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Policy shifts on sustainable agricultural productivity and efficiency: Strengths and gaps to improve food security in Zimbabwe

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Abstract

Food insecurity is one of the major challenges threatening humanity in sub Saharan Africa. Therefore, attaining food security year after year should be the focus for policy makers. This review study considers the status of Zimbabwe's agricultural policies on sustainable agriculture production and efficiency emphasising on strengths and gaps. Most policy shifts by the Zimbabwean government had negative effects on agriculture productivity. Only one drafted and adopted in 1995 to alleviate the disastrous Economic Structural Adjustment Program proved to have a marked positive effect on agriculture. Currently, agriculture in Zimbabwe is guided by the comprehensive 2018 - 2030 policy framework draft which has a holistic approach towards agriculture value-chains. Its objective is to support and promote sustainable flow of investments to transform the agricultural sector through increased and sustained agricultural production, productivity and competitiveness by providing policy guidance and direction. However, the policy is lacking on essential issues such as improvements on existing inorganic and organic fertilizer formulations that drive efficiency and sustainability of agriculture. There is need to formulate policies that are implemented and supported by the government and various stakeholders such as industry and commerce so as to improve agricultural productivity, profitability and sustainability.

Keywords**:** *Agriculture; efficiency; food security; productivity; sustainability.*

1. Introduction

Food insecurity is one of the major challenges threatening humanity in sub Saharan Africa (SSA) (Muzhinji and Ntuli, 2021). Therefore, undoubtedly attaining food security should be the focus for policy makers in SSA. Population growth, unfavourable weather conditions, shifting climates, pests and diseases immensely contribute to food insecurity in SAA (Vanlauwe et al., 2015). Moreover, land degradation due accelerated soil erosion, cereal mono-cropping and sub-optimal nutrient application is significantly contributing to food insecurity in SSA (Kihara et al., 2020). In Zimbabwe, the problem of land degradation is more pronounced in the smallholder sector, where farmers are resource constrained and apply sub-optimal organic and inorganic soil fertility amendments (Soropa et al., 2018). The situation in Zimbabwe is further exacerbated by outbreaks of alien invasive insect pests in several agriculture value-chains. The pest species include: Larger grain borer – pest of stored grains; Oriental Fruit fly – pest of fresh fruits (citrus and mango), Fall armyworm – pest of cereals mainly maize; and Tomato leaf miner – pest of solanaceous mainly Tomato. Therefore, regardless of

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potential agricultural seasons in Zimbabwe several communities are vulnerable such that, a sizable proportion of households are unable to meet their food, livelihood and nutritional requirements (Kuku et al. 2011).

The problem of food insecurity in the smallholder sector will exacerbate in the next coming decades unless sustainable crop productivity practices are adopted or more food is imported (Leitner et al., 2020). Sustainable crop productivity is only feasible if there is a sound supporting agricultural policy at national level. However, the major hindrance to success of agriculture in Zimbabwe is lack of an agricultural policy and in part relevant legislation to ensure enforcement of certain neglected but critical aspects. There is need to develop and implement a proper agricultural policy to guide towards successful revamping of the agricultural sector. Mudzonga and Chigwada (2009) highlighted the need to put in place enabling policies in agriculture that will help mobilize both domestic and foreign investment to boost food grain production. Prior to the historic Fast Track Land Reform program (FTLRP) the country has been operating using the Zimbabwe Agriculture Policy Framework (1995-2020). This policy was drafted and adopted up to year 2000. Then the fast track land reforms took place – side-lining the policy. The frame work was adopted in an effort to resuscitate the economy of Zimbabwe which had heavily suffered under the Economic Structural Adjustment Programme (ESAP) of 1991. The ESAP failed to sail through as it was marked with serious meltdowns in several sections of Zimbabwe's economy, including agriculture where agriculture contribution to GDP and value-added per worker decreased as shown in Figure 1 (Kawewe and Robert, 2000).

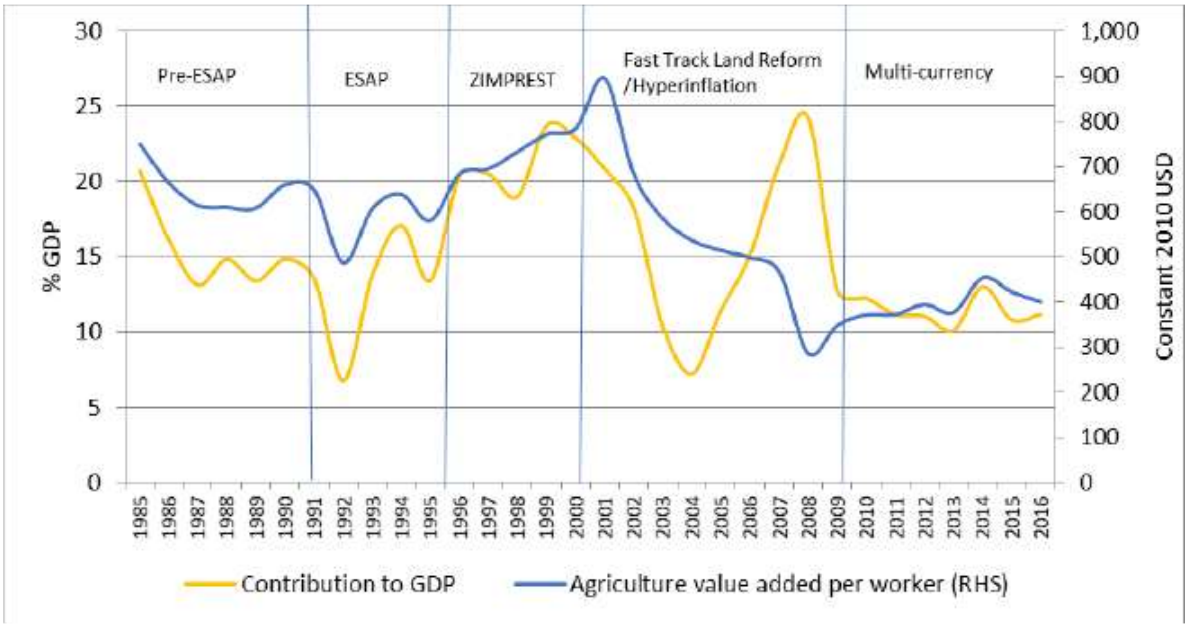

Figure 1: Agriculture contribution to the gross domestic product (GDP) and value – added per worker from 1985 -2016 (Source: ZIMSTAT, 2016)

In 2012, development of a draft "Comprehensive Agricultural Policy Framework" which sought to address issues on crop and livestock production, marketing and trade was completed but never adopted as the policy guiding the agricultural sector. Currently, the government of Zimbabwe have a draft National Agriculture Policy Framework (NAPF) (2018-2030) which seeks to come up with policy options better suited to different farm categories as well as guide investments and sub-sector strategies to sustainably transform the agricultural sector (Ministry of Lands, Agriculture and Rural Resettlement, 2018). However, having a policy framework alone does not mean transformation unless there is a huge injection of funds from the national budget and measures to monitor the uses of the funds. This is essential as investment and production in the agricultural sector has been on a decline and a proper policy framework will go a long way in curtailing these declines. It is important to note that policies put in place should also factor in agricultural research findings to ensure continuity of

implementation and sustainability. Hence the study will enhance understanding of Zimbabwe's agricultural policy shifts, strengths, and gaps with a special emphasis on agricultural research findings to ensure continuity of implementation and sustainability.

2. Policies to support agriculture production and efficiency

2.1 The agricultural inputs and subsidy policies

In order to stimulate agricultural production, the government of Zimbabwe has come up with several plans and programmes. These include farmers getting subsidized seed, fertilizer and equipment (Mudzonga and Chigwada 2009). Following successive droughts in the 1990s, the Government of Zimbabwe implemented an Agricultural Recovery Programme to help smallholder farmers recover. However, according to Munro (2003) the programme had no clear impact on grain yields. In 2007, the agricultural mechanization programmes supported by the reserve bank of Zimbabwe where by farmers got farming equipment was launched. Overall, it was a noble initiative to mechanise the agriculture sector but the food security reward (outcome) was not achieved as no proper measures were taken to monitor equipment utilisation and repayment mechanisms

A scheme called operation Maguta targeted at increasing production of maize and wheat was launched in November 2005 whereby farmers got inputs such as fertilizers, seeds and herbicides. These schemes where not sustainable and had no significant impact on improving crop production as yields remained low and the country continued importing maize and wheat. Maguta was spear-headed by military personnel, who sourced information from various institutions within the Department of Research and Specialist Services (DR&SS) and Department of Agricultural Technical and Extension Services (AGRITEX). However, the Maguta program was supposed be run by agricultural experts, which is indicative of a poorly developed policy.

During the 2016-17 growing season, the Government of Zimbabwe released a farming input subsidies program called Command Agriculture. With production growth in mind, instead of smallholder farmers, Command Agriculture targeted 2,000 farmers in higher potential areas, who had 200 hectares or more, and irrigation facilities (Scoones 2017). The Command Agriculture program shows potential however, effort is required to remove various biases and contradictions associated with it. During the 2020/2021 cropping season, the government of Zimbabwe launched the 'Pfubvudza concept' whereby farmers are given inputs in the form of seed and fertilizers after having prepared planting basins on their land. The Pfubvunza concept aims to improve yields at household level and ensure food security. The main difference of this program or policy was the inclusion of bankers, which were offering it as a loan while the farmers were to align to the program's requirements (i.e. basins and mulch issues). However, sustainability of this concept is questionable as planting pits where previously promoted with very poor adoption due to high labour requirements.

Unfortunately, most of these programmes launched by the Government of Zimbabwe have not been successful because they lack supporting policies and implementation strategies for sustainability. Moreover, the major challenges brought by these policy shifts include increased livelihood, food, and nutrition insecurity in many vulnerable communities of Zimbabwe. There is therefore need to promote sustainable use of land and ensure that technology is transferred to benefit all farmers even smallholder farmers that face challenges associated with crop productivity. This is possible through crafting, promotion and adoption of policies that are missing in Zimbabwe and most SSA countries on soil fertility management, climate change adoption, soil and water conservation and sustainable agro-marketing and integrated pest management for reduction in land degradation and maximizing crop productivity and profitability (Kudejira, 2014).

2.2 Agricultural marketing policies

At independence in Zimbabwean, there has been strong emphasis on maintaining agricultural production through offering of good producer prices especially to the about 4500 minority white commercial farmers owning most of the productive land (Moyo and Chambati, 2013). According to Bratton (Rukuni et al., 2006), the government set up good producer prices which also covered smallholder communal farmers and this resulted in an increase in production with only continent-wide droughts having a negative impact. It is very clear that between 1980 and 2000 most of the agricultural marketing policies adopted had appositive effect on sustainable agriculture. Around 1999/2000 the government of Zimbabwe then embarked on the Fast track land resettlement programme (FTLRP) which resulted in a shift of land ownership dynamics with most commercial farmers having their land repossessed for redistribution. There is no doubt that though the land reform was necessary in correcting the colonial injustices but it had a huge negative impact on crop production. The crop which benefited the most from land reform is tobacco which has seen more smallholder farmers growing as it is paid immediately upon delivery compared to grain producers whose reimbursements take time and have set producer prices by the government (Lown et al., 2016). Setting up of producer prices which are often announced well into the cropping season have affected crop production since it is not attractive to produce certain crops whose selling prices are controlled. According to the World Bank (1981), agricultural production had been declining in Africa due to controlled pricing of produce by officials as they seek to keep the cost of food cheap. According to Mudzonga and Chigwada (2009), lack of alternative marketing channels and the presence of price controls result in farmers producing just enough to suit their subsistence needs. This problem of low producer price has been persistent in Zimbabwe especially after the year 2000 with poor pricing leading to decrease in production of some crops with cotton being the most affected. There is no doubt that the Government of Zimbabwe need to abandon this policy of setting/fixing up producer price and allow market forces of supply and demand to determine prices in order to promote crop production.

The Government of Zimbabwe pledged to improve efficiency of the agricultural market system in their comprehensive policy draft framework of 2018 -2030 (Ministry of Lands, Agriculture and Rural Resettlement, 2018). The objective of the draft policy framework on agriculture marketing is to develop a competitive and efficient agricultural marketing system through: (i) Promoting investment in research and market development; (ii) Promoting provision of market support services to market participants; (iii) Enhancing access to financing by private sector for agricultural marketing; (iv) Regulating marketing of agricultural products and provide for maintenance of quality standards through appropriate legislation; and (v) Promoting establishment of commodity committees to enhance dialogue between public and private sectors. In the 2018 -2030 framework, Zimbabwean government maintained the liberalised marketing environment of all agricultural commodities and inputs, provided targeted support for staple food production and marketing, and maintained floor pricing system for strategic food security crops (maize and wheat). However, this framework is only at the draft stage, and efforts should be put for it to be implemented as a functional policy that will massively support agricultural production efficiency and productivity.

2.3 Use and control of hazardous agro-chemical policies

The management of pests surprisingly is missing in all policy frame works although it is an important pillar of agriculture production and efficiency. Zimbabwe needs to quickly develop its own national policy on management of pests and disease probably, informed by best practices and the FAO/WHO guidelines on highly hazardous pesticides (HHPs). This will help reduce pesticide risks and promote sustainable agricultural production approaches. Most farmers in Zimbabwe overuse mostly chemical pesticides in an indiscriminate manner especially organophosphates (Malathion), benzoylureas (diflubenzuron), and diamides (chlorantraniliprole) in efforts to manage insect pests (Zimba and Zimudzi, 2016). Another factor contributing to indiscriminate and overuse of chemical pesticides in Zimbabwe is lack policing and monitoring agrochemicals registered for use. Hence, the need for an immediate policy on management of pests in Zimbabwe's agricultural value-chains. The policy should be also guided by cutting edge industrial and research efforts to develop and test agro-

chemicals for pest management to ensure issues, such as toxicity, shelf life, and efficacy are adequately addressed.

3. Recommendations for improved agriculture production and efficiency

3.1 The soil fertility challenge in Zimbabwe

Soils in Zimbabwe like in most SSA areas are derived from many parent materials. The predominant parent materials are mafic, which give rise to high clay content soils and sandy soils from granite. Most people are located on granitic acidic sand soils that cover more than 66% of the soils in Zimbabwe (Zingore et al., 2007). These soils tend have high low water holding capacity and of nutrient deficiencies, with N and P being the most limiting. Similarly, throughout SSA, negative nutrient balances in terms of N and P have been found in most smallholder farming systems (Roy et al., 2003). The potential to produce on these soils is hampered by limited soil moisture and/or nutrient deficiencies in dry and wet years respectively. This has resulted in smallholder farmers infrequently exceeding 1.5 t ha^{-1} of maize yield in most areas across the agro-ecological zones compared to 7-8 t ha^{-1} achieved by resource-rich commercial farmers (Chipomho et al., 2020).

3.2 Chemical fertilizer formulations and recommendations in Zimbabwe

Use of inorganic fertilizers undoubtedly increases crop production and productivity, profitability and sustainability in SSA. The Government of Zimbabwe emphasis that all compound fertilizers used for basal applications should contain the NPKS nutrient combination, although in different proportions depending on crop type (Table 1). Thus, the common basal fertilisers types used in Zimbabwe are mainly compounds or blends rich in NPKS and a few straight others with a single nutrient. Some NPKS fertilisers may contain a micronutrient depending on the target crop and/or soil type (Table 1). Low N with high ratios of P and K fertilisers are formulated for tobacco (FAO, 2006). NPKS formulations containing B are for tobacco, cotton and some horticultural crops (e.g. onions). Crops such as cotton, potato, coffee and fruit trees requires fertilizers high in K. Fertilisers containing Zn are formulated for cereal crops in acidic sandy soils that are prone to Zn leaching. However, the use of formulations containing Zn by smallholder farmers, the majority of whom are located on sandy soil, is limited due to their relative higher cost and general unavailability (Manzeke et al., 2014).

Therefore, there is need for a policy change in terms of basal fertilizer formulation. A policy should be informed by research which can be implemented as standard instrument to send signal that the government is placing agriculture production at the centre of economy restoration. For example, learning from the facts that most Zimbabwean soils are deficient in available P that limits crop establishment and final yield, there is need to increase the level of P in the basal fertilizers. Studies in the SSA have shown evidence that secondary and micronutrients constrain production (Manzeke et al., 2014). Likewise, the new fertilizer policy should add micronutrients in all basal fertilizers, to carters for nutritional security particularly in children. Without food there is no industrial growth given the nature of our industry. The talk of industrialization will remain a talk without such drastic measure in agriculture development. Crop response to nutrient application is affected by the nutrient availability in the soil which current fertilizer formulations do not specifically address.

Table 1: Fertilizer formulations and their nutrient status in Zimbabwe

Fertiliser	Nutrient range (%)	Recommended crops

formulations							
	N	P_2O_5	K_2O	S	B	Zn	
NPKS	5-25	5-21	5-22	3.5-6.5			Maize, tea
NPKS + B	2-15	5-21	7-24	3.4-10	0.1-0.25		Tobacco, cotton, soyabean, coffee, potatoes, fruit trees
NPKS + Zn	7-8.3	14-16.5	7	6.5-8.3		0.3-1	Maize in sandy soils
NPKS + B +Zn	6.3	20	17.3	5.8	0.09	0.3	Vegetables
N	13-46						All crops
P		19-46		5-12			All crops
K			48-60				All crops

Source: FAO (2006)

3.3 Organic-fertilizer formulations and recommendations in Zimbabwe

The use of chemical inorganic fertilizers in SSA including Zimbabwe is negatively impacted by high costs. Moreover, continuous application of inorganic fertilizer without lime application results in soil acidification. Therefore, other options such as sole application of organic sources or combining the inorganic fertilizers with locally available organic sources can be essential to improve soil fertility, carbon reserves and maize yields (Chikowo et al., 2014;). However, besides massive use of organic resources in cropping systems by smallholder farmers, there are limited policies and programs available for sustainability. Soil organic matter plays an important role in long-term soil conservation and restoration. It improves soil health that is physico-chemical and biological properties thereby sustaining soil fertility and agricultural production.

Application of organic resources such as animal manure and plant residues is known to results in SOM build-up. In most smallholder soils, organic inputs are insufficient to maintain SOM levels as these marginal areas receive low-rainfall making it less likely to produce enough biomass to maintain SOM (Zingore et al., 2011). The effectiveness of manure is determined by nitrogen content and nutrients losses through leaching and volatilisation during manure handling and storage. This therefore necessitates the importance of research to be focused on ways that improve the traditional methods of soil fertility management. Overall, there has been wide research with scientific facts on organic resources utilisation in Zimbabwe but there has been no clear policy for their inclusion as fertilizer and fertilizer materials given that our soils are low in SOM. A policy should be crafted to allow the beneficiation of organic resources with minerals such as phosphate rock and vermiculite (Pisa, 2020).

3.4 Shifting towards semi-permanent and permanent soil and water conservation structures

Food production is mainly determined by soil quality and water availability. Unfortunately, soil degradation caused by soil erosion is common in many regions (Troeh et al., 1991), with an estimated 75 billion tons of soil lost annually (Pimentel et al., 1995). To counter these water induced soil loses and concurrently conserve soil moisture status, a number of soil and water conservation strategies have been developed and implemented in various regions. These soil and water conservation strategies have also been promoted in SSA to improve food security since soil quality and water availability are major factors limiting crop production. In-field rainwater harvesting techniques (IFWHT) have been promoted to conserve soil and water subsequently increasing crop production. Broadly, rainwater harvesting (RWH) is defined as the collection and concentration of runoff water for productive purposes such as crop, fodder, pasture or tree production, livestock and domestic water supply (Ngigi, 2003). Some of the techniques promoted in different parts of SSA includes stone bunds/lines, soil bunds, Fanya juu, bench terraces, vegetative barriers, trash lines, and ridges/tied-ridges (WOCAT, 2011).

Even though most of these soil and water conservation methods have been proved to be beneficial under certain climatic and soil conditions, adoption still remains low due to various reasons such as high labour demands and not locally suitable in some instances. These techniques should nevertheless still be promoted for adoption since they are sustainable and this calls for introduction of effective policies and practices to such effect. Enabling and supportive policies are the only way to ensure adoption of sustainable soil and water conservation strategies in SSA. There is need to promote policies that promote sustainable farming practices which help reduce land degradation and ensure maximum crop production and productivity. As such instead on promoting planting pits as rainwater harvesting techniques, focus should be put on semi-permanent to permanent water harvesting structures. There is need for more budget allocation for dam construction to allow irrigation development. As such, there is need for a national policy, which focuses on dam constructions and increase soil surveys for irrigation development.

3.5 Opportunities to build resilience to climate change and variability

Agriculture contributes significantly to the wellbeing of smallholder farmers in Zimbabwe, but it has become highly threatened by climate change and variability due to its reliance on the increasingly erratic rainfall patterns (Mujeyi et al., 2021), the increased frequency and severity of droughts and floods. In response to the climate changes that are already occurring and are focused to continue, researchers have developed sustainable technologies to build resilience in the smallholder farming sector. One of the technologies that offer opportunities to sustainably increase productivity and improve food security in the sector is climate-smart agriculture (CSA). Climate-smart agriculture is an approach that is anchored on three objectives: (i) to sustainably increase agricultural productivity and incomes; (ii) to adapt and build resilience to climate change; (iii) to reduce and/or remove greenhouse gases emissions, where possible (Campbell et al., 2014). Sustainable crop intensification is another concept that also seeks to achieve similar goals. Sustainable crop intensification refers to system or process of increasing yields without negatively impacting on the environmental and cultivation of more land. Zimbabwe, just like many other SSA, has been actively involved in promoting CSA technologies but this has mainly been through Non-Governmental Organisations (NGOs). Such promotions, if done consistently and supported by relevant policies will enhance the adoption of these technologies because currently, the adoption of CSA has so far been low. Many CSA technologies have some deficiencies that undermine their adoption by farmers. Conservation agriculture is known to yield better only when there is a negative deviation in rainfall that is drought but may actually cause yield loss under normal or above-normal conditions due to waterlogging.

4. Conclusions

Zimbabwe like most SSA countries is lacking on policies to support agriculture. Therefore, agricultural policies should be developed to improve the livelihoods of people through improvements in agricultural productivity and efficiency. During the development of the policies, stakeholders' inclusiveness is important for adoption, implementation and sustainability. This study has highlighted shortfalls and major initiatives to increase agricultural productivity in Zimbabwe. Most of the key policies that need to be developed are on: reformulation of basal fertilizers to suit soil fertility decline and variability, bio-fertilizer formulations and recommendations, semi-permanent and permanent soil and water conservation structures and climate smart agriculture.

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