



Fertiliser Application by Small-Scale Farmers in the Post-Colonial Tanzania: Lessons from the Fertiliser Subsidy Programmes

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Abstract: Tanzania has been subsidising fertilisers for farmers, but its accessibility to small-scale farmers has remained a challenge. This study assesses the fertiliser subsidy programs implemented in Tanzania since its independence. Precisely, the study analyses the driving forces for the identified fertiliser subsidy programs assess the programs' strengths and weaknesses and suggests the way forward based on lessons learnt. A desk review of journal articles, grey literature from conference papers and national documents on fertiliser subsidy programs in Tanzania was conducted. The fertiliser subsidy programs identified include the universal fertiliser subsidy program, the fertiliser transport subsidy, and the National Agricultural Input Voucher Scheme (NAIVS). The implementation of the fertiliser subsidy programs was informed by changes that occurred in different historical periods, including the period just after independence and before the economic liberalisation, the economic liberalisation in the 1990s, the drought agenda in 2002/2003, and the food price crisis in 2007/2008. Besides the universal fertiliser subsidy program, the other two targeted farmers, geographical locations, and crops to enhance staple food production to ensure national food security. The fertiliser transport and NAIVS subsidy programs had some weaknesses such as elite capture, malpractices by the agro-dealers, and limited capacity of agro-dealers to timely delivery of fertilisers. The study concludes that, since economic liberalisation, Tanzania has been subsidising fertilisers to enhance food crop production for food security purposes with limited impact in transforming the sector. The study recommends that fertiliser subsidisation should not be limited to improving food security but also focus on enhancing household income gains to help some small-scale farmers graduate to another level and/or exit from the sector to strengthen agricultural transformation. Also, the Ministry of Agriculture should devise a comprehensive monitoring system for any fertiliser subsidy program targeting small-scale farmers to control the elite capture.

Keywords: Agriculture, small-scale farmers, fertiliser subsidy, post-colonial Tanzania

1.0 Background Information

Agriculture accounts for 32% of Africa's Gross Domestic Product (GDP), and more than two-thirds of the African population depends on agriculture for their income (Bassey, 2018). In Tanzania, the economy has continued to be dominated by agriculture. Since its independence, a wide range of policies and institutional reforms were done to increase the agricultural production growth rate to reduce the state of poverty. This is because literature indicates a strong link between agricultural production and the state of rural and national poverty (Hazell, 2020; Larson et al., 2020; Lyatuu et al., 2015). Most poor people reside in rural areas and comprise a large per cent of Tanzania's population, implying that rural poverty translates into the national state

of poverty. Despite the improvements in other economic sectors to absorb the rural population, their contribution to creating jobs in rural areas is still limited. Therefore, agriculture is still a major sector influencing poverty reduction due to its potential to develop in terms of the number of people it employs and the nation's available land (Larson et al., 2020; Lyatuu et al., 2015).

In Tanzania, like in many other African countries, the big challenge in the agricultural sector is low productivity. Over time, the growth experienced in the sector has been due to area expansion rather than productivity increase (URT, 2016a). Nevertheless, area expansion also responded to the increasing demand for food and non-traditional cash crops (URT, 2016a). Considering the population in rural areas, improvements in agricultural productivity will contribute to



improved livelihood of the rural poor and poverty reduction in general. This is because the agriculture sector has greater multiplier effects than the other sectors due to its strong backward and forward linkages (Wineman *et al.*, 2020). Donors and African governments recognize improvements in agricultural productivity among small-scale farmers as one of the key areas in reducing rural poverty and improving the food security of rural households (Mather and Ndyetabula, 2016). The initiatives by the government of Tanzania for the structural transformation of decreasing the number of people employed by the sector will be achieved through investment in the sector to increase its productivity (Wineman *et al.*, 2020).

Chemical fertilisers have a high potential to increase agricultural productivity due to their potential effect on soil fertility. However, Tanzania is among the countries reported with the lowest use of fertilisers in the region. For example, from 2008-2013, farmers in Tanzania recorded fertiliser use of about 8–10 Kgs per hectare, compared with an average of 16 kg/ha for Southern African Development Community (SADC) countries (URT, 2016b). This low fertiliser application by small-scale farmers is due to limited accessibility caused by high prices and limited availability (Cagley *et al.*, 2009; Baltzer and Hansen, 2012). For example, the Minister of Agriculture mentioned a 100 per cent increase in fertiliser prices due to the rise in the price of fertilisers in the international market (Self-reporting during the parliament sitting in February 2022). Fertiliser subsidisation is among the strategies for improving fertiliser accessibility by small-scale farmers in rural areas through selling at reduced prices and/or on a credit basis. Since its independence in 1961, Tanzania has been subsidising fertilisers as strategies for enhancing agricultural productivity. Despite fertiliser subsidisation by the government, the accessibility of fertilisers by small-scale farmers has remained a challenge. Previous studies on fertiliser subsidisation have generalized the findings on the subsidy programs used with limited analysis of each subsidy program to inform decision-makers (Baltzer and Hansen, 2012; Fujimoto and Suzuki, 2021; Minde *et al.*, 2008; Morris *et al.*, 2007; Pan and Christiaensen, 2011; Theriault, 2019). Other studies focused on only one subsidy program lacking insights from other subsidy programs (Masinjila and Lewis, 2018; Mather and Ndyetabula, 2016), while other studies were location and period-specific (Druilhe and Barreiro-Hurlé, 2012). This study assessed the fertiliser subsidy programs implemented by the government of Tanzania since its independence. The study identified the fertiliser subsidy programs implemented and assessed their strengths and weaknesses and the driving forces behind implementing them. Then, the study suggests the way forward based on lessons learnt. The findings from this study inform the policymakers to take appropriate initiatives to enhance the accessibility of fertilisers by small-scale farmers in increasing agricultural productivity contributing to the

attainment of sustainable development goals on poverty reduction and food security.

2.0 Methods

A documentary review was employed to collect information on the fertiliser subsidy programs implemented since 1961. The review included published, grey literature and other secondary evidence from national documents. Academic publications and other sources were gathered, synthesized, and analysed with national documents. The search used keywords such as: “agricultural input subsidies in Tanzania, agricultural subsidies in Tanzania, fertilizer subsidy programs in Tanzania, agricultural subsidisation”. The desk review used national documents such as the Arusha Declaration, Rural Development Strategy, Agricultural Sector Development Strategies, Agricultural Sector Development Programmes and the Five-Year Development Plans. The following research questions guided the desk review process:

- i. What are fertilisers subsidy programs implemented in Tanzania from 1961 to 2021?
- ii. Why were the fertiliser subsidy programs implemented?
- iii. How strong or weak were the fertiliser subsidy programs?
- iv. What are the lessons learnt from the fertiliser subsidy programs?
- v. How best can fertiliser subsidisation for small-scale farmers be implemented?

3.0 Findings and Discussion

3.1 Fertiliser subsidy programs implemented in Tanzania since its independence

The study identified three fertiliser subsidy programs implemented in Tanzania since its independence. The programs were informed by the changes that occurred in the country, like the period after independence and before the economic liberalisation, liberalisation in the 1990s, the drought agenda in 2002/2003, and the food price crisis in 2007/2008. Fertiliser subsidy programs identified are the universal input subsidy implemented through the Ujamaa villages (TANU, 1967), fertiliser transport subsidy (Mather and Ndyetabula, 2016), and the National Agricultural Input Voucher Scheme (NAIVS) (Masinjila and Lewis, 2018; Mather and Ndyetabula, 2016). Sections 3.1-3.3 discuss the fertiliser subsidy programs implemented along with the driving forces for their implementation, strengths, and weaknesses.

3.1 Universal input subsidy program

Universal input subsidy programs are characterized by a government-controlled input (and output) marketing system. Farmers are supplied with agricultural inputs at controlled and subsidised prices and often on heavily subsidised credits (Baltzer and Hansen, 2012). The programs provided farmers with agricultural inputs, farm credits, extension services, and



marketing facilities while controlling the market and food crop prices (Kato, 2016). In Tanzania, agricultural input subsidisation started in 1967 during the Arusha Declaration, based on TANU's policy of building a socialist state. Among the principles of socialism that TANU believed was the responsibility of the state to intervene actively in the nation's economic life to ensure the well-being of all citizens (TANU, 1967). This consisted of villagisation policy, collectivisation of all productive activities, and state control of the provision of social services. State control in agricultural production was implemented through large-scale 'universal' subsidy programs to increase agricultural production through collective production and marketing.

Input subsidisation was done under the villagization programs, as outlined in the Arusha Declaration of 1967. Under this Declaration, Tanzania established the state-owned Tanzania Fertiliser Company (TFC). The TFC and other parastatal agencies had a monopoly on all fertiliser procurement, distribution, and sales until 1992. Government marketing boards, crop authorities, and cooperatives also managed input subsidies, credit for agricultural production, crop purchases, and price-setting. In the 1970s, subsidies were provided through the National Maize Project to improve the production of maize to ensure food security (Masinjila and Lewis, 2018). During this period, fertiliser subsidies varied between 60-70% of the final price (Cagley *et al.*, 2009). These input subsidy programs aimed to increase agricultural productivity with the ultimate goal of ensuring food security. In many cases, this fertiliser subsidy program was appropriate in raising input use by farmers and increasing agricultural productivity. This is because farmers were provided with all the needed field support through the extension services and the availability of other inputs like tractors to facilitate timely farm operations. In addition, the government control of inputs through farmers' cooperatives ensured the availability of fertilisers and the produce market. During that period, farmers' cooperatives were strong in finding good crop markets, and farmers were paid reasonable prices that motivated them to increase production, especially cash crops (Mhando, 2014). This implies that the continued use of fertilisers was due to its availability to farmers and other supporting services like extension services, farm implements like tractors, and market availability through farmers' cooperatives and crop marketing boards (Morris *et al.*, 2007).

Nevertheless, the literature indicates that universal input subsidy programs were extremely expensive, most subsidies tended to benefit relatively well-off and better-connected farmers, and the sustainability of agricultural productivity was dependent on continued government support (Baltzer and Hansen, 2012; Cagley *et al.*, 2009; Mather and Minde, 2016; Pan and Christiaensen, 2011). The sustainability of the universal input subsidy can clearly be seen during the economic reforms in the mid-1980s when fertiliser subsidies

were greatly reduced, from 80% in 1990 to 55% in 1992, and to no more than 20% by mid-1992 and the ultimate phase-out between 1991 and 1994 (World Bank, 2014; Mather and Ndyetabula, 2016). The changes caused TFC to lose its monopoly over fertiliser distribution and procurement as private companies were allowed to compete. Consequently, the private sector was also not well prepared to invest in the area, given the uncertain nature of the agriculture sector. Many farmers had limited access to fertilisers due to unavailability and/or higher prices (Cagley *et al.*, 2009). According to Cagley *et al.*, (2009), the real price of fertiliser increased by a factor of 2.5–3.9 from 1991 to 1997, and its consumption decreased by 84% between 1991 and 2001. The Southern Highlands, the most maize-growing part of Tanzania, which had greatly benefited from fertiliser subsidies, was highly affected. The growth of total agricultural output, including food crops, began to slowly raise the prices of food crops, which necessitated actions to be taken by the government. The government found the best way to improve national food security in the situation of high international food prices was to promote the use of fertilisers to raise productivity (Cagley *et al.*, 2009). This resulted into the introduction of the fertiliser transport subsidy.

3.2 Fertiliser transport subsidy

The fertiliser transport subsidy program was implemented to address the challenge of the decline in agricultural production because of a reduction in input use due to the withdrawal of government support. Several African countries ventured into new input subsidy programs. The Malawian government pioneered the return to large-scale subsidies in 1998 when it began distributing free fertiliser to farmers (Baltzer and Hansen, 2012). Tanzania reintroduced input subsidies as a transport subsidy for fertilisers implemented from 2003/2004-2006/2007. The fertiliser transport subsidy program was introduced because the cost of fertiliser is primarily determined by the costs of importing, including all the associated transport and distribution costs as well as the trader and agro-dealer margins. Tanzania imports fertiliser from Europe or North America, where it is mainly produced (Masinjila and Lewis, 2018). Therefore, the fertilisers' final price to the farmers is determined by competition in transport and fertiliser trading. Given the nature of transport systems in the rural areas in Tanzania, the fertiliser transport subsidy program was explicitly aimed at reducing the disadvantage faced by farmers far from Dar es Salaam (the import port). The program covered the transport cost and part of the cost of the consumer price of the fertiliser (Cagley *et al.*, 2009). Private companies were involved in the supply of fertilisers to abide by the requirements of the structural adjustment policies. The government identified major selling points and entered into contractual agreements with different companies to distribute fertiliser to those points. Both the government and the identified companies analysed the cost of fertiliser



distribution, and fertiliser was sold at a price agreed upon by both parties (Masinjila and Lewis, 2018).

Contrary to the universal input subsidy program, the fertiliser transport subsidy program was small in scale. Initially, the program targeted the Southern Highlands of Tanzania and slowly expanded to other regions, focusing on the production of maize and rice (Mather and Ndyetabula, 2016). Additionally, the other regions remained unsupported, causing a decline in the production of cash and food crops. Although the country concentrated much on improving food security, the sector's contribution to economic development had limited consideration. Tanzania being an agrarian economy, limited accessibility to fertiliser to support other crops and/or geographical areas negatively affected the national economy and poverty reduction.

Despite targeting staple food-producing regions, the fertiliser transport subsidy program did not perform well in terms of efficiency, effectiveness, targets and distribution of benefits (Masinjila and Lewis, 2018). This was due to agro-input companies' non-adherence to contracts with the government, selected agro-dealers' limited capacity to undertake the deal, input delivery delays, re-packaging of fertilisers in the warehouses, and ineffective inputs caused by quality deterioration. Besides, most of the fertilisers were accessed by large-scale farmers, resulting in shortages of fertilisers for small-scale farmers (Masinjila and Lewis, 2018). Limited access to fertilisers by small-scale farmers, who are the majority of farmers and food producers in Tanzania, led to a decrease in agricultural production; consequently food shortage crisis. This situation caused the government of Tanzania to rethink another fertiliser subsidy program to increase food production. As a result, a National Agricultural Input Voucher Scheme (NAIVS), a voucher-based subsidy system, was introduced to enhance the fertiliser purchasing power of small-scale farmers with the greatest potential to expand maize and rice production based on specific selection criteria (World Bank, 2014).

3.3 National Agricultural Input Voucher Scheme

The National Agricultural Input Voucher Scheme (NAIVS) started in 2007/2008 as a one-year pilot targeted voucher scheme and officially launched in 2008/2009 as a three years program. Unlike the original plan of three years, the program was extended for two more years and ended in 2014 (World Bank 2014). NAIVS was implemented in 58 districts distributed across 11 regions, namely Iringa, Mbeya, Ruvuma, Rukwa Kilimanjaro, Arusha, Manyara, Kigoma, Tabora, Mara and Morogoro (World Bank, 2014). NAIVS aimed to increase the production of maize and rice, the two major staple crops, to enhance national food security. The target was to implement the program in the geographical areas most suitable for maize and rice production. The

households which cultivated less than one hectare of maize or rice were the main target for the subsidy program. NAIVS involved private companies in importing, selling, and retailing fertilisers. Small-scale farmers purchased fertilisers from participating agro-dealers at a subsidised price using a voucher from the government. The role of the government was limited to distributing vouchers to farmers who met the target criteria, coordinating private sector actors on the supply of the fertilisers to the villages and re-paying agro-dealers for the 50% of the market price of the subsidised fertiliser (two 50 kg bags) that a voucher recipient obtained (Mather and Ndyetabula, 2016). However, members of parliament's political pressures led to the expansion of the program to 74 districts in 2009/10 and 87 districts (in 24 regions) in 2010/11.

Contrary to targeting maize and rice high potential districts, the expansion included the medium/lower potential districts (World Bank, 2014). The political pressure on expansion wanted to make the fertiliser input subsidy nationwide rather than in high maize and rice-producing areas as initially planned. This is because the impact of fertilisers on maize and rice productivity in drier regions of the country is lower than in the higher rainfall zones (Minde *et al.*, 2008; Wineman *et al.*, 2020)

NAIVS is among the market-smart subsidy programs that adhere to several design principles: targeting specific farmers, developing market-based solutions, and devising credible exit strategies. The short-term goal of NAIVS was to increase food production. At the same time, the criteria for voucher distribution were designed with the longer-term goal of initiating a market-driven agricultural input distribution system. NAIVS, during its short-term goal, was supposed to induce farmers to use fertilisers and to purchase fertilisers at the market prices for sustainable use of fertilisers. The achievement of NAIVS during its short term was expected to contribute to the long-term goal by making farmers realize the impact of fertilisers in improving agricultural productivity and the situation that can influence them to buy fertilisers. The following sections explain how NAIVS incorporated the market-smart fertiliser subsidy program design principles.

3.3.1 Small-scale farmers targeting

The National Agricultural Input Voucher Scheme targeted small-scale farmers cultivating less than one hectare in the production of maize and rice. Each beneficiary household was entitled to an input package suited for cultivating 1/2 ha of maize or rice at a 50% subsidy (Mather and Ndyetabula, 2016). The priority was given to female-headed households and farmers who had not used inputs in the past five years. However, the farmers were supposed to be willing and be able to co-finance. The program targeted marginalized farmers to promote pro-growth and not displace commercial (non-subsidised) input sales (Mather and Ndyetabula, 2016).



However, limited use of fertilisers was caused by high transportation costs, low knowledge level of small-scale farmers and agro-dealers, unavailability of improved seeds to respond to fertilisers, and low access to credit (Cagley *et al.*, 2009). The goal of NAIVS was to enhance the accessibility of the inputs at subsidised prices for farmers to realize the impact of the inputs on maize and rice yields to induce them to buy fertilisers at the market prices. The involvement of agro-dealers in the program also aimed at enhancing knowledge on the agro-input profitability based on the population of small-scale farmers involved in agricultural production (Mather and Ndyetabula, 2016; Pan and Christiaensen, 2011). The subsidy program started with knowledge improvement for both small-scale farmers and agro-dealers.

An evaluation study by the World Bank (2014) indicated that NAIVS fulfilled its primary goal of introducing small-scale maize/rice producers to inorganic fertiliser and improved seeds and reducing the riskiness of using these inputs due to farmers' inexperience with observing the net returns to fertiliser and improved seed on their fields (Mather and Ndyetabula, 2016). Targeting small-scale farmers were well addressed, but political pressure interfered with geographical targeting to include areas with low rainfall potential to support efficient production of maize and rice. The expansion of the fertiliser subsidy program from 12 regions to 24 regions to cover the whole country limited the overall impact of NAIVS (Mather and Ndyetabula, 2016). The findings from Fujimoto and Suzuki (2021) indicate that the input subsidies in SSA had an insignificant positive change on farmers' maize harvests at the household level. The study by Fujimoto and Suzuki (2021) in Tanzania collected data using national representative samples; regions with low maize and rice production potential were also included. This indicates that lack of consideration on the geographical targeting caused limited impact of fertiliser use on improving maize and rice production on an aggregate basis.

The implementation of NAIVS in reaching the targeted small-scale farmers also had challenges. Small-scale farmers are marginalized; the decentralisation procedure for farmers to access the subsidised fertilisers went through several steps that created loopholes for well-off farmers and elites to reap more benefits than the targeted farmers. The findings from the evaluation report on the input voucher pilot program in Kilimanjaro, Tanzania, indicated that elected village officials received about 60 per cent of the distributed vouchers (Pan and Christiaensen, 2011). Manipulations by politicians and nepotisms were common because the committee members were likely to include names of their relatives and created loopholes for corruption by well-off farmers while leaving the beneficiaries without fertilisers (Ricker-Gilbert, 2020). In addition, the elites were the ones providing the required information on the location and eligible farmers for targeting. Therefore, there was a high likelihood of the

targeted farmers not benefiting in situations where monitoring from the central government was limited (Pan and Christiaensen, 2011). However, fertiliser subsidisation by the government aimed at creating a demand push to help input providers (agro-dealers) overcome high initial distribution costs and achieve economies of scale. The assumption was that the well-off farmers would manage to purchase the fertilisers at the market prices. Therefore, the supported marginalized farmers and the well-off farmers' demand for fertilisers were expected to motivate the agro-dealers based on economies of scale for a stable fertiliser market (Pan and Christiaensen, 2011). This is because small-scale farmers in Tanzania, like in other developing countries, are the main producers of the country's food and represent most of the population (Hazell, 2020). This population was considered a potential market for agro-input companies to expand to tap the opportunity on fertilisers' demand by the small-scale farmers.

NAIVS addressed the challenges of limited knowledge among small-scale farmers and agro-dealers on the impact of fertilisers and improved seeds. However, the high transportation costs to remote areas and the limited financial capacity of small-scale farmers to purchase fertilisers at the market price were not addressed. Based on the fertiliser transport subsidy findings, the government subsidised the fertilisers due to high transportation costs transferred to small-scale farmers, hence high prices uncoverable by farmers. Knowledge of the impact of fertilisers on agricultural productivity is not the only factor influencing the use of fertilisers by small-scale farmers; rather, it is a combination of many factors. The factors include increasing the scope and quality of extension services and promoting farm management practices because lack of knowledge about input use may prevent the complimentary use of inputs and lower input-output response ratios hence the limited impact of fertiliser use (Fujimoto and Suzuki, 2021).

3.3.2 Delivery of subsidy through market-based solutions

The government of Tanzania had good initiatives in the implementation of the NAIVS. The government's role was limited to distributing vouchers to villages/smallholders, and the private sector handled fertiliser intended for the subsidy program from importation to individual farmers. Different from other countries like Malawi, whereby a government parastatal physically handled fertilisers from the port to parastatal distribution depots throughout the country (Mather and Minde, 2016); in Tanzania, the implementation of NAIVS involved private investors in the fertiliser value chain in realizing the available opportunities in the course of creating market-based solutions. The market combines various issues, including suppliers' capacity (agro-dealers) and consumers (farmers). Based on the fertiliser transport subsidy findings, the agro-dealers had limited capacity for



timely delivery of the inputs and malpractices along the value chain. On the other hand, small-scale farmers had limited ability to purchase fertilisers. NAIVS helped the agro-dealers and farmers in the fertiliser market by creating a pull of customers and increasing purchasing power. Agro-dealers were assured of the fertiliser's consumption since the government paid 50% of the price and beneficiary farmers paid 50%.

Market-smart, input subsidy programs, were implemented in a shorter period; it was three years with an extension of two years more for the case of NAIVS. This is a very limited period to realize a tangible impact in situations where multiple factors contribute the market failure. In Tanzania, the market failure for small-scale farmers to use fertilisers was due to limited knowledge of the impact of fertilisers and the limited capacity of farmers to access fertilisers (Mather and Ndyetabula, 2016). From the findings, the program successfully raised the knowledge of both farmers and agro-dealers on the impact of fertiliser use on crop yield. Also, farmers were made aware of the places to access fertilisers (agro-dealers shops) with expectations for agro-dealers to continue supplying fertilisers after NAIVS completion. However, the long-term impact of creating market-based solutions and a proper exit strategy to enhance the capacity of farmers to access fertilisers was not well achieved, as explained in the following section.

3.3.3 Credible exit strategy

The Market-smart input subsidy programs aim to create sustainable market-based solutions to input accessibility by farmers, which is ensured by establishing a clear exit strategy (Baltzer and Hansen, 2012; Kinuthia and UNU-WIDER, 2020; Mather and Ndyetabula, 2016; Morris et al., 2007). In achieving this, the Ministry of Agriculture, Food Security and Cooperative by then, under its Agricultural Inputs Section (AIS), generated the initial design for an Agricultural Credit Subsidy Program (ACSP) in 2012/13. This was viewed as the 'eventual follow-on program to NAIVS after its implementation in 2013 (Mather and Ndyetabula, 2016). In this study, ASCP is regarded as an exit strategy for NAIVS. The government believed that farmers had acquired knowledge and experience on fertiliser use and that improving maize and rice yields would motivate them to increase fertiliser demand. Therefore, rather than the government continue to purchase inputs for them, the Agricultural Marketing Cooperative Organisations (AMCOS) was supposed to do so by accessing loans from commercial banks. The government planned to subsidise the interest rate for group loans accessed by AMCOS. This aimed at reducing the risks by banks on lending to small-scale farmers to improve their accessibility to fertilisers (Cagley *et al.*, 2009). During the fourth year (2013/14) of NAIVS implementation, the government attempted to involve AMCOS as the instrument for easy accessibility of fertiliser by small-scale farmers. However, the results were

not promising because out of 4,990 legally registered AMCOS, only 712 AMCOS could get loans from banks to support their farmers to access fertilisers on a credit basis (Mather and Ndyetabula, 2016).

Additionally, banks that agreed to participate in the program wanted the government to pay up-front a 50% loan guarantee as collateral. However, since the government was not ready to do that, the commercial banks pulled out of the program (2013/2014). Nevertheless, the continued negotiations between the banks and the government were somehow successful in the year 2014/2015, whereby a total of 712 groups that had met the loan requirements received credit from the National Microfinance Bank (NMB), Cooperative Rural Development Bank (CRDB) and Community Banks (Masinjila and Lewis, 2018).

The plan to involve AMCOS and commercial banks was a big challenge as commercial banks were unwilling to bear the risks of lending money to small-scale farmers since many challenges faced by small-scale farmers were not addressed. Additionally, the existing AMCOS were not well organized (Masinjila and Lewis, 2018); as such, they were not the best structures to channel fertiliser subsidies to small-scale farmers (Mather and Ndyetabula, 2016). The end of NAIVS in 2013/2014 led to the limited availability of fertilisers in 2014/2015 as the donors' funding to NAIVS ended and the government negotiations with commercial banks did not work well; hence maize and rice production decreased in the year 2014/2015. The situation forced the government of Tanzania to return to the voucher system in 2015/16 using its funding; the voucher system was regarded as promising to boost agricultural productivity (Mather and Ndyetabula, 2016). The government's return to using the vouchers in 2015/16 and later into the bulky purchase of fertilisers by contracting private companies implies that credit subsidy to farmers through their AMCOS, an exit strategy for NAIVS, was not successful. This was partly due to the poor timing of the negotiations with the commercial banks on providing loans to small-scale farmers through AMCOS. The negotiations started during the fourth year of NAIVS implementation (the first year of its extension). This paper argues that the commercial banks and AMCOS did not appear well in advance to take over the role of NAIVS exit strategy. One year of limited fertilisers to small-scale farmers (neither donor nor government support) led to disjointed efforts, reducing the impact on inducing farmers to use fertilisers. The lack of well-planned and stable strategies put farmers into a dilemma of being involved in new initiatives with unremarkable changes in their agricultural production activities.

4.0 Lessons from the fertiliser subsidy programs

The three fertiliser subsidy programs explained in Section 3 have provided lessons regarding fertiliser use by small-scale



farmers in Tanzania. The issues that came out as the determinants of the use of fertilisers by small-scale farmers are the focus of the subsidy programs, efficiency of fertilisers, organisation of small-scale farmers, and limited grain market.

The focus of the fertiliser subsidy program: As revealed from the findings, the universal fertiliser subsidy scheme aimed to increase agricultural production for food and cash crops. The program considered other factors influencing agricultural production, such as the availability of extension services, credits, and produce markets. The aim was to boost agricultural production to improve the country's economic situation after independence. On the other hand, the fertiliser transport and NAIVS subsidy programs focused on enhancing food security while abiding by the market liberalisation policies involving the private sector. The latter two fertiliser subsidy programs came into effect due to reduced agricultural production, which threatened national food security. Government support for agricultural intensification through increased use of fertilisers was crucial to small-scale farmers. Firstly, most rural poor are small-scale farmers with limited opportunity to improve agricultural production through area expansion due to limited acreage and/or capital to finance farming activities (Wineman *et al.*, 2020). Secondly, the government could not go back to universal input subsidy programs due to the structural adjustment policies that required limited government control in all sectors; hence impossible to subsidise fertilisers to all crops and/or farmers. This paper argues that the government had good intentions since supporting these farmers to enhance food production reduced the burden to the government on grain imports. However, the fertiliser subsidy programmes had limited achievement in transforming the agricultural sector.

Literature indicates poor targeting is among the weaknesses of most agricultural input subsidy programs (Baltzer and Hansen, 2012; Cagley *et al.*, 2009; Mather and Ndyetabula, 2016; Pan and Christiaensen, 2011). Tanzania strives to transform the agricultural sector so that some of the population employed in it can be absorbed into other economic sectors and reduce dependency on agriculture for its economic growth (URT, 2021a). On the other hand, the agriculture sector review (2017/2018-2020/21) report has indicated limited progress in reducing the relative weight or share of the agriculture sector in the total GDP and its number of people (URT, 2021b). Agricultural sector transformation will not be possible if small-scale farmers are poorly targeted in the government support initiatives to enhance national food security. Wineman *et al.* (2020) point out that, in the structural transformation, it is important to enhance food crop production to support the population exiting from agriculture to other sectors and/or the poor living in cities. In the agricultural transformation, fertiliser subsidy programs should target the 'productive poor' defined

by Ricker-Gilbert (2020) as "farmers who are full-time small-scale farmers, who can contribute to increasing national-level production but cannot afford to purchase one or two 50 kg bags of fertiliser at commercial prices". The fertiliser transport system was untargeted whereas NAIVS targeted vulnerable households which generally do not have land, labour and skills necessary to use inputs effectively. It is therefore important to target the 'productive poor' in order to increase agricultural productivity and reduce poverty (Ricker-Gilbert, 2020). Both fertiliser transport and NAIVS subsidy programs focus on enhancing food security with limited efforts on transforming the agriculture sector. Thus, the sector is still the major employer of the rural population with low rate of reduced contribution of the sector in the national income. Limited number of small-scale farmers are graduating to another level and/or exiting to another productive sectors (URT, 2021a,b).

Efficiency use of fertilisers: The fertiliser subsidy programs since independence have recorded limited efficiency to varying degrees. During the universal fertiliser subsidy program, inefficiency was contributed by the high cost of the government to distribute fertilisers to small-scale farmers. However, with the fertiliser transport and NAIVS, limited efficiencies were associated with the poor weather condition and late delivery, which caused the poor application of fertiliser and agronomic practices. According to Ricker-Gilbert (2020), low response rates are a major challenge for input subsidies and undermine their cost-effectiveness. This indicates that fertiliser subsidies do not work in isolation, such that to be effective and efficient, other factors need to be considered. Furthermore, climate variability poses many challenges to rainfed agriculture; thus, farmers are too uncertain about agricultural production, affecting their decision to purchase fertilisers to use on their farms. This gives little prospect that farmers can purchase fertilisers at market prices.

Additionally, there are limited extension services whereby farmers are not knowledgeable on the proper agronomic practices to realize the potential fertiliser application. Currently, one agricultural officer at the ward level serves several villages (URT, 2016b). This officer cannot provide farmers with the necessary support during agricultural production activities. The limited financial capacity of fertiliser suppliers (agro-dealers) caused delayed fertiliser delivery, leading to limited application. Fertiliser application is made at particular stages of the planned growth; once the application is delayed, it is obvious that the efficiency of fertiliser will not be achieved (Ricker-Gilbert, 2020; Wineman *et al.*, 2020)

The organisation of small-scale farmers: The government distributed fertilisers through farmers' cooperatives as the distribution networks under the universal fertiliser subsidy program. The cooperatives were strong since members



trusted one another; hence fertilisers access by the targeted farmers was ensured. However, the model was costly and ineffective because fertilisers were not accessed at the market price, and it seemed unsustainable as the government could not support the farmers endlessly. On the other hand, transport and NAIVS lacked close monitoring, so the programs suffered from elite capture and malpractices by actors along the chain. As a result, the intended beneficiaries did not fully benefit as expected. Additionally, the limited capacity of AMCOS was the key challenge for the commercial banks in providing loans to small-scale farmers. Access to financial capital could enable AMCOS to bulky purchase the fertilisers and collectively sell the crops to enjoy economies of scale, reducing production costs to farmers and getting better crop prices. Cooperatives unite farmers like their smallness where they can act as a large business in the marketplace, reaping the advantages of economies of scale that are not available to its members individually (Mhando, 2014). From the findings, the challenges like malpractices by agro-dealers, late delivery of inputs and elite capture could be solved by strong farmers' cooperatives because trust is among their core social capital. This implies that farmers' cooperatives are the proper channel for fertiliser subsidy programs for small-scale farmers. The findings that only a few AMCOS were eligible to access bank loans to support their members indicate limited and/or weak small-scale farmers' organisations. The weak and non-existence of the cooperatives hampers the efforts by the government to ensure that the subsidised fertilisers are accessible to farmers.

Limited grain market: Grain-selling activities are the main income source that Tanzanian small-scale farmers use to buy agricultural inputs, limited grain market implies limited financial capacity of farmers to buy fertilizers. Findings from Fujimoto and Suzuki (2021) indicate that NAIVS did not promote farmers' grain market sales. Fertilisers transport and NAIVS subsidy programs aimed at enhancing national food security such that the government imposed a ban on grain selling. The ban discourages small-scale farmers from massive commercial production hence impeding the use of fertilisers. Farmers are not generating income to buy fertilisers, thus a continued dependence on government support for fertiliser use. Small-scale farmers indeed have a role to play in ensuring national food security; however, there is a need to promote profitable small-scale farming and meet poverty reduction, nutritional, social and sustainable development goals. According to Ricker-Gilbert (2020), a clear distinction between at least subsistence-oriented and market-oriented farms is needed when designing national food security strategies. The small-scale farmers who can manage to produce a surplus for selling are supported to access the market for increased production and income to enable them to graduate to medium-scale farmers and/or non-farm activities (Ricker-Gilbert, 2020). This will enhance agricultural transformation through increased productivity

and releasing the labour force from agriculture to other productive sectors. The Southern Highlands of Tanzania, the most maize-producing area, have been facing a limited market due to government interventions through the ban on exportation to enhance national food security. This paper argues that not all grain-producing farmers were included in the fertiliser subsidy programs. Therefore, the universal ban on grain export is unfair to other farmers who did not access subsidised fertilisers and/or produced grain (maize) for business. This practice negatively impacts the national food security resulting from reduced production by farmers which translates into reduced use of fertilisers. Lack of markets was the main reason for the decline in the production of traditional crops such as coffee (Mhando *et al.*, 2013).

4.0 Conclusions and recommendations

Agriculture is still the backbone of Tanzania's economy due to the number of people it employs and the land endowed. Agricultural productivity catalyses broad shifts in the national employment structure, especially in heavily agrarian societies. Rising agricultural productivity enables greater surplus production and generates extra income for farm households to demand goods and services. The demand for goods and services improves a rural economy and deepens the non-farm economy. Additionally, the more productive farms also lead to backward linkages through agricultural employment and increased demand for inputs (Wineman *et al.*, 2020). Farm inputs like fertilisers are very important in improving agricultural productivity for economic development and ensuring food security. Tanzania has implemented various fertiliser subsidy programs since its independence in lieu of improving agricultural productivity though little progress has been recorded. The total removal of fertiliser subsidisation as a response to the structural adjustment policies resulted in reduced agricultural production. Although the major aim was to remove state control in the market to enable a free-market economy through the participation of the private sector, Tanzania, like many other African countries, was ill-prepared. Increasing national and household food security was the major aim of targeting the fertiliser subsidisation programs to small-scale farmers in the areas with high potential for producing maize and rice. However, the fertiliser subsidy programs did not contribute much to the sector transformation.

From the findings, the use of fertilisers by small-scale farmers is still a nightmare. The current fertiliser price increase is partly due to increased fertiliser prices in the international markets. Transportation costs are a limiting factor for farmers to purchase fertilisers at the market prices, hence a continued dependence on government support. Limited markets for crops also limit farmers' use of fertilisers. The ban on maize and rice exports to ensure food security hinders farmers from fetching reasonable crop



prices. This not only discourages them from producing more but also leads to limited income to buy fertilisers hence a continued dependence on government support.

On the other hand, the weather variations caused by climate change pose many risks and uncertainties in agricultural production such as prolonged periods of droughts, which is unsupportive for fertiliser use by farmers. Rainfed agriculture is risky as such farmers are not willing to invest much in using fertilisers; hence, they traditionally produce for subsistence. Extension services are also key to providing farmers with good agronomic practices in applying fertilisers for optimal output. Therefore, fertiliser application by small-scale farmers is determined by several factors which need to be considered in totality.

Based on the findings discussed above, the study recommends the following:

- i The Ministry of Agriculture should devise practical market-based solutions and exit strategies with appropriate timing of implementation for the success of any market-smart fertiliser subsidy programs like NAIVS;
- ii The Ministry of Agriculture properly target small-scale farmers for fertilisers subsidisation in achieving agricultural sector transformation. A comprehensive monitoring system should be devised to control the elite capture so that small-scale farmers can graduate to another level and/or exit from the agriculture sector;
- iii The government should re-establish and/or strengthen the AMCOs to provide farmers with structures for easy accessibility of fertilisers (availability and affordability) and markets for their crops in order to realize profits through economies of scale;
- iv The Ministry of Agriculture should extend the input subsidy provisions to support the production of both food and cash crops based on the agro-ecological zones' production potential to enhance agricultural transformation in Tanzania; and
- v National policy options on improving national food security should take into account small-scale farmers' income from grain sales to motivate them to use fertilisers for a sustained agricultural productivity

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