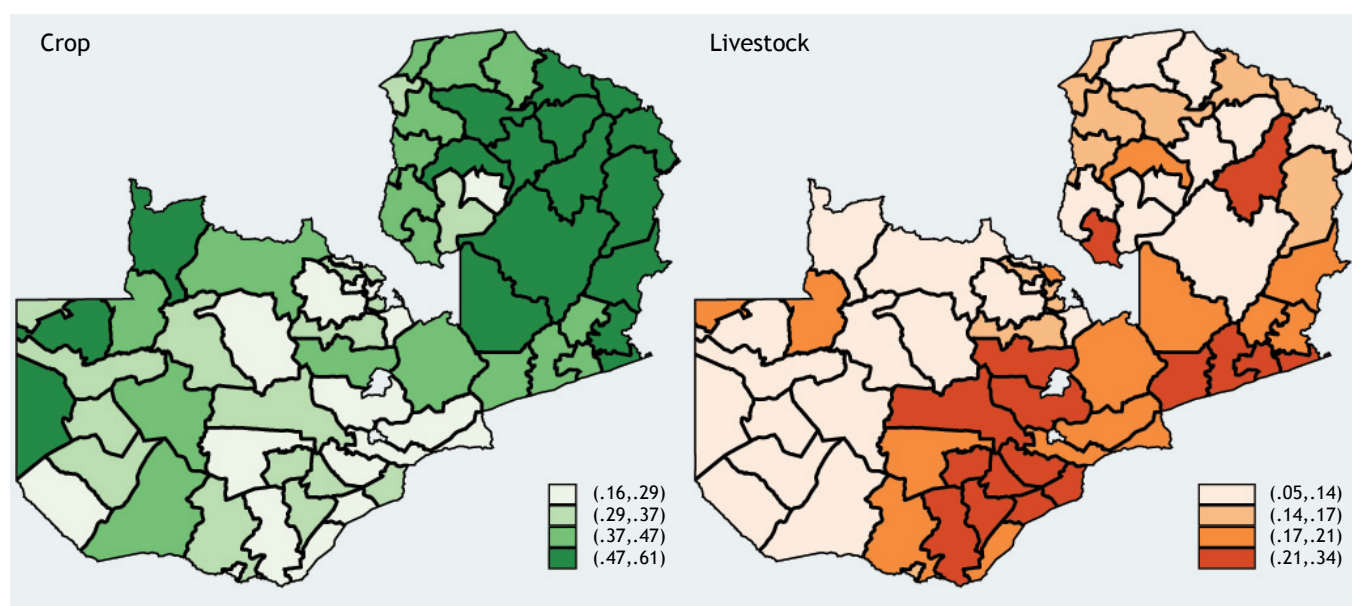
national maize production (ZEF, et al., 2017). The crop forecast survey for 2018/2019 estimated that the national average yield rate for maize has declined to 1.62 MT per hectare, largely due to the prolonged dry spells experienced in the growing season (CSO, 2017/2018 & 2018/2019). The production of maize is largely dependent on rainfall, making it vulnerable to adverse weather conditions such as droughts and floods (MoA, 2016). Despite maize being the main crop in area covered and production, 39% of all smallholder farmers in Zambia who cultivated and sold maize were still net buyers of maize in 2013/2014, meaning their household purchased more maize than they sold (CSO, et al., 2016).

Figure 1. Area cultivated (1,000 hectares) and production of major crops (1,000 metric tonnes), 2017/2018 and 2018/2019



Source: (CSO, 2017/2018 & 2018/2019). Note: No national level data for cassava available

Figure 2. Crop and livestock diversification (Gini-Simpson Indices) – RALS 2015



Note: The Gini – Simpson index for crop diversification refers to the area allocated to different crops, while for livestock it refers to the contributions of different livestock species to the total livestock holdings. The higher the index the more diverse the province (see Section 5.1 for more details).

Source: Adapted from (Arslan, et al., 2018), based on RALS 2015

3.3 Household crop diversification

The agricultural activities of smallholder households in Zambia are characterised by low levels of crop diversification. The RALS data showed most smallholder households (80%) cultivate three or fewer crops, with 18% of farmers cultivating only one crop, 32% cultivating two crops and 29% cultivating three crops (Mofya-Mukuka and Hichaambwa 2016: 3). The level of crop diversification varies widely across Zambia, with the north and north-eastern provinces being more diversified than the other provinces (Figure 2).

The promotion of conservation agriculture is one of the main strategies used by the Zambian government and various organisations for crop diversification, since one of conservation agriculture’s pillars is crop rotation with legumes. Additional analysis of the RALS (2015) showed that 61% of farming households cultivated maize with a leguminous crop (groundnuts, velvet beans mixed beans, cowpeas or soybean).³

3.4 Livestock and aquaculture production

The livestock sub-sector in Zambia plays several socio-economic roles, including being an important livelihood source for rural smallholder farm households. It is estimated that 1,151,393 smallholder households support their livelihoods through raising at least one type of livestock (Mkandawire, 2015). Depending on the dominant species, the contribution to household income can be as high as 45% (Lubunga & Mofya-Mukuka, 2012). The smallholder livestock sector accounts for 80% of all livestock in the country and

for about 80% of all meat entering the value chain (Lubunga & Mofya-Mukuka, 2012).

There are large differences in livestock ownership across the provinces, with most livestock owned by households in the southern and eastern provinces (MFL & CSO, 2019). The level of livestock diversification also varies widely, with Southern Province and part of Eastern Province being the most diverse (Figure 2). Overall, the livestock sector in Zambia is still underdeveloped, with investments mostly directed towards cattle production (Kabaghe, et al., 2017).

Zambia’s fisheries sector is growing, with aquaculture production growing from 5,000 MT per annum in 2006 to more than 30,000 MT per annum in 2017 (Chapoto, et al., 2019). However, per capita consumption of fish in the country has declined – from 12 kg in the 1970s to 7.7 kg in 2012 (Kefi & Mofya-Mukuka, 2015).

3.5 Horticulture

Horticultural production has the potential to secure an adequate supply of fruit and vegetables throughout the year. Fruit and vegetables are important for dietary diversity, with four out of the ten food groups for measuring dietary diversity consisting of vegetables and fruit (FAO & FANTA, 2016). The horticultural sector in Zambia is highly constrained, however, mostly on the marketing side. The sector faces very high price volatility which increases the risk and reduces profitability for most poorly resourced smallholder farmers. Price volatility arises mostly from underdeveloped marketing channels, with more than

³ Based on unpublished analysis of the RALS (2015) data.



Maize and banana cultivation in the same field (Salim Dawood)

80% of the horticulture products being traded on the informal market (Chapoto, et al., 2018). Other challenges for smallholder farmers include inadequate market infrastructure and cold chain systems, lack of irrigation and inadequate access to finance and insurance (Agri Pro Focus, 2015).

3.6 Food supply and food prices

The supply of nutritious food is important. However, there has been a shift in the food supply with increased availability (kg per capita) of root vegetables, eggs, cooking oil and sugar, but less availability of cereals, pulses, fruit, vegetables, meat, fish and milk (Harris, et al., 2019). In particular, the supply of fruit and vegetables is not sufficient to provide the 400 grams per person per day recommended by the World Health Organization (WHO). Well over half of the calories available per person in Zambia comes from cereals, largely from maize (Harris, et al., 2019). This demonstrates that the current food system is not able to provide diverse and nutritious diets for all.

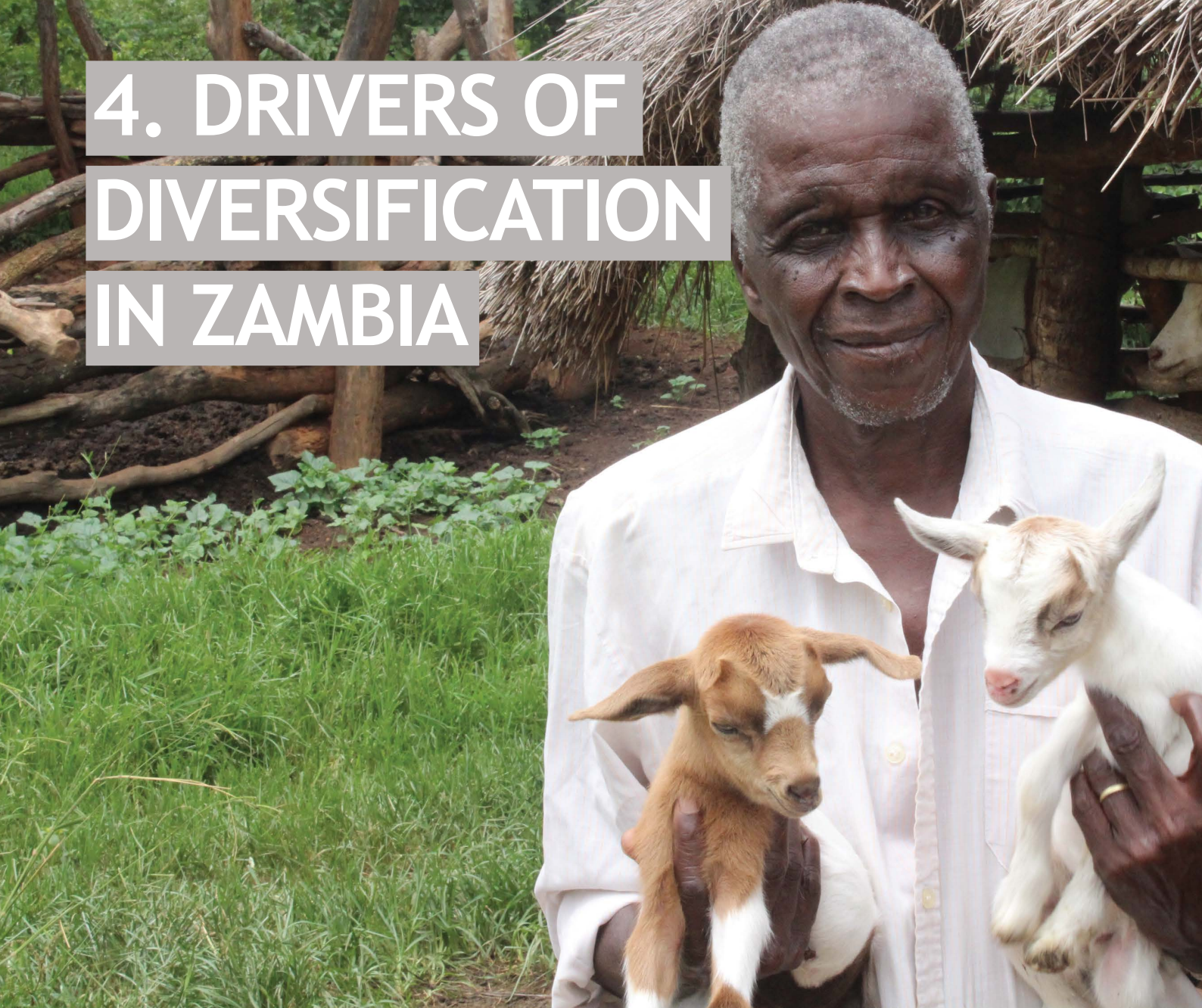
Another important determinant of food security is the price of food, which determines economic access. However, ensuring a nutritious diet can be expensive. Meeting the nutrient needs of a family while keeping costs to a minimum and respecting cultural traditions is a challenge (Termote, et al., 2014). In Zambia, the share of the household food budget spent on fruit and vegetables decreases with income, while expenditure on animal food sources such as meat, fish, eggs and dairy increases with income. Households spend on average about 17% of their household food budget on highly processed foods, which are associated with increases in excess weight and chronic diseases (Chisanga & Zulu-Mbata, 2017). The Jesuit Centre for Theological Reflection (JCTR) has developed a methodology that estimates the monthly

cost of a nutritious diet for a family of five in Zambia's urban areas. This suggests a cost of almost 2,300 kwacha a month (around US\$170), which is expensive considering that the average monthly household income was 1,801 kwacha (140 US\$) in 2015 (CSO, 2015). More than half of the costs of a nutritious diet are associated with legumes, vegetables and fruits, while only 15% are associated with cereals (JCTR, 2019). This is confirmed by a recent paper on nutrition transition in Zambia showing that while households' overall purchasing power may have increased for some foods, the cost of diversifying away from maize has become greater, with key nutrient-rich foods, including fruits, legumes, eggs and kapenta, becoming more expensive (relative to maize) over the period 1996 to 2015 (Harris, et al., 2019).

3.7 Dietary patterns in Zambia

Measuring change in diets is often hampered by the lack of available dietary data for individuals. Until the results of the national food consumption survey are published in Zambia, the picture remains blurry. The Household Dietary Diversity Score (HDDS) shows household food security in terms of access to food. It is also meant to reflect the economic ability of a household to access a variety of food. The HDDS records the consumption of 12 food groups – including foods that require resources to obtain, such as condiments, sugar and beverages – using a 24-hour recall method (FAO, 2013). The RALS showed a national average of six food groups being consumed, and that in about one-third of rural smallholder households the diet consists of less than four food groups (CSO, et al., 2016). The WHO recommends five servings of fruit and vegetables a day. A recent national survey in Zambia showed that more than 90% of the population consumed fewer than five servings of fruit and vegetables a day, with a daily average of 0.7 servings of fruit and 2.1 servings of vegetables (MoH, 2017).

4. DRIVERS OF DIVERSIFICATION IN ZAMBIA



Farmer showing off recently born kids in Chongwe (Edward Musosa)

Various factors drive farm households to diversify their crop production. These vary significantly across countries and households as they are closely linked to off-farm and on-farm income dynamics, development of agricultural markets, infrastructure and information (Asfaw, et al., 2019). Broadly, drivers of diversification can be divided in market drivers, environmental drivers and socio-economic drivers.

4.1 Market drivers

Access to markets tends to influence crop diversification, implying that deliberate efforts and resources need to be devoted to developing input, output and food markets in remote areas of Zambia (Mofya-Mukuka & Hichaambwa, 2016). An analysis of the RALS data showed that the number of private agricultural traders in a village has a

significant positive impact on the adoption of cropping systems that include legumes and other staples or cash crops over monocropping (FAO, 2018). On the other hand, proximity to parastatal marketing boards such as the FRA discourages the adoption of more diverse cropping systems. As the distance to the FRA depots increases, the probability of adopting diverse cropping systems instead of maize monocropping increases significantly (FAO, 2018). Another study showed that receiving the traditional FISP as opposed to the E-voucher is associated with a decrease in crop diversification. Therefore, these key government policy instruments (the FRA and FISP) are undermining crop diversification (Mofya-Mukuka & Hichaambwa, 2016).

A well-functioning input and output market increases farmers' tendency to specialise and to produce high-value commodities, while also providing opportunities to diversify production and invest in value addition (Heumesser & Kray, 2019). However, the specific circumstances and characteristics of the farm can tip the balance in one or other direction (Heumesser & Kray, 2019). There is a tension between specialisation and diversification of crop activities (see also Section 2.1). Farm diversification can contribute to income growth and stability up to a certain point, but beyond that point further diversification may reduce potential household income as they may miss out on the benefits of specialisation (Sibhatu, et al., 2015) (Pellegrini & Tasciotti, 2014). In Zambia, poor households are more likely to reap income benefits from crop diversification than wealthier households, probably because richer farmers have other ways to cope with production risk, whilst for the poorest, diversification is often the only viable alternative (Asfaw, et al., 2019).

The contribution of subsistence production to household diets decreases with proximity to markets, with several studies showing that dietary diversity was higher in market-oriented than in subsistence-oriented settings (Sibhatu & Qaim, 2018). Poor market access can push households into crop and livestock diversification; households are significantly more likely to be diversified as distance to markets increases (Arslan, et al., 2018). However, when it takes more than a day to reach the market, the level of crop diversification starts to decrease again, suggesting that remote rural areas face challenges in crop diversification due to input and output market constraints (Mofya-Mukuka & Hichaambwa, 2016).

The price of maize seed is an important driver of diversification; the higher the price, the lower the adoption of other crops. This indicates that priority is given to maize seeds before investing in the production of other crops, pushing farmers away from more diverse cropping systems (FAO, 2018).

The pull effect of markets on agricultural diversification is also illustrated by the Community Markets for Conservation (COMACO) programme implemented in the Luangwa Valley (Box 3).

Box 3. Community Markets for Conservation (COMACO)

Led by the Wildlife Conservation Society, COMACO promotes income generation, biodiversity conservation and food security in Zambia's Luangwa Valley. Farmers received training in eco-agriculture and organic farming techniques. The organisation linked 40,000 rural farming households to markets for a diverse range of agriculture produce, including groundnuts, rice, soya bean, honey. Their produce was sold as value-added processed products, or to high-paying commodity markets. The programme shows that markets can have a significant pull effect on diversifying agricultural production. The programme has increased production of rice by 300%, groundnuts by 270% and soya beans by 180%. The overall number of food crops contributing to income has increased from 10 to 16. The greater diversification of household food crops has allowed for greater food security and resilience in the face of unpredictable weather patterns (UNDP, 2012).

4.2 Environmental drivers

Farmers' decisions on what to grow are often strongly influenced by the environment and weather conditions. Globally, Zambia ranks 15th on the list of countries most vulnerable to climate change (Arslan, et al., 2018). High reliance on rainfed agriculture makes farmers more vulnerable to weather variability and therefore is an important driver of crop diversification. Diversification is considered an adaptation response, with long-term variation in rainfall during the growing period acting as a push factor into livestock diversification in Zambia. While rainfall stress does not seem to increase crop diversification (Arslan, et al., 2018), the length of the growing period and the average rainfall during the year are highly correlated with crop diversification in Zambia, with shorter growing periods linked to lower diversification (Heumesser & Kray, 2019; Mofya-Mukuka & Hichaambwa, 2016). Diversification is more an adaptation response to long-term climate change, as prior knowledge of a predicted short-term climate anomaly does not necessarily result in a change of smallholder farmers' crop production choices (Mubanga, et al., 2015).

Poor environmental conditions, especially poor and degraded soils, can also encourage farmers to diversify agricultural production as a means of improving land productivity (Heumesser & Kray, 2019). In Zambia, conservation agriculture has been widely promoted and includes crop rotation or intercropping with legumes to reduce soil erosion and increase soil fertility.

4.3 Socio-economic drivers

Land size is an important determinant of diversification (Asfaw, et al., 2019; Sichoongwe, et al., 2014). When land holdings are relatively large farmers can take the risk of incorporating other crops into their production system, whilst still being able to dedicate sufficient land to staple food production (FAO, 2018). A study in Malawi, Mozambique and Zambia showed that land size is a key determinant of more diverse systems. For example, a 10% increase in land size (approx. 0.5 ha) correlated with a 29% increase in the probability of having a cropping system involving maize, legumes, alternative staples and a cash crop rather than simply maize monocropping (FAO, 2018).

Gender is another critical consideration for diversification as there is strong evidence that women are often more constrained than men in access to credit, land, extension services and other productive resources, and more marginalised in terms of decision making (Aberman, et al., 2015). A study in Zambia showed that although the gender of the household head did not have a significant impact on the crop diversification index, households composed entirely of men had a significant negative impact on crop diversification (Mofya-Mukuka & Hichaambwa, 2016). Anecdotal evidence suggests that men tend to focus on maize production and other cash crops and are not as inclined as women to produce other crops, particularly legumes (Mofya-Mukuka & Hichaambwa, 2016).

Other important socio-economic drivers of diversification are asset endowments of smallholder farming households; membership of co-operatives, farmers, women's or saving and loan groups; and access to extension services (Asfaw, et al., 2019; Mofya-Mukuka & Hichaambwa, 2016). The impact on crop diversification of group membership and access to extension services is illustrated by the Realigning Agriculture to Improve Nutrition (RAIN) project (Box 4).

Box 4. Realigning Agriculture to Improve Nutrition (RAIN) project

The RAIN project (2012-2015) was implemented by Concern Worldwide in Mumbwa, Zambia. It has established 181 women's groups involving a total of 4,437 women. The project offered the groups agricultural extension services and agricultural inputs combined with nutrition behavioural change communication and a gender component. The overall aim was to reduce the prevalence of malnutrition. The project included a rigorous randomised design to evaluate its impact. It found it had a large and consistently positive impact on agricultural diversity, increasing the total number of crops produced on average by 1.5. It improved various domains of women's social and economic empowerment, as well as household food security as measured by household dietary diversity. It also had a potential protective effect on child wasting (Harris, et al., 2016).

5. PERSPECTIVES ON DIVERSIFICATION

5.1 Methodology

This section describes the results of cross-sectional research – the ‘Beyond Maize’ study conducted as part of the SD4All project through a collaborative effort by IAPRI, CSPR and CUTS and facilitated by Hivos. Its aim was to explore agricultural diversification from multiple perspectives including those of farmers, market actors and extension workers. The study employed both quantitative and qualitative methods, including household questionnaires (n=320), focus group discussions with farmers (n=3), and in-depth interviews with farmers (n=40; 40% of them women), market actors (n=48) and extension workers (n=7) in Monze and Chongwe in Southern and Lusaka Province respectively. The study used the Simpson Index of Diversification (SID) as a measure of crop diversification based on the count of crop types cultivated as well as the share of land allocated to each crop. The SID ranges from 0 to 1 – the higher the value the greater the level of diversification.

5.2 Farmers’ perspectives

5.2.1 Cropping choices

The average level of crop diversification among farm households was calculated at 0.51, with minor differences between Chongwe (0.49) and Monze (0.53). This level of crop diversification was slightly higher than the national average of 0.47 (CSO, et al., 2016). Multivariate analysis showed the amount of land cultivated is a key driver of crop diversification: a 1% increase in area cultivated increased the SID by 1.2%. However, this study did not find any other significant determinants of crop diversification, largely because the methodology may not have been adequate to detect them. However, the qualitative data provided rich insights into the constraints faced by farming households to diversify their crop production, as outlined below.

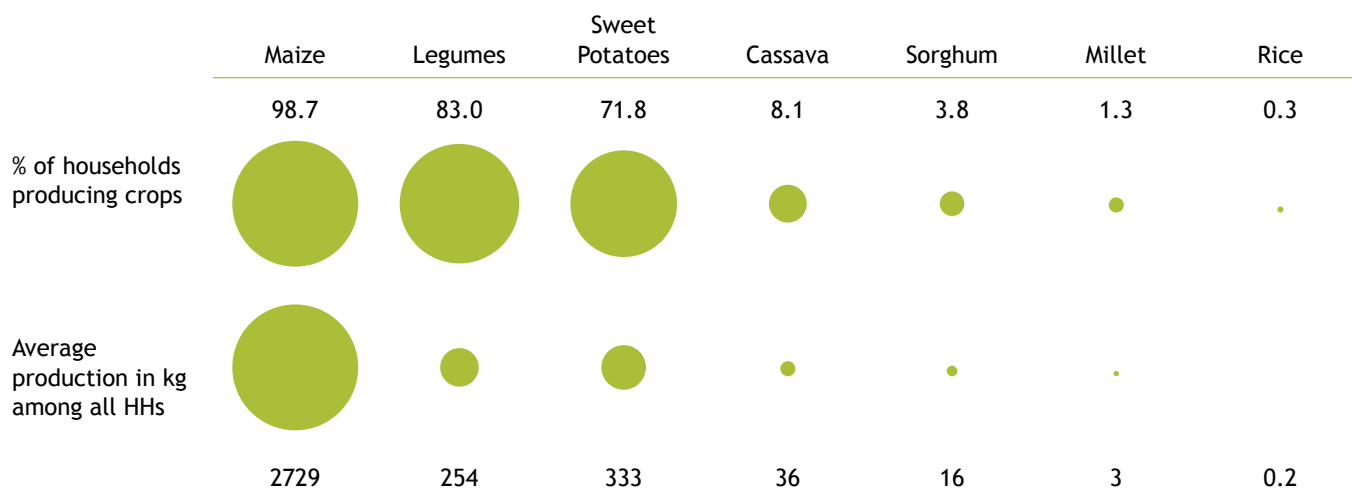
As expected, the study found that maize is the dominant staple crop in terms of the percentage of farming households cultivating it (98.7%) as well as the area under cultivation. Other cereals such as sorghum, millet and cassava played a negligible role. Groundnuts (73.4% of households), sweet potatoes (69.4%) and cowpeas (40.3%) were also widely cultivated by farming households.

“We know that every year we have to plant maize because we know that if we do not plant, we will end up buying from other neighbours”
(Male respondent, Chongwe)

The average number of crops cultivated per farming household for both sale and consumption was 3.8, with 45.1% of farmers cultivating three crops or fewer. This appeared to be higher than the national RALS data, which showed that the average number of crops grown was 2.6 (CSO, et al., 2016). Intercropping of maize with legumes was high, with 83.9% of farmers cultivating at least one type of legume (groundnuts, mixed beans, cowpeas, soybeans or Bambara nuts). The few farming households cultivating cereals other than maize, combined with the low production (Figure 3), suggests that these crops would not be widely available for consumption unless they are brought in from outside the study area through markets.

Farming households indicated that they aspire to diversify their crop production for various reasons including generating income, improving soil fertility, fighting pests, diversifying consumption, providing feed for livestock and being able to grow drought-resistant foods. Their main constraints are the low availability of diverse seed,

Figure 3. Share of crops grown and average production levels in study households



Note: legumes are a combined category for groundnuts, mixed beans, Bambara nuts, cowpeas and velvet beans

lack of financial capital, inadequate manpower, lack of irrigation, susceptibility to pests and diseases, lack of knowledge, lack of land and inadequate access to markets. More than 10% of the households studied had borrowed or rented land. Accessing land was more challenging for women and youth, who identified this as a major barrier to diversifying agriculture.

“As farmers we do not have much funds that would allow diversifying, hence we opt to grow a few crops that our resources can allow”
(Female respondent, Monze)

“Without market I would not grow. I can only grow a little for consumption”
(Female respondent, Chongwe)

5.2.2 Agricultural inputs

Accessing the agricultural inputs required for a diverse range of crops was identified as a major challenge in diversifying agriculture. Farming households depend on what is available at the local agro dealer as transport to urban centres is difficult, especially for women and youth. In Zambia, the average distance to an agro dealer for a farming household is 32.5 km (MAL, et al., 2016).

The research also looked into varietal diversity within the same crop species, as one element of agricultural diversification. It found large differences between crops

in the percentage of households cultivating more than one variety, ranging from 5% for cotton to 46% for maize. The use of hybrid and improved seed varieties was relatively high for cash crops including maize (81%), cotton (86%) and soya beans (64%), whilst local varieties were mainly used for food crops such as mixed beans (83%), cowpeas (80%), white sweet potatoes (93%), orange sweet potatoes (78%) and cassava (88%).

This study shows that farming households make use of both the formal and informal system for seed management: the main seed sources are seed companies, seeds from other households or their own harvest. Maize seed is mainly procured from seed companies (60%), whilst the percentage of households receiving seeds through the E-voucher or FISP is low, with only 11% of maize being sourced through the Ministry of Agriculture. Most seeds for sunflower, groundnuts, Bambara nuts, cowpeas, cassava, and sweet potatoes are received from other farmers or from households' own harvest, highlighting the importance of the farmer seed systems. Outgrower or input credit schemes were mainly used for cotton and soya beans.

“The nearby agro dealer only sells chemicals, fertiliser and seed for maize and soya beans. We need to go to Chongwe town (for other inputs), but transport is difficult”
(Female respondent, Chongwe)



Bambara nuts (Salim Dawood)

5.2.3 Marketing channels

Market access or the ability to generate income from a crop was an important determining factor for farming households in their cropping choices. Although the study area was relatively close to larger markets, there were still challenges in accessing markets for various crops, with maize markets closer than markets for other crops. The average distance in Zambia to a marketplace with many buyers and sellers of agricultural products is 25.5 km (MAL, et al., 2016).

As discussed in Section 4.1, studies based on RALS data have shown a negative impact on crop diversification of proximity to an FRA (FAO, 2018). The 'Beyond Maize' study could not confirm this due to the small role played by the FRA in marketing maize among the study population (fewer than 8% of study participants reported having sold maize to FRA). The main outlets for most crops were traders and other households. Outgrower schemes were mainly used for cotton and soybeans. The role of co-operatives in marketing crops is negligible in the study area.

Transport to markets is a big challenge. The high taxes and levies at markets and during transport add to these problems. The levies do not vary according to the quantity of produce, thereby discouraging the sale of small quantities. The lack of storage facilities at the market is another barrier to growing diverse foods, as it means farmers must sell their produce in one day and may receive lower prices than those who can store their produce.

There is also a gendered aspect to market participation; the study shows that women face more challenges than men in accessing markets. Some of these challenges include lack of transport (men can easily use alternative means of transport such as bicycles) and the lack of time to travel to markets due to household chores and childcare activities. The findings of this study support previous research showing

that men are more in charge of cash crop production (maize, cotton etc.), while women take responsibility for crops like groundnuts and beans. This division restricts women from growing more crops to diversify their income.

“The distance requires us paying a lot of money just to take our produce to Chongwe which in the end results in less profit because they also overcharge us.”
(Male respondent, Chongwe)

“We face a lot of challenges finding the market to sell our crops, at times you can have a buyer near your village, but the price offered is too low such that we end up making losses. In some instances, you may hear of a place where they are buying them at a good price, but the distance becomes a problem for you to transport them”
(Female respondent, Chongwe)

5.2.4 Gender and cropping decision making

The gender of the primary decision maker has implications for the type of crops produced and ultimately on the degree of crop diversification. The study showed that in households with a male household head and a female spouse, the production of crops that are considered cash crops – such as maize, sunflower, cotton and soybeans – is controlled by men. Women control the production of mostly food crops, such as groundnuts, mixed beans and Bambara nuts. Women indicated that they are the main providers of the ingredients of relish – the accompanying nutritious dish for *nshima*

(the maize-based staple dish) – hence their stronger focus on food crops. Previous studies have also shown a similar pattern in the gender of primary decision makers in crop production (Mofya-Mukuka & Sambo, 2018).

5.2.5 Vegetable and fruit diversification

The production of vegetables for both sale and household consumption varies widely between households and between districts. Most farmers participating in the survey had cultivated between one and four different types of vegetables in the previous 12 months (42%). Vegetables such as tomatoes, rape, Chinese cabbage, okra, onion and eggplant were more likely to be cultivated using irrigation than rainfed cultivation. Conversely, green leafy vegetables (including sweet potato leaves, pumpkin leaves, amaranthus and bean leaves) were more likely to be grown during the rainy season. This suggests that the presence of irrigation is important for diversifying the range of vegetables produced and to ensure access to micronutrient-rich vegetables throughout the year. A major barrier to vegetable cultivation was the lack of water and/or irrigation. Another barrier was the inadequate absorption capacity and fluctuating prices of the local markets. Slightly less than half of the farming households were selling vegetables, with the main takers being other households (53%) and marketers/retailers (35%).

“Lack of local market for vegetables; this is hard unless if you take to town. People in this area do not buy vegetables with cash but in exchange with something else”.
(Female respondent, Monze)

The availability of fruit trees in households is higher in Chongwe, where 80% of the households grow some fruit trees, compared to 40% in Monze. In Monze, few farmers grow more than three types of fruit (13.1%), whilst in Chongwe 56.9% of farming households cultivate three or more types of fruit. This study did not take into account the quantity of fruit produced. As fruit is a seasonal product, in order to have access to fruit throughout the year there is need for greater diversity in what is grown. There is a strong

interest in cultivating fruit, both for consumption as well as for the market. The main reasons for aspiring to grow fruit are the health benefits and the income-generating potential. However, there are many barriers to the cultivation of fruit trees, including cattle eating the young saplings, termite attacks, lack of water, inadequate knowledge of fruit tree propagation and management and the limited availability of fruit tree saplings. Only a few respondents are familiar with the propagation techniques for creating fruit tree saplings. There are a number of places where saplings can be bought, including Kasisi, City Market, Arcades market and in Chongwe town, but most places are far away, reducing the accessibility of fruit tree saplings. One respondent in Monze said, *“I don’t have an idea where to buy saplings, most of them just grow on their own”*. This illustrates that fruit cultivation is not a common practice. Instead, people rely mainly on harvesting wild fruit or fruit from existing trees.

“I have not been able to plant these fruit trees because I do not have seedlings or know where to find the seeds. There is no place here where they sell seedlings”
(Female respondent, Monze)

There was a general feeling that the market for selling fruit is adequate, either among local households, or at local markets and along roads. Bananas, oranges, lemons and avocados were considered to have the best market.

“Once you grow them [fruits] even the market will instantly be available. This is because sometimes you might think as if they don’t have market but it’s just that people don’t cultivate them here”

“All the fruits are on demand and people can readily buy them. I would plant these fruits even without taking to Monze because I know people will be coming home to buy them”
(Male respondent, Monze)

5.2.6 Livestock diversification

The combined potential impact of meeting nutritional needs and providing income makes livestock an interesting resource for smallholder farmers. A study of pastoralists in Ethiopia found that diversification of livestock species was associated with shorter periods of food deficit, improved dietary diversity and lower household food insecurity (Megersa, et al., 2014).

While there is little empirical evidence on the extent to which livestock species diversification can improve household food security or make households more resilient to climate shocks, increasing the type of livestock within a household is thought to be an important climate adaptation measure (Waha, et al., 2018). In Zambia, rainfall stress is increasing the incentives to diversify into and within livestock activities (Arslan, et al., 2018).

Rearing livestock is common in the study area, with more than 90% of households indicating owning livestock, with an average of three livestock types. The most commonly owned livestock are chickens (88%), goats (58%) and cattle (50%). The role of aquaculture was negligible in the study area. The major reasons for keeping livestock are consumption and income, whilst cattle are also used for draft power. There is interest in rearing more diverse types of livestock, but major constraints identified included the lack of capital to buy and manage livestock, inadequate grazing land, pests and diseases, long distances to veterinary services and the unavailability of various types of livestock.

The RALS study showed that participation in the livestock market was low, especially in areas where a greater proportion of households own livestock (MAL, et al., 2016).

“I only keep chickens because other kinds of livestock are not readily available here”.
(Respondent, Monze)

5.2.7 Household dietary diversification

Household food access is defined as the ability to acquire sufficient quality and quantity of food to meet all household members' nutritional requirements for productive lives (FANTA, 2010). Using the Household Dietary Diversity Score (HDDS; see Section 3.7), the study found that on average households in Chongwe consume six out of a total of 12 food groups, and 5.6 in Monze. The most common food groups consumed by households were cereals (96% of households), vegetables (88%), spices (85%) and oil (84%). The animal-based foods consumed by the households were meat (31%), eggs (29%), fish (24%) and milk (44%), while fruit was consumed by only 28% of households. There are differences in household food access between Chongwe and Monze, with households in Chongwe having greater access to fruit, fish, oil and sweets, while those in Monze have greater access to milk and milk products.

5.3 Market actors' perspectives

The input and output marketing system plays an important role in the agricultural system.

5.3.1 Input market

Agro dealers play an important role in supplying farmers with fertiliser, seeds, chemicals and machinery. The interviews with market actors showed that agro dealers are driven by profit and that their choice of which inputs to promote mainly depends on farmer demand and the price of inputs. Some agro dealers indicated that they sold seed on a consignment basis, in which the agro dealer sells on behalf of the input supplier and is given a commission on each item sold. Agro dealers interviewed as part of the study were ready to support crop diversification by providing a variety of seeds, coupled with the necessary information. However, their stock is driven by demand from farmers and supply from input suppliers. Therefore, increasing diversification will require strong interaction among input suppliers, agro dealers and farmers.

5.3.2 Output market

There are different types of product markets, with the informal market playing a decisive role in marketing the agricultural produce of Zambia's smallholder households (CSO & MLSS, 2018). Co-operatives play a negligible role. Our research shows that informal traders tend to prioritise crops with a higher market value and a long shelf life. They depend on the availability of crops in the area. These traders are risk averse, preferring to trade in crops with a known profitability, which may reduce the incentive to trade in a wider range of crops. Smallholder households are the primary suppliers for informal traders, who bring their produce to the market. The price for the produce is set by both traders and farmers, with prices also depending on the quality of produce and its packaging.

The traders interviewed as part of the study were of the view that increased diversification would drive demand and thus increase the profitability of informal trade. Traders indicated that to achieve this, farmers need support to diversify their production and move away from maize. They indicated an important role for both government and the private sector to enhance farming technology, access to irrigation, farmer information sharing, credit, availability of diverse farming inputs and the involvement of youth in agri-business.

A major constraint to market participation by smallholder farmers is market accessibility, in terms of distance and options for transport. Traders, having more bargaining power, take advantage of this, but also buy based on the availability of markets for the different produce. Traders indicated that for agricultural markets to be successful, the market should be in a central and favourable location.

5.4 Extension officers' perspectives

Agricultural extension services play a crucial role in the agricultural sector as intermediaries between policy and research, and farmers. Such support to farming households stimulates agricultural productivity, increases food security and improves rural livelihoods. In Zambia, the provision of extension services is a driver of diversification (Mofya-Mukuka & Hichaambwa, 2016).

In-depth interviews with extension officers showed that their main activities include providing training, as well as individual farm visits and support in the formation of co-operatives. Although crop diversification is addressed through their activities, few extension officers indicated it to be a specific topic of extension services. The main focus of extension services is on the production of maize and legumes, with no mention of other cereals or roots such as millet, sorghum and cassava, or fruit and vegetables. The crops selected for promotion are mainly those which are staple or cash crops, those which maintain soil fertility and those which can break the chain of pests and diseases.

Extension officers' main approach to implementing government crop diversification policies is through training and advice and providing women's groups with processing equipment for different crops. Although extension officers were well aware of the benefits of diversification for food and nutrition security, few mentioned its importance for creating resilience, increasing soil fertility or reducing pest outbreaks. Only a few extension officers reported having received training on diversification. Some mentioned a lack of adequate training materials.

The main challenges experienced by agricultural extension officers were the lack of transport to reach out to farmers, lack of availability of training materials and the high farmer–extension ratio. Also, changing the mindset of farmers to adapt their agricultural production was identified as a major challenge. Special attention is given to women farmers by almost all extension workers by giving them priority in training, especially on food processing, and encouraging women to form their own co-operatives. The extension officers indicated that there was a low level of co-ordination at sub-district level among different ministries.

6. CONCLUSION AND RECOMMENDATIONS

Increasing agricultural diversification is vital for improving food security, nutrition and diets and also has important socio-economic and climate-resilience benefits. The Zambian policy framework has a strong focus on diversifying the agricultural sector, but this has not translated into significant diversification on the farm or on the plate. Therefore, this study examined the obstacles holding back the various actors in the food system from driving diversification. The analysis showed that smallholder households believe that diversification can increase income and resilience and support healthy diets, but the realities are that poor access to land, a diverse range of agricultural inputs (including fruit tree saplings), finance and the accessibility and absorption capacity of markets among others are limiting their capacity to diversify their production. This is further exacerbated by the vicious circle characterising the interaction among producers, markets and consumers, with markets being influenced by demand and availability of produce, while demand is influenced by the price, affordability and accessibility of agricultural produce.

The approach to agricultural diversification should be holistic and based on the priorities and requirements of farming households. In order to successfully support agricultural diversification, a coherent and co-ordinated policy framework and market environment for entrepreneurial and sustainable small-scale agriculture should be put in place. With women making up more than half of the agricultural labour force in Zambia, and given their important role in enhancing food and nutrition security, there is need for deliberate actions for women that increase their access to a wider range of agricultural inputs and other support. As diversification can be implemented in a variety of forms and at a variety of scales, allowing farmers to choose a strategy that best fits their situation is key. The success of Zambia's diversification agenda relies on the collective efforts of key players, requiring a range of co-ordinated policy changes. This section provides a number of policy recommendations that could enhance sustainable diets through agriculture diversification.

1. Convene a high-level policy dialogue involving smallholders, consumers, market actors and civil society to drive a sea change in Zambia's agricultural and dietary diversity

Achieving agricultural diversification requires a mindset change throughout the food system to catalyse the ultimate change in diets. Influencing policies and practices of public and private actors effectively requires mobilising and supporting citizen groups to jointly drive evidence-based policy change towards crop diversification in line with local needs and local realities. By lobbying and advocating from the grassroots up and building multi-stakeholder dialogue on transforming food systems, a systematic change to the food system addressing local, national and global challenges can be achieved. This should result in the development of a coherent, standalone national strategy to promote a sustainable food system that ensures culturally acceptable and nutritionally adequate diets for all.

2. Support market actors (both input and output) to pull farmers towards more diverse agricultural production

The private sector – ranging from farmers to large enterprises – is a key actor in agricultural diversification. Government and private sector actors need to work together to reshape the food systems with the goal of attaining healthy diets and improved nutritional outcomes (GPAFS, 2016). The adoption of more diverse cropping systems depends on functional and competitive input and output markets (FAO, 2018). The private sector is crucial for creating markets for farmers producing a surplus, as the ability to sell is the main incentive for farmers to grow nutritious foods. Markets can create significant incentives for diverse agricultural production. There is a need to invest in access to markets (both formal and informal), market information and market infrastructure for wholesale and retail markets in order to improve rural smallholders' access to markets. Simultaneously, there is a need for a production “push” by facilitating access to inputs for diverse and nutritious crops (including small seed packs for diverse vegetables, legumes, small

livestock and fruit saplings) and increasing access to finance and extension services.

3. Increase investments for more diverse agricultural production

There is a need for the funding allocation across the agricultural sector to be guided by achieving a “high-quality diet” to rebalance inputs, extension services, market development and processing away from maize and towards a range of crops. Improving diversification will require greater investment in the promotion of alternative staple foods, fruit and vegetables, and legumes. Although the E-voucher system can unlock the potential for diversification, it will require a change of mindset by farmers, input suppliers, traders, marketeers and consumers in order to effectively diversify agriculture and diets. There is also need to fully transition to the E-voucher system.

4. Stimulate demand for healthy and nutritious diets from the bottom up by supporting people-driven change initiatives

Food cultures – values, beliefs and social norms around food – play an important role in shaping what people eat and what they demand from the food system (GPAFS, 2016). There is a need to break the vicious circle between low supply of and demand for nutritious foods by stimulating production whilst also empowering consumers to make healthy and sustainable choices. This can be achieved through government-supported measures including for example public procurement programmes or health messaging, combined with actively supporting people-driven initiatives for change, such as home-grown school meals programmes and consumer awareness groups. This will require intensification of nutritional awareness advocacy, training and education programmes to maximise consumption of nutritious foods from both own production and market purchases (Heumesser & Kray, 2019).

5. Increase investments in agricultural research and development that support agricultural diversification

Research and development are important in fostering innovation, diversity and production in agriculture and in transforming towards a sustainable food system. Increased investment for research on a diverse range of crops, including fruit and vegetables, is needed to foster diversification and ultimately improve nutritional diversity. Investments in agricultural research should reflect a priority focus on supporting sustainable diets. Globally, the private sector still allocates about 45% of its research investment to maize, whilst research funding for pulse crop productivity is estimated to be far less than maize and comes mostly from the public sector (GPAFS, 2016). There is a need for increased research on crops, vegetables and fruit varieties suited to Zambia’s agronomic conditions. The gap between research and extension services needs to be closed to ensure that knowledge and improved inputs reach smallholder households.

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