

Rwanda Value Chain and Regulatory Assessment Fertilizer and Pesticides



Final Report

Rwanda Value Chain and Regulatory Assessment Fertilizer and Pesticides **Final Report**

Client

IFC

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List of abbreviations

AGRA	Alliance for a Green Revolution in Africa
APTC	Agro Processing Trust Corporation
CAES	Customized Agricultural Extension System
CEPAR	Coffee Exporters and Processors Association of Rwanda
CIP	Crop intensification Program
COMESA	Common Market for Eastern and Southern Africa
DAP	Diammonium phosphate
EAC	East African Community
EBA	Enabling the Business of Agriculture
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GoR	Government of Rwanda
ISP	Input Subsidy Program
IFC	International Finance Corporation
ISFM	Integrated Soil Fertility Management
LSF	Large Scale Farmer
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
MOPA	Mobile Ordering and Processing Application
NAEB	National Agricultural Export Development Board
NPK	Nitrogen Phosphorous Potassium
NISR	National Institute of Statistics of Rwanda
OCP	Office Cherifien des Phosphates
PTSA	Strategic Plan for Agricultural Transformation
RAB	Rwanda Agriculture and Animal Resources Development Board
RDB	Rwanda Development Board

REMA	Rwanda Environment Management Authority
RICA	Rwanda Inspectorate, Competition and Consumer Protection Authority
RRA	Rwanda Revenue Authority
RSB	Rwanda Standards Board
RwF	Rwanda Fertilizer Company
RwaSIS	Rwanda Soil Information System
SAS	Seasonal Agricultural Survey
SNS	Smart Nkunganire System
SSF	Small Scale Farmer
USDA	United States Department of Agriculture
USAID	United States Agency for International Development

Executive Summary

This assessment scans the fertilizer and pesticide value chains in Rwanda to evaluate the country's advantages to attract private investment. It analyses the current enabling ecosystem for agri-input firms to understand the key impediments for scaling up private investment and improving access to quality inputs.

The current global environment is challenging, with market prices rising rapidly in 2022 and there is generally a global shortage of fertilizer due to the Ukraine Russia conflict meaning that there is potentially a serious food security issue looming for Rwanda. Against this backdrop Rwanda is undergoing a period of significant transition within the regulatory environment for agricultural inputs. There are two major thematic areas of reform: firstly, Rwanda is aiming to harmonize agrochemical regulations with the East African Community; secondly, Rwanda has committed to a reform of the Input Subsidy Program. These two reform areas offer a significant opportunity for the private sector to expand its role within these two markets.

This study employed several methods of information gathering, including literature reviews, data collection from public sources, quantitative and qualitative field surveys, and in-depth interviews with private and public stakeholders. For the fertilizer and pesticide value chain analysis, customs information was provided covering imports and exports of pesticide and fertilizer products by importer, and data was collected from various other sources including Seasonal Agricultural Surveys, Rwanda Agriculture and Animal Resources Development Board, National Agricultural Export Development Board, among others. Field surveys were conducted in six districts, which were selected to provide a comprehensive representation of key crops of interest and to include all regions of Rwanda. Key informant interviews were conducted with a wide range of stakeholders including importers, distributors, private sector business and government representatives.

Regarding the fertilizer value chain, the assessment found that high prices and difficulties in the fertilizer distribution system are seen as the most significant barriers to increased fertilizer use. The cost of imported products makes up a large proportion of the fertilizer retail price and reducing costs within Rwanda will not have a substantive impact on retail price. There is significant market concentration in the fertilizer import market, especially in terms of importing companies. In terms of distribution, One Acre Fund has effectively acquired a monopoly in several districts.

In terms of opportunities, the market for fertilizer is growing and there is unmet demand for soil specific fertilizers, micronutrients, and affordable alternatives to chemical fertilizer. There are several options to meet this demand including blending of new products, and diversification into organic fertilizers. Overall, there is a broad consensus that Rwanda's current fertilizer subsidy program requires reforms to enhance efficiency, effectiveness, and sustainability. In terms of digital solutions, the Smart Nkunganire System and Mobile Ordering and Processing Application demand management systems are revolutionary systems, but there is room for improvement. It will be up to private sector actors to investigate

whether to continue with this system or to replace it, or to enhance it by using system data to provide improved access to finance.

Regarding the pesticide value chain, the assessment found that pests and diseases pose a strong threat to Rwandan agriculture – at present the most serious threat is the Fall Army Worm which attacks maize crops. For farmers, sometimes it is difficult to access pesticides in a timely fashion in parts of Rwanda and pesticides are expensive for farmers. Further, there is evidence that pesticides are not applied in a proper manner – meaning that they are both less effective and potentially harmful. In terms of counterfeit products, the analysis found little direct evidence of counterfeit products, but inspection reports indicate that there may be a substantial market in unregistered pesticide products that is not captured in official statistics.

Despite these difficulties, imports of pesticides have been steadily increasing over the last half decade, which may be linked to the strong growth in the horticulture sector. Import costs represent a lower fraction of the retail price for pesticides than for fertilizer. Hence, there is potentially a stronger case for cost reduction at retail stage. There may also be market opportunities to increase the efficiency of pesticide application.

The second major component of this assignment was to conduct a regulatory assessment, which had two main areas of focus: registration of new agrochemical products, and product and facilities inspections. The analysis found that importers looking to register new agricultural input products face a significant administrative burden. There is a lack of coordination between RICA, RSB and RAB in terms of the protocols for product testing, which creates long delays and costs for the private sector. Inspection of imports can cause long delays due to limited laboratory testing capacity.

There is a harmonization process underway for both fertilizer and pesticide regulations at the EAC level, which will drive reform of the Rwanda regulations on agrochemicals. The pesticide EAC regulations have been developed and must now be adopted in Rwanda, while the fertilizer EAC regulations are in the process of being finalized at the time of writing. Both reform processes offer huge opportunities to improve market efficiency: recognition of international standards would accelerate the registration process and allow more products to enter the market; reduced testing requirements on new products would allow better market access.

The final chapter of the report is a detailed list of recommendations which are sorted into priority, near term recommendations; recommendations for further analytical work and technical assistance; and long-term capacity building recommendations.

In terms of priority, near term recommendations, it is important that private sector actors have a clear understanding of the implementation of the reform roadmap for the agriculture Input Subsidy Program. Clear communication about the transition out of the ISP and a strong commitment to the reform transition process is a key requirement going forward. The other key recommendation is that IFC should facilitate the harmonization process of fertilizer and pesticide regulations within EAC by providing technical assistance to the Government of Rwanda to help implement the guidelines, review existing laws and regulations,

and promote the adoption of the new EAC regulations. Another key area is to improve coordination between key agencies regarding the process for testing and registering new agri-input products.

In terms of recommendations for further analytical work and technical assistance, the report identified several areas of interest for further investigation. Areas of interest include private sector extension services, professional spraying services, organic fertilizer production in Africa, and insect farming to produce biofertilizer in Rwanda. The report also highlighted the potential for the use and production of bio-pesticides. Bio-pesticides and organic fertilizer also have the advantage that they are not subject to the same level of regulatory control as synthetic inputs. The report also recommends that the level of competition in the market should be monitored to ensure an effective level of competition among suppliers, and that where possible innovations in demand management and access to finance should be encouraged.

Finally, in terms of long-term capacity building recommendations, the report finds that human and physical capacity should be developed along the registration process, and along the inspection and testing process. These are long term recommendations that will require investments in physical infrastructure as well as human capital.

1. Introduction

This assessment scans the fertilizer and pesticide value chains in Rwanda to evaluate the country's advantages to attract private sector investment. It analyses the current enabling ecosystem for agri-input firms to understand the key impediments for scaling up private investment and improving access to quality inputs.

In 2021, the agricultural sector in Rwanda accounted for 24% of GDP and 48% of national employment.¹² Despite the significance of the sector, it is underperforming compared to its potential, and while the use of agricultural inputs has been steadily increasing over the past decade, use of agrochemicals remains very low.³ Against this background, Rwanda's current Strategic Plan for Agricultural Transformation (PSTA 4) explicitly recognizes that agricultural growth must be driven by private sector investment. To encourage private sector investment, it is important to consider the enabling environment. "*Regulatory bottlenecks limiting access to fertilizer, including fertilizer registration, import and quality control*" were identified by the World Bank as key factors inhibiting the performance of the agricultural sector.⁴

With the international prices of agricultural inputs at record levels, the current global environment is especially challenging for an inland nation like Rwanda which depends on imports for synthetic agricultural inputs. However, in this challenge lie two major opportunities for change. Firstly, the high prices lead to increased pressure on the regulatory environment to reform and improve processes to allow agri-input firms to operate more efficiently. Secondly, in the light of the current crisis, many heretofore "marginal" investment opportunities have become more attractive – not just commercially, but also in terms of improving the resilience of the Rwandan agricultural sector to future shocks.

The Ministry of Agriculture and Animal Resources has recently proposed a reform roadmap for the agricultural Input Subsidy Program, which aims to gradually phase out the input subsidy through to 2026/27. The private sector will be expected to fill the space left by this reform process and it is important for private sector investors to already start positioning themselves for the change.

The report can be subdivided **into two components: (1) mapping and assessing the fertilizer and pesticide value chains in Rwanda with a focus on their functional performance; and (2) assessing the agri-input regulatory system** with a focus on benchmarking the existing system vis-a vis international best practices for market-oriented fertilizer and pesticide sub-sectors.

¹ (NISR, 2021)

² (NISR, 2022)

³ Crop yield gaps (the difference between potential and actual yield) in Rwanda have been estimated at 60.7% for maize, 46% for wheat, 71.7% for beans, and 65% for cassava (cy'iterambere, 2020).

⁴ (MINAGRI, 2018, S. 22)

Methodology

This study employed several methods of information gathering, including literature reviews, data collection from public sources, quantitative and qualitative field surveys, and in-depth interviews with private and public stakeholders. The methodology for each component is described below.

For the fertilizer and pesticide value chain analysis, customs information was provided by the Rwanda Revenue Authority (RRA) for 2007 to 2022 covering imports and exports of pesticide and fertilizer products. Field surveys were conducted in six districts. These districts were selected to provide a comprehensive representation of key crops of interest and to include all regions of Rwanda. The list of actors interviewed in each district is provided in Table 1.

Table 1: Distribution of sample value chain actors by district

DISTRICT	AGRODEALERS	AGRIBUSINESS/SO-CIAL ENTERPRISES	FARMER COOPERATIVES
Musanze	4	5	4
Nyabihu	4	2	4
Nyagatare	4	4	4
Nyaruguru	4	3	5
Rubavu	5	3	4
Rusizi	4	4	4
Total	25	21	25

Source: (Unique landuse, 2022)

The **field surveys** focused on gathering price information at the wholesale and retail level for different agricultural inputs as well as gathering information on a range of value chain activities such as packaging, storage, marketing, networking, and experiences with counterfeit products. To obtain a broader view of the value chain in the districts, the field surveys also involved a qualitative questionnaire which again asked a range of questions regarding market dynamics, challenges, and opportunities. The survey instrument is contained in Annex 8.1.3.

The **regulatory assessment** focused on understanding regulatory processes and in particular the administrative burden and effectiveness of regulations. The regulatory assessment involved an in-depth literature review (described in Annex 8.1.1) and interviews with private and public sector stakeholders in Kigali. A combination of a simple survey with in-depth interviews was used. The list of stakeholders and interview template is provided in Annex 8.1.2

Key stakeholders from the public sector include the Ministry of Agriculture and Animal Resources (MINAGRI), the Rwanda Agriculture and Animal Resources Development Board (RAB), and the National Agricultural Export Development Board (NAEB), Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA) and the Rwanda

Standards Board (RSB). Key stakeholders from the private sector include fertilizer and pesticide importers, producers and exporters of horticulture, agricultural inputs suppliers and the developers of the Smart Nkunganire System (SNS).

A final set of interviews was conducted with private and public stakeholders to broadly canvas opportunities and challenges for private sector involvement in the fertilizer and pesticide value chains. The list of stakeholders is provided in 8.1.2.

Structure

The report is structured as follows: chapter 2 informs on the current situation on global fertilizer markets and related recent developments in Rwanda. Chapters 3 and 4 are dedicated to the fertilizer and pesticide value chains in Rwanda, provide a detailed mapping of those chains, analyzing the cost-build-up along the different stages. Market trends are assessed highlighting opportunities. The regulatory environment of both chains is examined in the fifth chapter, focusing on the registration of new products and the inspection procedures. A detailed process analysis is provided. Chapter 6 offers detailed recommendations.

2. Rwanda's agriculture sector and recent developments in agricultural input markets

Rwanda is heavily reliant on the agricultural sector that accounts for 25% of exports, 65% of foreign-exchange earnings, and 90% of the country's food needs.⁵ Food crops account for the lion's share of agricultural GDP (77.2% in 2019), followed by livestock and livestock products (15.7%), and export crops (7.1).⁶

Rwanda's agricultural sector is characterized by small farms on sloping land and low productivity. At 499 persons per sq. km⁷, population density in Rwanda is the highest in continental Africa. Consequently, land is scarce, and the average farm household cultivates merely 0.6 ha and owns 2 -5 animals.⁸ Ninety percent of farms are smaller than 1 ha, and a mere 3% of farms exceed 2 ha⁹. While 70% of agricultural production is already carried out on slopes of up to 55% inclination, the pressure on the scarce and fragile land resources is mounting further, and soil erosion and nutrient depletion lead to a deterioration of the quality of agricultural land.

In 2007, the Government of Rwanda (GoR) launched the Crop Intensification Program (CIP) to increase the productivity of priority food crops, achieve food security, and increase rural households' income. CIP has four major components: (1) distribution of improved inputs, (2) land use consolidation, (3) proximity to extension services, and (4) post-harvest handling and storage. The CIP aims to raise the productivity of priority crops, increase the revenues to smallholder farmers and thereby ensure food security through sustainable intensification processes. The general objective of the proposed strategies is to double the productivity levels of the eight priority crops.¹⁰ CIP encompasses an input subsidy program (ISP) that gives farmers access to subsidized fertilizers and seeds. Targeting under the CIP is not specified, with the only restriction that farmers must grow one of the CIP priority crops.

In terms of production, staple crops such as bananas, potatoes, cassava, plantains beans and maize remain the most important crops in Rwanda. Production levels of these crops have grown steadily in recent years. However, the COVID-19 pandemic led to reduced levels of production. For export cash crops, tea and coffee remain the largest export crops, while the highest growth over recent years has been seen in vegetable markets. As seen in Figure 1, horticulture producers have seen strong growth in exports in recent years,

⁵ World Bank. (2019). Creating Markets in Rwanda: Transforming for the Jobs of Tomorrow. Country Private Sector Diagnostic (p. 127). The World Bank Group. <https://www.ifc.org/wps/wcm/connect/46ae22ae-6034-42a7-beb7-42d3c42a6e3e/201906-CPSD-Rwanda.pdf?MOD=AJPERES&CVID=mKmmoCW>

⁶ NISR. (2019). Gross Domestic Product - 2019. National Institute of Statistics of Rwanda.

⁷ <https://data.worldbank.org/indicator/EN.POP.DNST?locations=RW>

⁸ World Bank. (2019c). Future Drivers of Growth in Rwanda: Innovation, Integration, Agglomeration, and Competition. World Bank, Washington, DC.

⁹ Based on the 5th round of the Integrated Household Living Conditions Survey (EICV5), conducted in 2016/17.

¹⁰ The crops covered by the CIP are Irish potato, cassava, beans, maize, wheat, rice, banana and soybean

however the value of exports dropped somewhat in 2020, likely due to covid related restrictions.¹¹ Figure 1 shows the value of exports from 2014 to 2020.

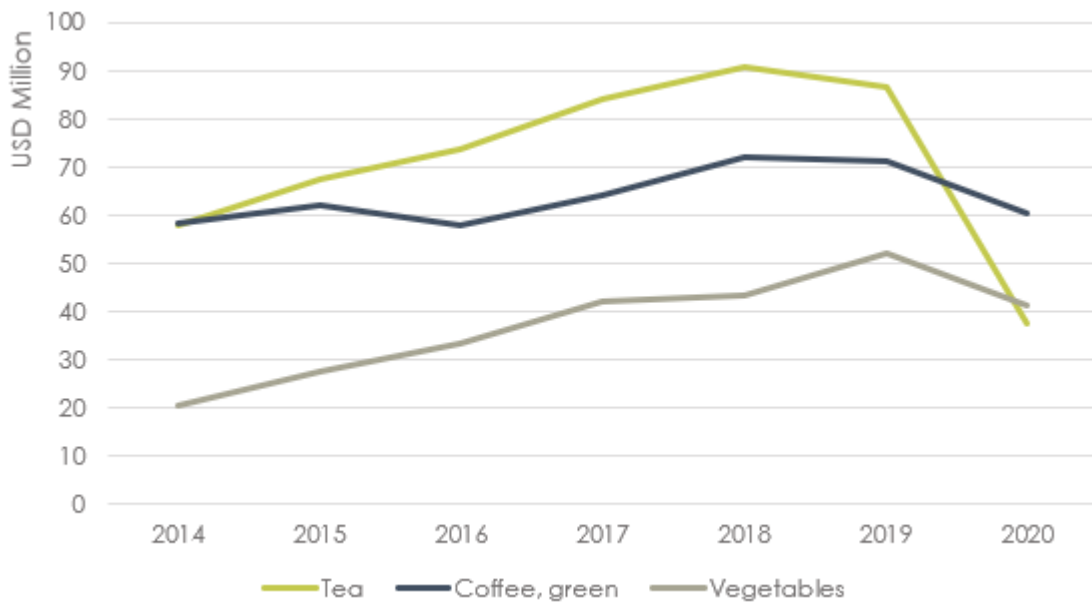


Figure 1: Value of Coffee, Tea and Vegetable exports from Rwanda, 2014 to 2020

Source: <https://www.fao.org/faostat/en> (Accessed 29.04.2022).

Rwanda's agriculture sector has been heavily affected by recent global developments.

International fertilizer prices are under upward pressure due to strong demand, production cuts, escalating input costs, extreme weather, and trade restrictions (World Bank 2021). Several important trade measures were introduced which impacted global markets. China imposed an export freeze in October 2021, and Turkey, Russia and Egypt have also recently restricted exports of various kinds of fertilizer in the interest of maintaining national supplies. On the positive side, several countries have been increasing fertilizer production in recent years – including India, Nigeria and Brunei, which may alleviate some of the pressure on prices in the medium term.

¹¹ For example, Proxifresh, a medium sized horticulture producer, have experienced strong growth and profitability in recent years thanks to increased exports to the European market.

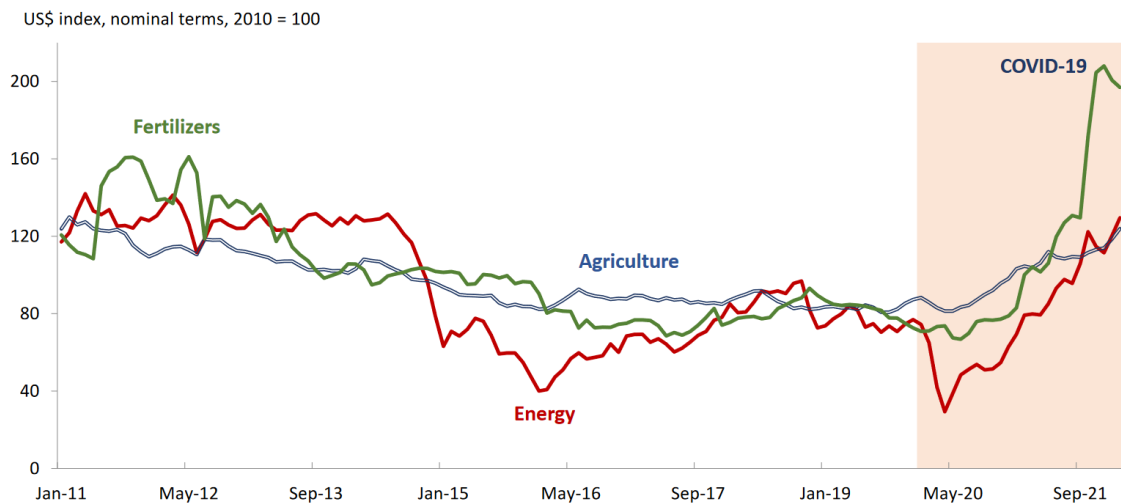


Figure 2: Fertilizer, Agriculture and Energy prices index¹²

Source: (Hebebrand, 2022)

To put the current crisis into perspective, it is important to recognize that energy, fertilizer, and food prices are strongly interrelated. Energy prices are arguably at the core of this interrelationship, as energy prices impact almost every aspect of supply chains, in particular production and transport costs. For example, energy prices make up around 70-80% of production costs of ammonia. Figure 2 shows the level of energy, food, and fertilizer prices over the past decade. Note that the current price surge comes as a time of historically high prices for fertilizer. The shaded area of the chart shows the period since the start of COVID-19 which has drastically impacted supply chains globally.

The Ukraine-Russia conflict has significantly exacerbated this price pressure to previously unseen levels. The main reason is that global fertilizer production is highly concentrated in a small number of countries. Russia supplies 11% of global ammonia, 8% of global phosphoric acid, and 19% of global potash (with Belarus contributing a further 17%) as can be seen in Figure 3. Of the three major fertilizer elements, potash is perhaps the most crucial for global food production because approximately 82% of potash is imported. Embargoes on Russian gas and increasing natural gas prices will likely lead to further pressure on the market. For example, Yara, one of the largest fertilizer producers in the world, recently announced that it would reduce production in Europe by 55%¹³ in response to increased energy costs.

¹² Last observation is February 2022. The green line is a composite of potash, phosphate and nitrogen

¹³ <https://edition.cnn.com/2022/03/09/business/food-costs-fertilizer-yara/index.html>, Accessed 17.03.2021.

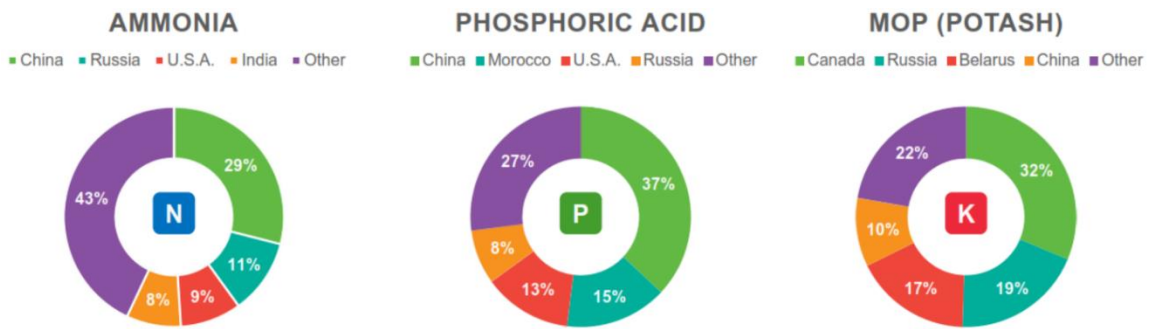


Figure 3: Global fertilizer supply by country

Source. (Hebebrand, 2022)

In Rwanda, the price of urea has doubled, the price of Diammonium Phosphate (DAP) has increased by 94% and the price of Nitrogen, Phosphorous, Potassium (NPK) has increased by 91% (comparing 2022 season B prices to 2021 season A and B). Figure 4 shows the commercial prices and subsidized prices paid by farmers over the last 3 years. The figure also shows the level of the subsidy, which had been stable from 2017 through to 2020.

Reacting to the international price developments, MINAGRI has increased the subsidy level and the level of the price ceiling for various fertilizer types, but this will not be enough to cushion farmers from the dramatic price increases. In response to the dramatic increase in international fertilizer prices, in 2021 and 2022, the government has increased the subsidy on the three main types of fertilizer from 30% to 40% for urea, from 35% to 42% for DAP, and from 15% to 35% for NPK. However, despite the increase in the subsidy, prices paid by farmers in 2022 Season B will be higher than the price ceiling of 2021 for all fertilizer types.

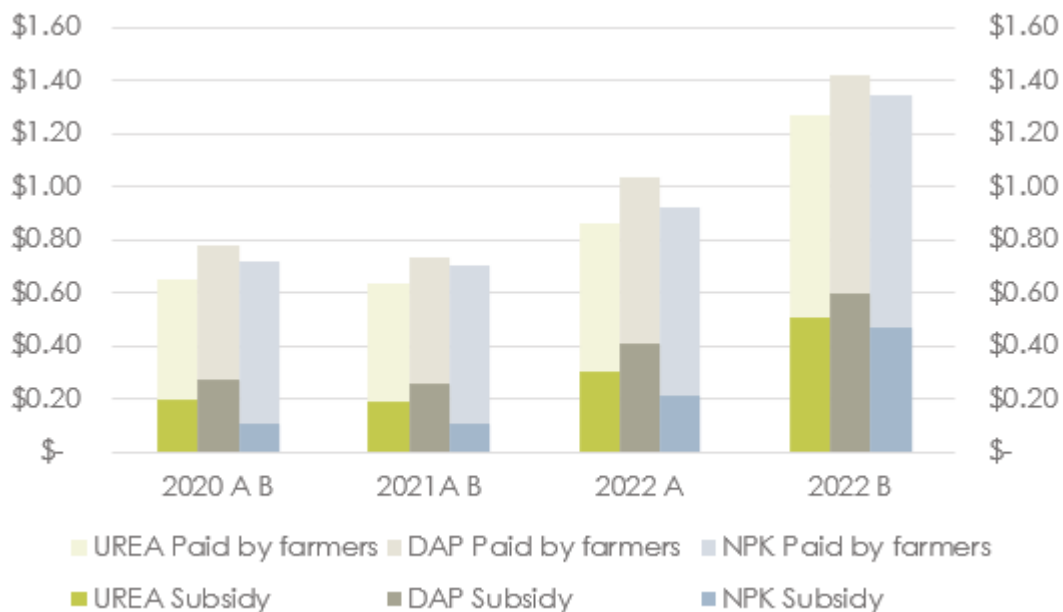


Figure 4: Rwanda fertilizer subsidy levels and price ceilings over time

Source: (MINAGRI, 2022)

Typically, in Rwanda, spending on the Input Subsidy Program (ISP) accounts for around 21% of the annual agricultural budget.¹⁴ The input subsidies are based on fixed rates so that as the price of fertilizer increases, the cost of the subsidy to the government will commensurately increase. It is also important to mention that the ISP in Rwanda is in a constant state of arrears, meaning that funding future fertilizer subsidies as prices rise will become increasingly challenging.

If international fertilizer prices continue to rise in line with expectations, then spending on the subsidy could dramatically increase. Figure 5 gives an approximate picture of how much fertilizer expenditure could increase over the next three years. The estimate reflects the 18% increase in agricultural prices forecast for 2022 in the Commodity Markets Outlook in April this year (World Bank, 2022, S. 4).¹⁵ The large increase from 2021 to 2022 reflects both the stepwise shift in the size of the subsidy and the expected price increase. The largest increase is seen for NPK, where the subsidy will increase from 15% to 35% from 2021 to 2022 Season B. The latest import data is for 2021, which implies that the level of spending could already be at unprecedented and potentially unsustainable levels.

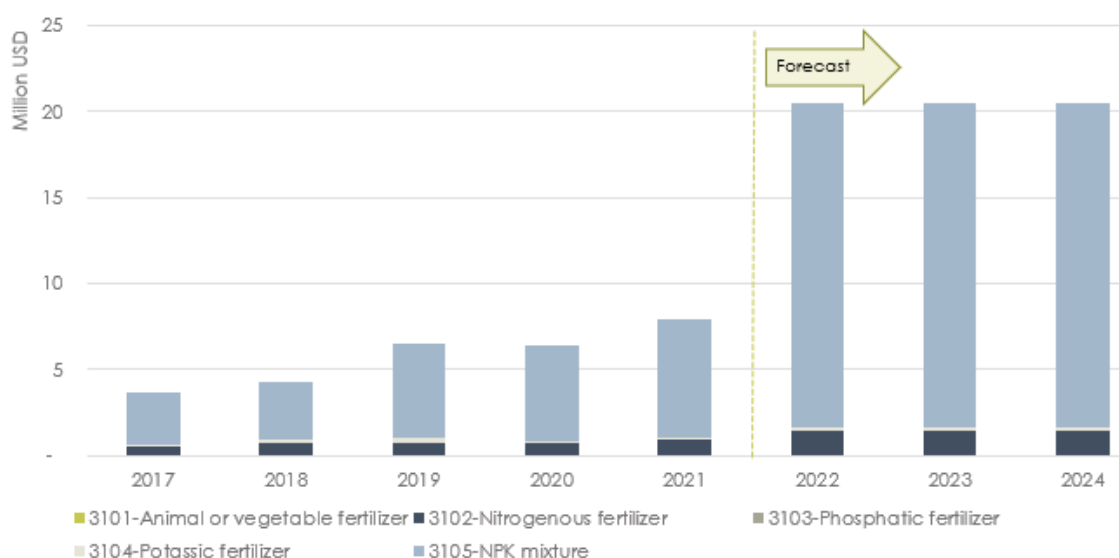


Figure 5: Estimated fertilizer subsidy spending and forecast

Source: (RRA, 2022) (MINAGRI, 2022), (World Bank, 2022)

GoR recognizes that a continuation of the program and rising international prices will lead to a heavier burden on public expenditures and plans a reform of the ISP (MINAGRI, 2022). GoR will adopt a phased approach to reform. During a short period (2022-2023), the current level of subsidy will be continued followed by a gradual reduction of input subsidy rates and the ISP budget (2024-2026), and a complete phase-out thereafter. To ease the transition GoR will invest in complementary areas of intervention such as (i) strengthening extension services for enhanced technical efficiency of fertilizer use, (ii) improving farmers'

¹⁴ (Unique Landuse, 2022, S. 49).

¹⁵ The forecast only includes the increased prices and keeps quantities constant from 2021. Any decrease in quantities would require elasticity of demand analysis which is not available and beyond the scope of this assignment.

capacity and affordability of fertilizer via various strategies, i.e. contract farming and access to finance, (iii) promoting the engagement of the private sector.

Summary

- **Rwandan agriculture is performing below its potential as evidenced by persistent yield gaps for key crops**
- **International prices for fertilizer and energy have increased dramatically in the early part of 2022 and are expected to increase further**
- **In response, the Input Subsidy Program has already increased subsidy rates, and the required spending levels will increase far above previous levels.**
- **There is a reform process underway to phase out the subsidy program creating space for the private sector.**

3. Fertilizer value chain

This chapter will provide an overview of the fertilizer value chain and related market trends and opportunities. The first section provides a brief overview of market trends. The next two sections provide a mapping of the different stages of the value chain and examine the cost build-up from the importer to the final user.

3.1. Market trends

Use of inorganic fertilizer remains low in Rwanda relative to national targets, however the proportion has grown strongly in recent years. Use of mineral fertilizer currently averages 46.6 kg/ha¹⁶, which remains well below the target of 75 kg/ha by 2024, as set out in the National Strategy for Transformation.¹⁷ From 2013 to 2017, the incidence of mineral fertilizer use remained at around 20% of farmers. Since 2018, the share of farmers applying mineral fertilizer doubled to reach 40.9% in the 2021 A season. Figure 6 shows the share of farmers using mineral fertilizer in the main cropping season (A season), over the period from 2013 to 2021. The figure shows results for large-scale farmers (LSF) separately from those for small-scale farmers (SSF) and findings across all households. On favorable, consolidated agricultural land ('LSF'), the use of mineral fertilizer is much more common, with a steep increase from 42.8% in 2018 to 87.2% in 2021.

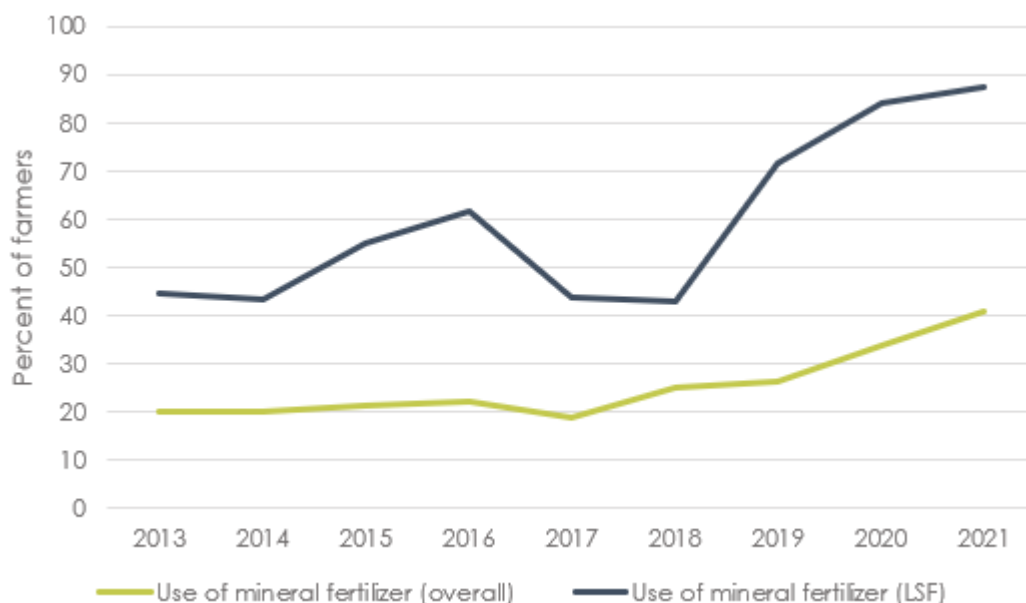


Figure 6: Incidence of mineral fertilizer use in Rwanda, differentiating small-scale farmers (SSF) and large-scale farmers (LSF), A seasons 2013 - 2021

Source: NISR Seasonal Agricultural Survey data

¹⁶ MINAGRI, personal communication, 9th April 2021.

¹⁷ GoR. (2017). National Strategy for Transformation (NST1), 2017-2024. Government of Rwanda. https://www.nirda.gov.rw/uploads/tx_dce/National_Strategy_For_Trsansformation_-NST1-min.pdf

In line with demand, fertilizer imports to Rwanda have shown impressive growth in recent years, with NPK continuing to be the most demanded fertilizer by far. Figure 7 shows imports of fertilizer to Rwanda since 2007; annual growth in the quantity imported has been over 10% for the last decade. Very little animal or vegetable (organic) fertilizer is imported.

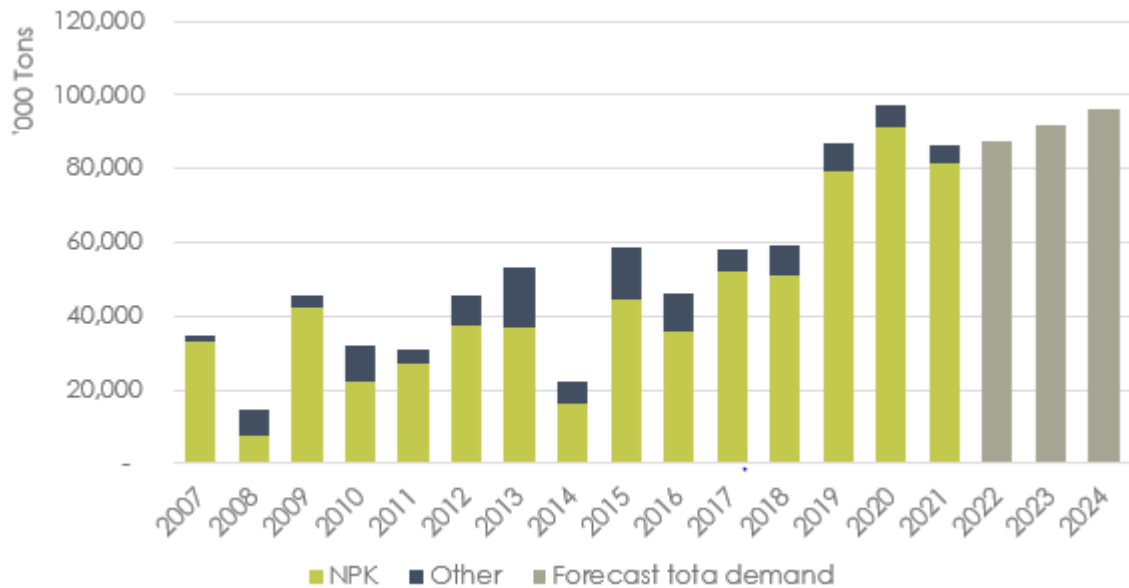


Figure 7: Fertilizer imports to Rwanda over time

Source: (RRA, 2022)

If the rising trend continues total demand in Rwanda may reach almost 100,000 thousand tons in 2024. Figure 7 includes a forecast of demand through to 2024, based purely on historical imports.

However, actual demand is sure to be impacted by the rising fertilizer prices. Globally, farmers are responding to the rising fertilizer prices by reducing the amount of fertilizer used, reducing cropped areas, or by switching to organic fertilizer. There is also a trend among farmers from wealthier nations to stockpile fertilizers in anticipation of even higher prices. To produce enough food, farmers, particularly in African nations, are turning to organic sources of fertilizer such as chicken and cow manure, as a substitute for the synthetic fertilizer that they can no longer afford (Polansek, 2022).

While evidence on soil nutrients points to the need for a greater variety of fertilizer types, including customized blends, to be utilized, fertilizers sold by the retailers are dominated by three types of fertilizer: DAP, NPK and Urea. Soil nutrient maps developed for Rwanda show deficits in a wide variety of elements, including calcium, magnesium, sulfur, copper and boron (Nkurunziza, 2020). A 2018 paper by the Alliance for a Green Revolution in Africa (AGRA) also showed that recommended fertilizer application rates from fertilizer importers/producers were significantly higher than government recommendations (AGRA, 2018). The types of fertilizer sold by suppliers (Agrodealers, Agribusinesses and Farmers cooperatives), is shown in Figure 8. Improved application of soil-specific fertilizers that are targeted to these soil deficiencies would greatly improve yield and soil health in the affected regions.

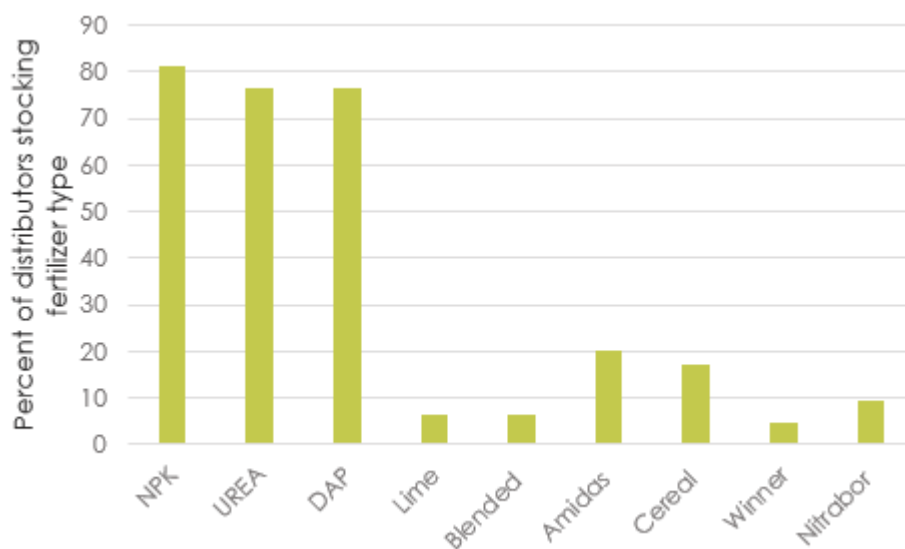


Figure 8: Types of fertilizer sold by retailers interviewed¹⁸

Source: (Unique landuse, 2022)

The Government of Rwanda has invested in a parastatal company to start blending. In 2021, the GoR entered a fertilizer joint venture partnership with APTC Ltd and the Moroccan company Office Cherifien des Phosphates (OCP).¹⁹ The trio have jointly set up a fertilizer blending plant in Rwanda (currently still under construction) to produce, market and distribute fertilizers registered with RDB (Rwanda Development Board) as Rwanda Fertilizer Company Ltd. Since farmers and agriculture experts in Rwanda have expressed concerns over the use of blanket fertilizer recommendations, the new company is updating soil maps to produce fertilizer blends that are tailored to site-specific nutrient deficiencies based on scientific data in the future.

The share of farmers using organic fertilizers has been increasing in recent years. Sixty-seven percent of farmers used organic fertilizer in 2021 Season A²⁰ up from around 55% in 2019. Figure 9 shows the incidence of organic fertilizer use over time differentiating small-scale farmers (SSF) and large-scale farmers (LSF). There is no definitive trend in organic fertilizer use, although high prices for synthetic fertilizer is likely to increase demand. While the use of organic fertilizer is relatively high in many districts (over 70% in more than one third of districts in Rwanda), few farmers are organic certified due to the costs of obtaining certification.²¹

¹⁸ Sample of 71 retailers surveyed

¹⁹ The Agro-Processing Trust Corporation (APTC) is a parastatal organization involved in multiple agricultural activities

²⁰ (NISR, 2021).

²¹ (NISR, 2021), <https://www.newtimes.co.rw/business/organic-farming-more-profitable-ordinary-practises>

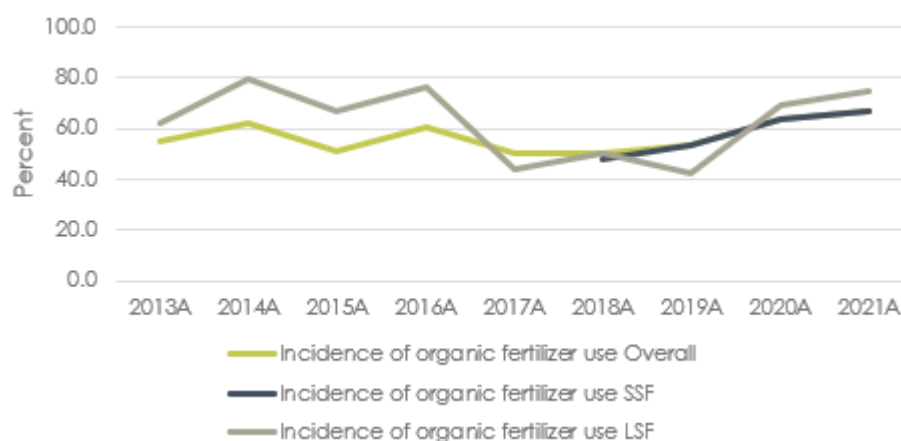


Figure 9: incidence of organic fertilizer use over time by farmer type

Source: (NISR, 2021)

In particular, the application of lime seems to be limited in Rwanda. There are only two districts in which is lime used by more than five percent of farmers. Knowledge about the advantages and opportunities of organic fertilizer is low among farmers. According to Palladium (2020), the CIP has been promoting lime around the Congo-Nile Ridge, resulting in increased lime use (19% of farmers) in the Nyaruguru region.

Organic certified producers have established successful businesses in Rwanda using their own production of organic fertilizer. While commercial production of organic fertilizer in Rwanda is still in early stages, there are examples of successful businesses pursuing this option.²² Ikirezi produce essential oils using eucalyptus (which does not need any agricultural inputs) and other herbs which are produced using an outgrower scheme. The outgrower areas are within a designated area where the integrity of the organic production style can be maintained according to the ECOSA standard.²³ Pride Farms is another organic horticulture producer that secures land and carries out agricultural activities (growing horticulture products) by hiring trained manpower. Pride farms contract farmers to supply crops at a future time and meeting certain requirements; in return, they agree to make the purchase (mainly at a pre-agreed price) and may provide other support (advancing seeds, fertilizers and crop protection products and small agricultural equipment).²⁴

3.2. Mapping the fertilizer value chain

This section describes the different stages of the fertilizer value chain. It focuses on inorganic fertilizer, which is the dominant form in Rwanda.

²² One of the leading producers is waste management company COPED which also partners with Swiss based trading house Sucafina. <https://www.copedgroup.rw/>, <https://group.sucafina.com/news/sustainable-development/page-2/making-biofertilizer-rwanda/> Accessed 5.05.2022

²³ Organic production can be contaminated by the inorganic production methods on neighboring farms. Ikirezi focus on converting the farms adjacent to their plots to organic production in order to have a buffer zone to ensure that their produce meets organic standards. They plan to make the entire village where they produce be organic.

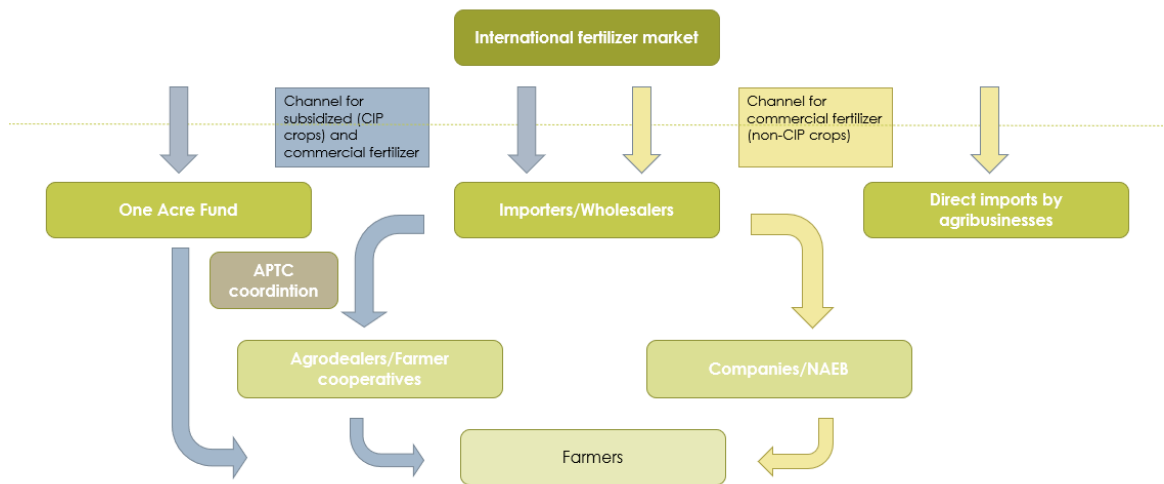


Figure 10: Stages of the Fertilizer Value Chain

Source: Unique landuse research.

The fertilizer value chain can be divided into a publicly managed channel for subsidized fertilizer and a commercial non-subsidized channel. The structure of the publicly managed channel for subsidized fertilizer is illustrated by the figure below.

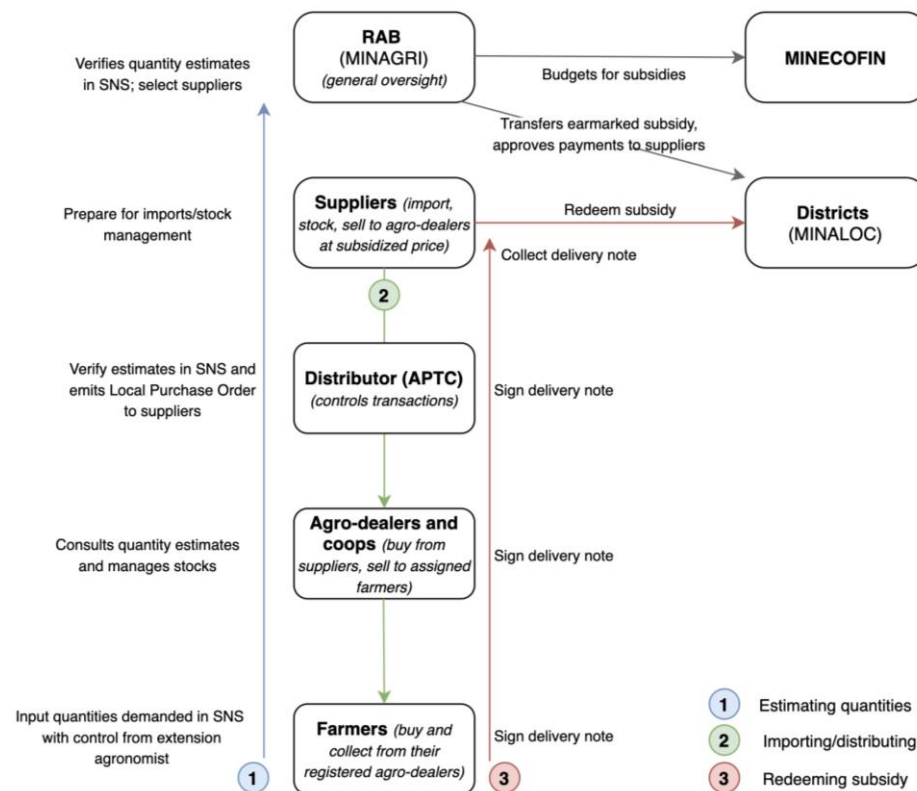


Figure 11 The fertilizer subsidy scheme

Source: (Unique Landuse, 2022)

The Agro Processing Trust Corporation (APTC) acts as a coordinator for the Input Subsidy Program via the subsidized market channel and has a role on both the supply and demand

side of the subsidized fertilizer market. APTC is a government-owned company involved in multiple agricultural activities.²⁵ On the demand side, APTC collaborates with sector agronomists in the districts to develop a list of farmers, their cultivated area, and to determine fertilizer demand through the Smart Nkunganire System (SNS). The Smart Nkunganire System (SNS) has been in use since 2017 and is used by agrodealers to determine input requirements and facilitate distribution. The SNS is complemented by the MOPA system. The SNS was developed by BK TecHouse in collaboration with RAB. The system allocates inputs based on the size of farmers plot and the crop that they are planning to sow. Critical issues identified with the system include the registration of farmers who are renting land, and the inability of agrodealers to sell outside of their designated areas. Suggestions to improve the system would be to develop a means of recognizing rental contracts for farmers who do not own their land, and to introduce flexibility for agrodealers in terms of their clients. For example, if agricultural inputs have not been collected after a certain date, they become open for sale to any customer rather than being reserved for the farmer under the SNS.

On the supply side, APTC acts as a distribution agency and agrodealers and farmer cooperatives under the ISP purchase fertilizer from importers through the APTC. The APTC receive a payment per kilogram of fertilizer from the Rwanda Agriculture and Animal Resources Development Board (RAB) for their service as a government distributor. This payment covers the costs of transport from the importer warehouse to the agrodealers as well as other costs associated with the distribution system. Forty Rwf per kg (4 US cents) from this payment is given to agrodealers²⁶.

The value chain for unsubsidized fertilizer is diverse, including outgrower schemes and direct imports. Many larger companies import non-subsidized fertilizer directly to their businesses. These businesses can use out-grower systems or have production directly on their own premises. Outgrower farming schemes often involve a company providing a bundle of agricultural inputs to farmers, including seeds, pesticide, fertilizer as well as training. The cost of these inputs is deducted from the price paid to outgrowers at the time of harvest. Prices for these unsubsidized agrochemical inputs can vary significantly over short time spans. Conversely, coffee and tea production have very different models. Coffee is produced by smallholder farmers with strong encouragement and some financial support from the National Agricultural Export Development Board (NAEB). Tea producers do not receive direct financial support from NAEB for fertilizer inputs, but rather benefit from NAEB's promotional activities and export networks.²⁷ Due to the support from NAEB, this value chain is not strictly commercial.

²⁵ (TASAI, 2021)

²⁶ Supplier agreement with APTC, 2022.

²⁷ NAEB is a commercial public institution that advises on policy, and strategies for developing agricultural and livestock product exports among other functions. See <https://naeb.gov.rw> for details

Importers

All inorganic fertilizer used in Rwanda is imported. Fertilizer is shipped to the regional east African ports of Mombasa or Dar Es Salaam and then transported to Rwanda. Both ports are located more than 1,300 kilometers driving distance from Kigali.

In recent years, imports of fertilizer have been dominated by three companies: Yara Ltd, One Acre Fund, and ETG Inputs Ltd. While import licenses for fertilizer are held by many companies, the Government of Rwanda tenders out import contracts for subsidized fertilizer to a select number of companies on a biannual basis under the input subsidy scheme. These companies effectively import all subsidized fertilizer into the country. The proportion of total fertilizer imports by each of the three major companies as well as Rwanda Fertilizer Company, is shown in Figure 12.

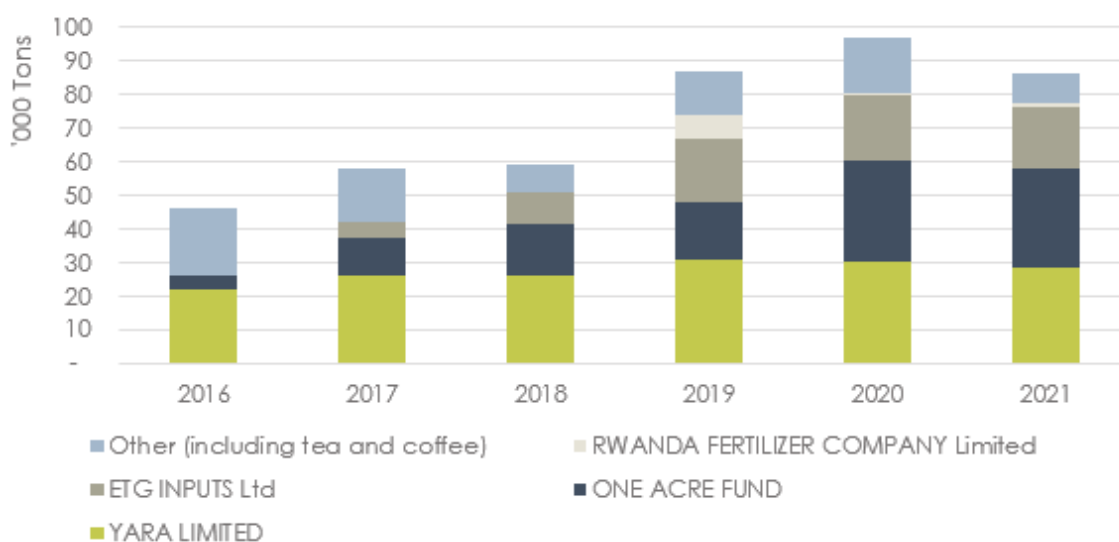


Figure 12: Share of Rwanda fertilizer imports

Source: (RRA, 2022)

Yara has maintained a relatively constant level of imports while ETG and One Acre Fund have grown in recent years. The “other” including tea and coffee has seen fluctuating imports. Imports generally saw a decline in 2021, potentially because of increased global prices. If that is the case, imports in 2022 may also see a downturn.

The social enterprise, One Acre Fund, has shown significant growth over the past five years, with the number of farmers served going from 164,000 in 2016, to 631,400 in 2020. The social enterprise has grown at an annual rate of 31%, which fits to the local name, Tubura, which translates as „to grow exponentially “. One Acre Fund pursues an innovative business model that has proved successful in other countries across East Africa (see Box 1). The strong growth of One Acre Fund in recent years shows the importance and success of this business model.

One Acre Fund is expanding its operations dramatically, to the point where it has become the main/only supplier of subsidized fertilizer in several districts. One Acre Fund is the

main/sole fertilizer supplier in Rusizi, Rubavu, Musanze and in 11 sectors of the Nyagatare district. It is also considered to be a major supplier in Nyaruguru and Nyabihu. In Rusizi, a relatively remote region in the Southwest of Rwanda, One Acre Fund has expanded operations to the point where Yara Ltd has now closed its store in Rusizi.

Box 1: One Acre Fund

The One Acre Fund (OAF) business model is to supply farmers with everything they need to grow more food and earn more money. This includes training on planting, crop health and soil health, as well as agricultural inputs such as seed and fertilizer. The Fund also provides farmers with credit, crop insurance and a market for cash crops.

One Acre Fund is active across Eastern and Southern Africa, with operations in Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Ethiopia.

One Acre Fund in Rwanda can sell direct to farmers or act as an agrodealer supplying fertilizers through the APTC. One Acre Fund provides quality farm inputs on credit, which farmers repay over the full growing season. Farmers in the One Acre Fund program pay 75% of the price directly for fertilizer and repay the remaining 25% in installments after harvesting. The products are delivered within walking distance of farmers homes, in time for planting. Farmers are also trained in the latest agricultural practices as well as in marketing.

While the focus of the Fund is on agricultural production, it is not limited to working with smallholder farmers. One Acre Fund have also co-launched a seed plant in Rwanda and are supporting tree planting in Ethiopia and Malawi.

One Acre Fund is registered with the RAB and provides inputs under the Input Subsidy Program/Crop Intensification Program.

Source: One Acre Fund website, <https://oneacrefund.org>, accessed 28.04.2022.

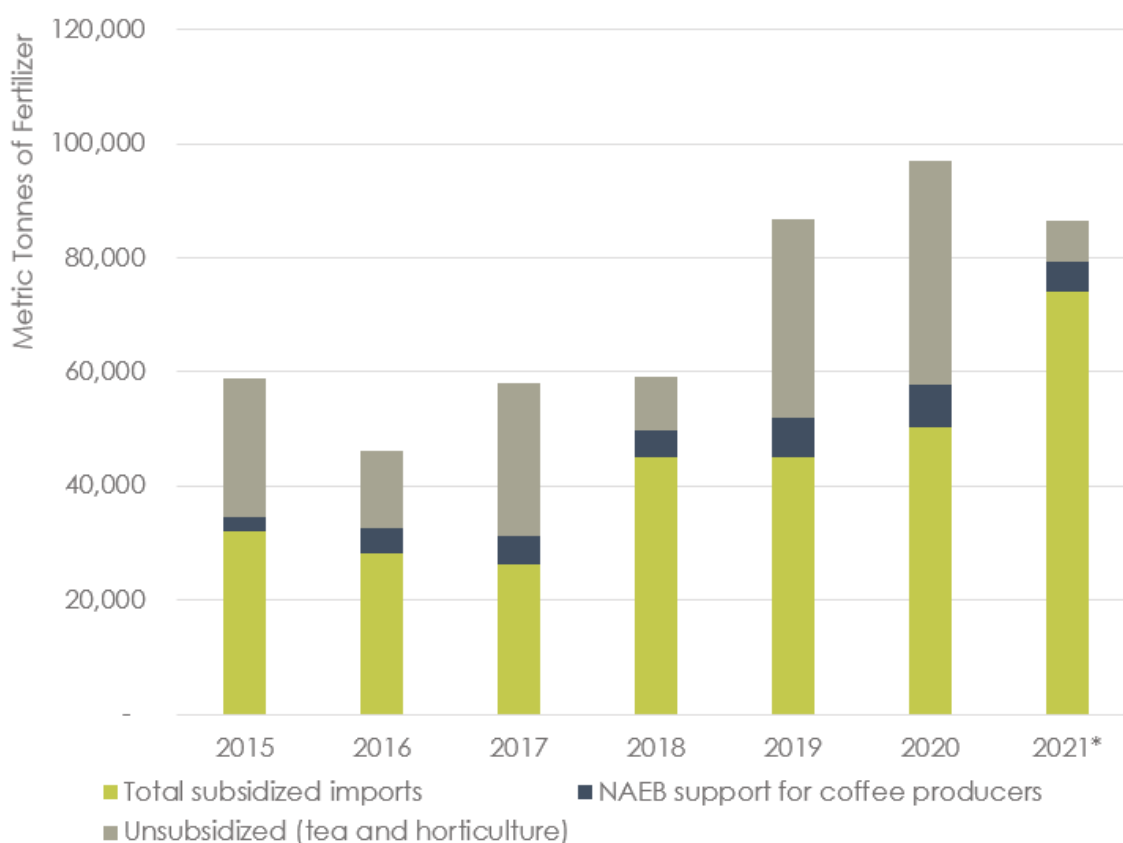


Figure 13: Subsidized versus unsubsidized imports of fertilizer over time

Source: RRA Customs data, RAB, MINAGRI Input Subsidy Program data *The authors suspect that 2021 total imports is likely to be an underestimate due to the time required to process import information at the RRA.

Subsidized imports make up most fertilizer imports, however the proportion varies over time and unsubsidized fertilizer imports are substantial. As can be seen in Figure 13, the amount of subsidized imports is generally slightly higher than the amount of unsubsidized fertilizer, however the unsubsidized fertilizer does make up a large proportion of total demand showing that there is strong demand for unsubsidized fertilizer. This demand comes from the tea and horticulture subsectors. Total imports in 2021 is likely to be lower than the actual amount due to data processing times at the Rwanda Revenue Authority (RRA).

Agrodealers

Rwanda has more than 1,754 agrodealers, with 3,114 agrodealer outlets around the country. These agrodealers sell subsidized fertilizer (and seeds) and many sell other agro-inputs such as pesticides. Agrodealers are registered by RAB in an ISP database. Unregistered dealers sell commercial fertilizer. In 2018, Rwanda began to award licenses to agrodealers, which certify their authorized retail status in the country. The licenses are awarded by the Ministry of Agriculture through Rwanda Inspectorate, Competition and Consumer, Protection Authority (RICA), which has an updated list of these licensed agrodealers. Dealers under ISP are not necessarily licensed. Nevertheless, their businesses are tolerated as they receive preferential treatment because they work with RAB. Nine in ten Agrodealers interviewed were registered with RAB/CIP, while just over half were licensed with RICA.

A RICA license is an assurance to customers that an agrodealer is selling quality, safe products. The RICA license is also an assurance to agrodealers that they can continue to operate. RICA also provide training, advice on managing an agrodealership, and easier access to payments from the government for subsidized fertilizers. Businesses that operate without a RICA license can face difficulties in securing storage facilities, or in making sure that they fulfil the requirements needed to trade fertilizers. Some agrodealers feel that selling inputs under the ISP without a RICA license will not be possible in the future.

The Rwanda Agro-Input Development Association (RAIDA) is much less known in the districts, with only one quarter of agrodealers registered with RAIDA, and most being unaware of it. Although fewer agrodealers are RAIDA members, being a member helps by keeping agrodealers informed regarding different fertilizer/pesticide types, and any changes in the legal status such as newly available or prohibited products. However, some RAIDA members do not recognize a meaningful benefit from membership.

Agrodealers are restricted in terms of the area and farmers that they can supply to. Under the Smart Nkunganire System (SNS), agrodealers are not allowed to sell fertilizers to farmers outside of their "cell" or to farmers not approved by sector agronomists. Agrodealers are also dependent on the system for stocking their stores, and they have no freedom to react to delays or shortages by sourcing fertilizer from elsewhere.

The Mobile Ordering and Processing Application (MOPA) can improve the efficiency of agrodealers, but some farmers complain that it introduces more uncertainty. The MOPA system enables agrodealers to see into the stores of supplying companies and know where they can get the type of agro-inputs they are looking for without going to their warehouses. This technology has reduced the use of paper in keeping stock records and has made it easier for agrodealers to conduct stock inventories. MOPA is also used to allow farmers to place orders for fertilizer. However, the MOPA system has the same restrictions as the SNS system; for example, farmers operating on rented plots cannot register their plots with MOPA. Further, the MOPA system does not allow for orders to be placed or changed in mid-season. The MOPA system can be impacted by internet connectivity issues, and sometimes the system is not properly harmonized with the SNS, which can lead to delays.

Large-scale agribusiness companies

Large scale agribusinesses and companies are mainly active in three sectors: tea, coffee and horticulture. Each of these crops have different market structures and receive different levels of support from the Government. The tea sector is largely organized into farmer co-operatives, while horticultural production is made up of a mix of different small and medium enterprises with a range of different business models. Coffee production is spread across 400,000 smallholder farmers²⁸. The National Agricultural Export Development Board (NAEB) supports the tea, coffee, and horticulture sectors in various ways. Coffee producers receive direct support in the form of technical assistance, inputs, and planting material, to

²⁸ <https://naeb.gov.rw/index.php?id=48> Accessed 4.05.2022

encourage coffee production. Tea and horticulture producers benefit via networking, promotional activities, and policy development.

NAEB is responsible for coordinating the coffee subsector. NAEB provides farmers with support in the form of pesticides and fertilizer, to incentivize smallholder farmers to produce coffee. The cost of these inputs is taken out of the final price offered by NAEB for the coffee when it is delivered to a coffee washing station. As with imports under the ISP, NAEB contracts importing services directly to a major importer. NAEB fertilizer imports are generally done by YARA Ltd; however, this process is re-tendered every year. The fertilizer product imported for coffee is NPK 22-6-12 and Sulphur. Support to coffee producers in terms of the amount of fertilizer supplied annual is shown in Figure 14.

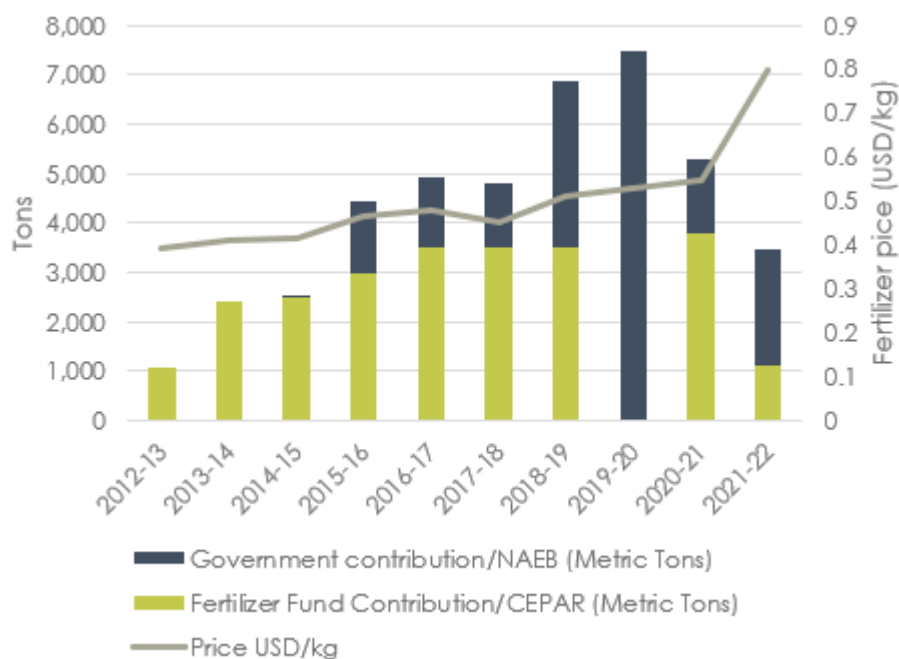


Figure 14: NAEB and CEPAR agri-input contribution to coffee producers

Source: (NAEB, 2022)

The size of the combined contribution of Coffee Exporters and Processors Association of Rwanda (CEPAR) and NAEB to the coffee sector is non-trivial, and rivals that of the ISP.

CEPAR is a non-political and non-profit membership organization of coffee farmers in Rwanda. CEPAR takes a fee from exported coffee and uses it to purchase bulk fertilizer and pesticide (USAID, 2018). Figure 15 provides a comparison of the supports to coffee farmers relative to the supports to crops under the input subsidy program. The support, considering that this is only one crop as compared to eight under the ISP, is quite substantial. The subsidy reform proposed in the recent cabinet paper will not include this support to coffee.

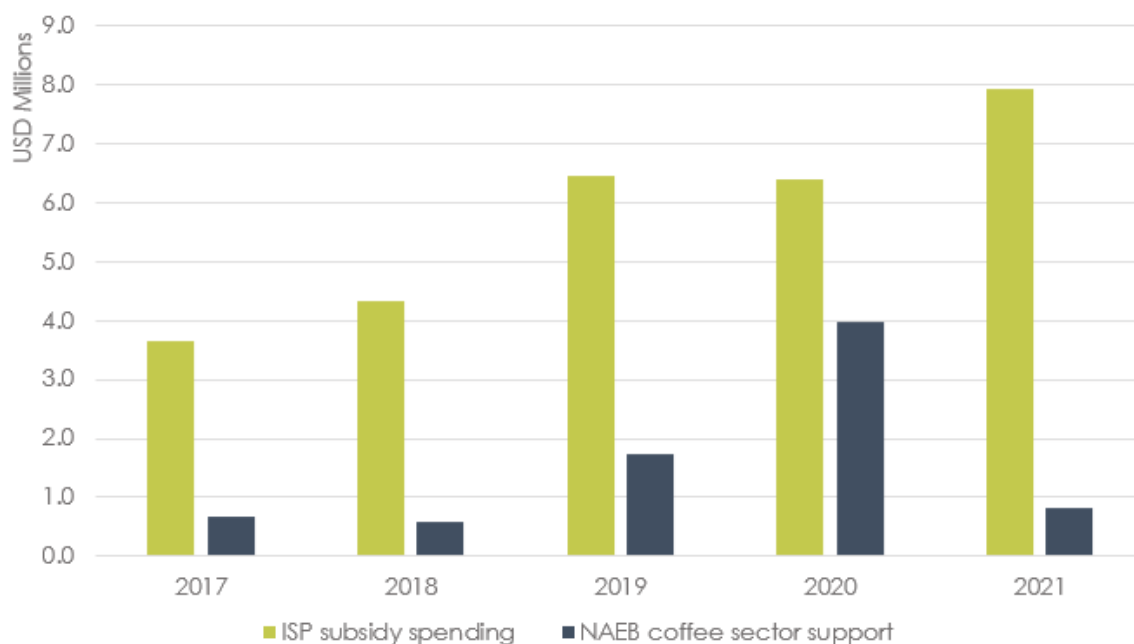


Figure 15 Estimated Size of ISP support and NAEB support to the coffee sector

Source: (RRA, 2022) (MINAGRI, 2022), (NAEB, 2022)

Farmers in the districts complain that the distribution system for NAEB fertilizers and pesticides does not provide sufficient inputs.²⁹ The distribution system for NAEB agricultural inputs is complicated by the fact that farmer cooperatives are not allowed to store those agro-inputs in their own storages. Instead, NAEB fertilizers are distributed to cells where farmers come to collect them for immediate use. The amount of fertilizer provided to the farmers depends on the number of trees they have. The quantity of fertilizer provided has decreased recently; it was 100g per tree, but in recent times farmers have only received only 30g per tree, which farmers say is insufficient. Pesticides are not given to farmers but are sprayed by the cooperatives and cell delegates in all farmers' coffee plantations.

The import of agricultural inputs for tea production is done by the private sector with no government subsidies. There are more than 24,000 hectares planted with tea in the Northern, Western and Southern provinces. There are 18 privately owned operational tea factories, 2 ongoing tea projects and more than 43,000 tea farmers organized in 21 cooperatives and 2 out growers' services companies.³⁰ Major fertilizer and pesticide importers within the tea industry include Rwanda Mountain Tea and Rwanda Tea Association. Tea production utilizes NPK 25-5-5 plus Sulphur and the annual amounts used are shown in Figure 16.

²⁹ Refer to Figure 10 for an overall understanding of the distribution channels and the various bodies involved in the fertilizer value chain.

³⁰ <https://naeb.gov.rw/index.php?id=44> Accessed 4.05.2022

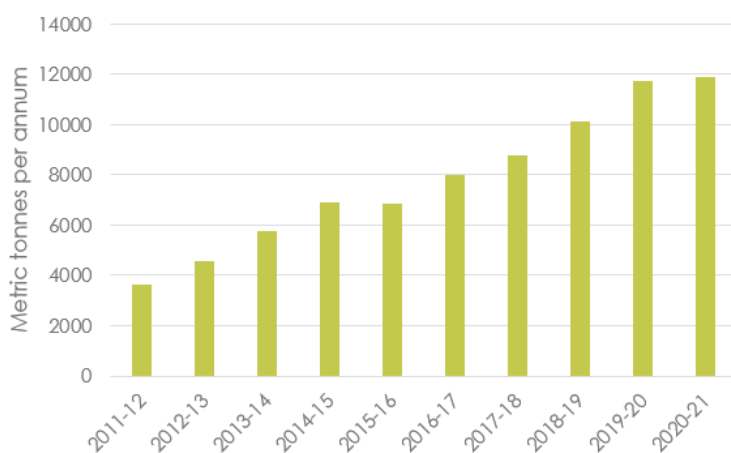


Figure 16: Use of mineral fertilizer in tea production

Source: NAEB

The horticulture sector is very diverse and includes many different business models. Horticultural crops are outside of the subsidy system as the crops that are produced do not fit within the Crop Intensification Program.

Farmers

High prices and difficulties in the fertilizer distribution system are widely seen as the most significant barriers to increased fertilizer use. Farmers stated that they face difficulties to register their land under the SNS, particularly where the land is rented. Farmers also mentioned that the arrangement under ISP whereby specific agrodealers provide limited amounts of fertilizer to farmers is inefficient and often leads to delays. Delayed supplies are a significant issue because the timing of fertilizer application is crucial for production (Unique landuse, 2022). Farmers cannot order extra stock within one season even if the current stock is depleted and more generally the timing of input provision can be uncertain. Delays can be due to a variety of factors, sometimes due to errors in the SNS system itself³¹.

The eligibility requirements for the subsidy scheme sometimes prevent farmers from receiving agricultural inputs. Access to subsidized inputs requires farmers to demonstrate their ownership of land title. This can lead to some farmers not having access to fertilizers – particularly for farmers who are renting land.

Farmers also complained that the Nkungarie system did not provide sufficient quantities of fertilizers. For example, the system does not allow farmers to purchase fertilizers for more than two seasons (in Rubavu district there are three cropping seasons). Farmers also said that due to soil quality decline, they require more than the designated amount of fertilizer allocated under the Nkungarie system. Farmers also claimed that the MOPA system provides insufficient quantities of fertilizer and doesn't account for land area properly.

As many farmers are not able to access enough fertilizer, they are forced to adapt production methods to available inputs. Some farmers choose to use recommended amounts

³¹ (Unique landuse, 2022)

on a limited amount of land, others choose to apply a lower amount over a greater area. In both cases this is not ideal, and the lack of capital means that farmers are unwilling to experiment with new products.

3.3. Cost build-up

This section describes the cost structure of the fertilizer value chain. The key cost items in the value chain are storage and transport costs.

The retail price in rural Rwanda is a function of various costs including procurement, port handling and clearing, transport and transaction, financing, border clearing, and other local distribution charges. Due to the diversity of business models, it is not possible to provide a standardized cost build up for unsubsidized fertilizer here.

The import price minus the subsidy accounts for 71-76% of the final price of fertilizer. Costs of storing and transporting fertilizer to the districts accounts for a further 13-20% of the final retail price. Importer costs include storage, handling, quality assessment and distribution to the district agrodealers and other suppliers. The agrodealer costs include processing orders, storage costs and other costs associated with running a supply store such as utilities and staff costs. Figure 17 shows the build-up of prices from imports at the border to the retail price offered by distributors to individual farmers.

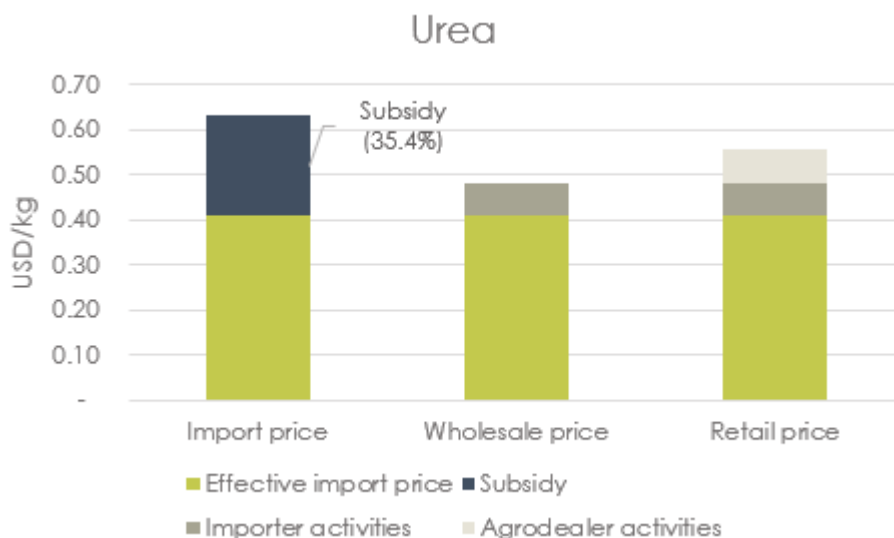


Figure 17: Urea value chain

Source: Wholesale and retail prices: (Unique landuse, 2022); Import price: (RRA, 2022); Subsidy rate: (MINAGRI, 2022)

Fertilizer retail prices offered to farmers are lower than import prices because of the generous subsidy offered by GoR. For subsidized fertilizer imports, prices at each stage of the value chain are limited by the size of the fertilizer subsidy and the price ceiling. The conditions of the import tender are negotiated at the start of each agricultural season with the major importers as described above. This contract sets the upper and lower bounds of the prices. The difference between wholesale and retail price is similar for all fertilizer types.



Figure 18: DAP and NPK value chain

Source: (RRA, 2022) (Unique landuse, 2022)

While road infrastructure is reported to be quite good for most districts, issues were reported for the southern districts of Rusizi and Nyaruguru. Poor roads in these districts mean that the supply of agricultural inputs can be unreliable and weather dependent. While no price differential based on travel distance was discernable from the survey data, field reports from Rusizi and Nyaruguru stated that transport infrastructure is a constraint in the supply of inputs – particularly during periods of poor weather conditions. Farmers in all the districts collect their fertilizer from the distributor (Unique landuse, 2022).

Transport costs for fertilizers under ISP are covered by the fertilizer subsidy. The APTC are responsible for compensating transport costs between importers and agrodealers. Agrodealers are paid a small amount depending on their location (see Table 2). Transport costs from Kigali to the districts are covered by suppliers. Transporters are also paid 1Rwf per kg for loading and unloading of product onto trucks.

Table 2: Transport subsidy rates

DISTRICT	TRANSPORT SUBSIDY PAID TO AGRODEALERS*
Rubavu	12 Rwf/Kg regardless of the sector within district
Rusizi	15 Rwf/Kg. However, it is 25 Rwf/Kg for sectors which are far (e.g. Gikundamvura Sector)
Nyaruguru	13 Rwf/Kg on average, but varies between 8-16 Rwf/Kg
Nyagatare	15 Rwf/Kg for sectors which are nearby the city of Nyagatare, and 17 Rwf/Kg for sectors which are far away.
Nyabihu	10-15 Rwf/Kg

Source: Agrodealer interviews in the districts, 2022. * Note values presented in Rwf because in USD this would not register (from around 0.9 to 1.5 US cent).

Access to storage and storage costs do not appear to be major constraints for suppliers in the districts. From the district survey, 95% of agrodealers, and 100% of agribusinesses reported having access to storage. While this figure was lower among farmer cooperatives (68%), storage was not seen as a major constraint from stakeholder interviews and in fact many larger importers are improving access to storage in regional areas. The largest cost

associated with storage is the establishment cost, which is often provided by MINAGRI.³² The average capacity of a storage facility is 50 tons, and it costs on average 6,300 USD to establish a storage facility. The average storage costs (excluding establishment costs) are 17 USD per ton for one month of storage, including operating costs, utilities, and other costs. These costs are presented in Table 3.

Table 3: Average storage costs for suppliers at the district level

COST CATEGORY	RWF/TON	USD/TON	USD/KG
Establishment cost	222,469	220	0.22
Operating costs permanent staff	9,964	10	0.01
Operating costs casual staff	2,369	2	0.00
Utility costs	155	0	0.00
Other costs	4,778	5	0.00
Total costs	239,734	237	0.24

Source: (Unique landuse, 2022)

There appears to be little scope for recuing cost from the current value chain. For subsidized fertilizer, the difference between the wholesale and retail prices ranges from 5 to 7 US cents per kg for all fertilizer types. Figure 17 and Figure 18 show that the price build-up occurs mainly pre-import, and then bulk of costs are accumulated on route to the distributor and at the distributor level. Production of synthetic fertilizer within Rwanda is not a realistic option in the short-term future given the significant resources required in terms of energy, minerals, expertise.³³

Packaging fertilizer can be an opportunity for suppliers to diversify and tailor their products to their customers, but in the current market this is not cost effective. Farmers can buy fertilizers from agrodealers either in bags (50 Kg or sometimes 25 Kg) or simply by weight from open bags. For many Rwandan farmers, bags of five, ten or 25 kilograms are more suitable than standard 50-kg sacks, since they are cultivating small plots and face credit constraints. The law does not prohibit the sale of fertilizer from opened bags and retailers may split the 50 Kg bags into smaller units of up to 5 kg, according to farmers' demand using un-standardized repackaging. This process can result in quality deterioration and/or adulteration with foreign materials. Thus, while repackaging fertilizer can offer some benefits to farmers, it also introduces a quality risk.

Agrodealers and importers cannot extract a meaningful price premium for repacking fertilizer into smaller packages for individual farmers. Importers cite re-packaging fertilizer into smaller bags as a significant cost. Although encouraged by the Government, repackaging

³² The Hinga Weze project noted that storage facilities are often available but underutilized in the areas where the project was active

³³ For ammonia production for example, natural gas reserves and phosphate deposits are needed, along with existing mining capacity. Significant infrastructure in terms of energy, roads, buildings, and technical expertise is also required. A large water mass is also needed; hence this is not a realistic possibility in the medium term for Rwanda.

fertilizer is seldom done in practice due to the very tight margins faced by importers.³⁴ While 22% of fertilizer distributors survey reported repackaging fertilizer, evidence from the field survey could only determine a very small price premium associated with this practice for agrodealers, as shown in Table 4. This may be due to the price ceiling imposed on subsidized fertilizer, meaning that fertilizer is sold at or close to the highest allowable price, regardless of the quantity sold.

Table 4: Agrodealer price for repackaged fertilizer

FERTILIZER	NON-REPACKAGED FERTILIZER AVERAGE RETAIL PRICE (USD/KG)	REPACKED FERTILIZER AVERAGE RETAIL PRICE (USD/KG)
DAP	\$0.62	\$0.63
NPK	\$0.67	\$0.70
Urea	\$0.56	\$0.56

Source: (Unique landuse, 2022)

Summary

Key issues

- High prices and difficulties in the fertilizer distribution system are widely seen as the most significant barriers to increased fertilizer use. Market prices are rising rapidly in 2022 and there is generally a global shortage of fertilizer due to the Ukraine Russia conflict meaning that there is potentially a serious food security issue looming for Rwanda
- The cost of imported products makes up a large proportion of the fertilizer retail price and reducing costs within Rwanda will not have a substantive impact on retail price.
- There is significant market concentration in the fertilizer import market, especially in terms of importing companies. In terms of distribution, One Acre Fund has effectively acquired a monopoly in several districts.
- The size of NAEB support to the coffee sector is non-trivial in comparison with ISP support provided to CIP crops. It faces similar issues related to effectiveness and efficiency but will not benefit from the upcoming subsidy reform process.

Opportunities

- The market for fertilizer is growing and there is unmet demand for soil specific fertilizers, micronutrients, and affordable alternatives to chemical fertilizer.

³⁴ According to Ministerial Order No 002/11.30 of 14/07/2016, The packages of agrochemicals are made upon consideration of the following: the range of packages provided can be safely and appropriately used by small scale farmers and other users.

- There are several options to meet this demand including blending of new products, and diversification into organic fertilizers.
- Overall, there is a broad consensus that Rwanda's current fertilizer subsidy program requires reforms to enhance efficiency, effectiveness, and sustainability.
- The Government of Rwanda is planning to liberalize the fertilizer market, reducing current public sector intervention in fertilizer procurement and distribution, and transitioning out of the subsidy. This reform process creates the opportunity and responsibility for the private sector to fill the void and move into the space left by APTC and RAB. This will require investment from private sector actors into distribution networks.
- The SNS and MOPA demand management systems are revolutionary systems, but there is room for improvement. It will be up to private sector actors to investigate whether to continue with this system or to replace it.

4. Pesticide value chain

This chapter will provide an overview of the pesticide value chain and related market trends and opportunities. The value chain analysis provides a breakdown of each stage of the chain and the actors within that stage, and examines the cost build up from the importer to the final user.

4.1. Market trends

The pesticide industry in Rwanda is not well developed and pesticide use is far less common than fertilizer use. Major pest problems in Rwanda include diseases, insect pests and vectors. While the major diseases of some high value crops need fungicides for their control, the major diseases of other crops do not require chemical pesticides. They can successfully be controlled by Integrated Pest Management (IPM) strategies. The current IPM practices commonly applied by most farmers in Rwanda include a combination of cultural practices, resistant varieties and chemical pesticides. The pesticides application is limited to crops of high value like tomatoes, Irish potatoes, rice and coffee, etc. Pest management in staple crops like maize depends mainly on cultural practices and resistant varieties¹⁶.

Pesticide use in Rwanda is very low but growing. According to MINAGRI, the national average of pesticide use is below 1 kg/ha³⁵ and mainly confined to fungicides (75%), while the remainder is composed of different insecticides and a few herbicides.³⁶ Figure 19 displays the share of farmers using pesticides in the main cropping seasons (A season) 2019, 2020 and 2021. Unfortunately, data on pesticide use were not collected in a consistent format in earlier years. The figure shows results for LSF separately from those for SSF and findings across all households. Overall, the incidence of pesticide use has increased slightly and at a relatively low level from 18.1% of farmers in 2019 to 22.4% in 2021. In contrast, on favorable, consolidated agricultural land ('LSF'), the incidence of pesticide use has more than doubled over the same period, from 41.5% in 2019 to 87.2% in 2021.

³⁵ For comparison, Brazil is around 6, Germany 4.

³⁶ Areco-Rwanda Nziza. (2020). Highly Hazardous Pesticides (HHP) Rwanda Situation Report. Rwandan Ecologists' Association, Kigali, Rwanda.

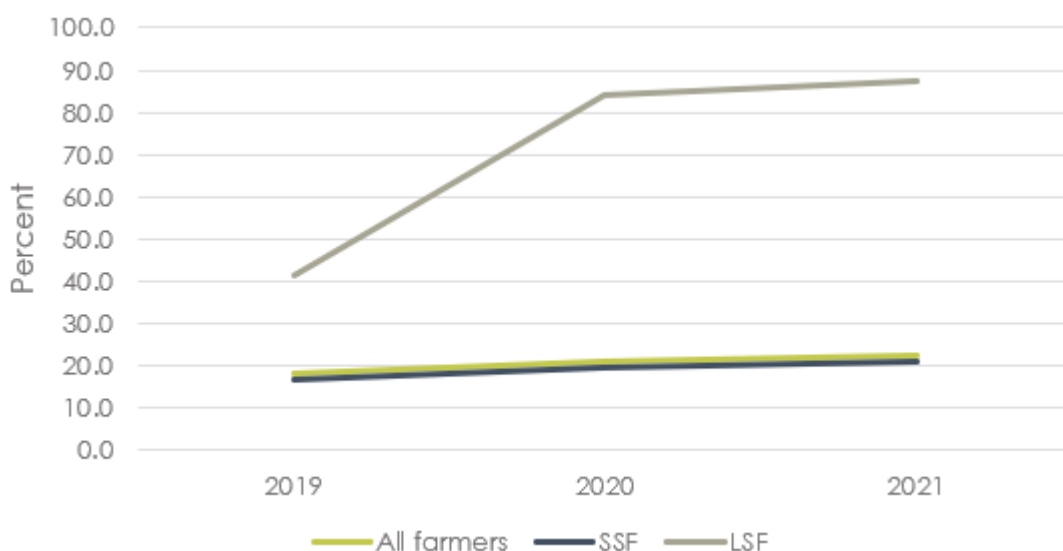


Figure 19: Percentage of large and small scale farmers using pesticide over time

Source: (NISR, 2021)

Pesticide use is highest for regions producing Irish potatoes, sweet potatoes, and vegetables. The districts with the highest percentage of farmers using pesticides are Rubavu (44%), Musanze (43%), Nyabihu (40%), Burera (39%), and Nyaruguru (32%). The lowest use rates are found in Ngororero (13%), Rusizi (11%) and Nyamasheke (9%). Pesticide use also spikes in Season C compared to Season A and B (NISR, 2021).

Imports of pesticides have been steadily increasing over the last half decade, and imports of fungicides have shown the highest increases. There was a sharp increase in the amount of insecticide imported in 2021. There were effectively no exports of pesticides from Rwanda over the past five years. Figure 20 shows imports of pesticides to Rwanda since 2015. Imports of pesticide are driven by the availability of capital of farmers, but also by the prevalence of pests and diseases. There is no clear evidence on the prevalence of bio-pesticide use in Rwanda, however Africa has generally lagged the rest of the world in adopting bio-pesticides.³⁷ Fall armyworm is having a devastating impact on maize yields in neighboring countries. While Rwanda has seen outbreaks of fall armyworm in recent years, the country has so far been able to manage the pest quite well through efforts by the Government of Rwanda and farmers.³⁸

³⁷ In 2015, Africa accounted for only 3% of the world biopesticide market (Frontiers in Sustainable Food Systems, 2020)

³⁸ <https://www.fao.org/rwanda/news/detail-events/en/c/1136723/> Accessed 04.05.2022

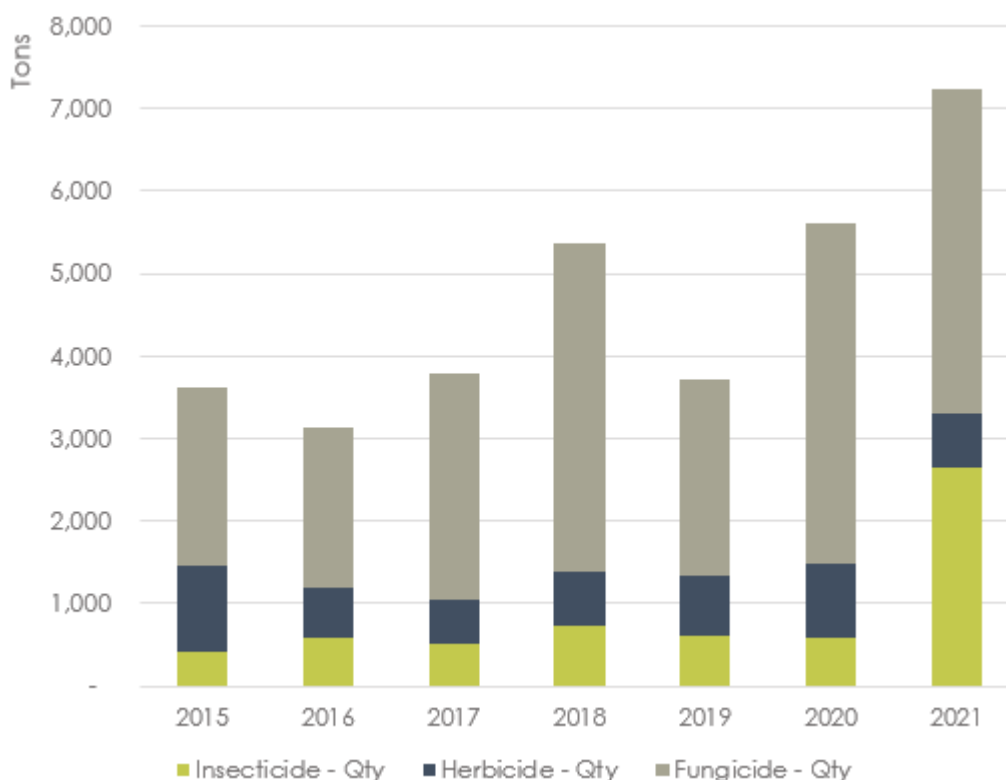


Figure 20: Pesticide imports to Rwanda since 2015*

Source: (RRA, 2022) * note that 2022 only contains data up to and including February 2022.

Pesticides are expensive for farmers and sometimes it is difficult to access pesticides in a timely fashion in some parts of Rwanda. Aside from the pesticides supplied to coffee farmers by NAEB, pesticides are not subsidized in Rwanda. Figure 21 shows the development of pesticide prices since 2015. The prices represent an average price over the year. Insecticide prices are more volatile than fungicide and herbicide prices. Stakeholder interviews indicate that the high price of pesticides is the main factor in limiting pesticide use. Because of the high prices farmers only purchase the amount of pesticides that they can afford, rather than the amount that they require.

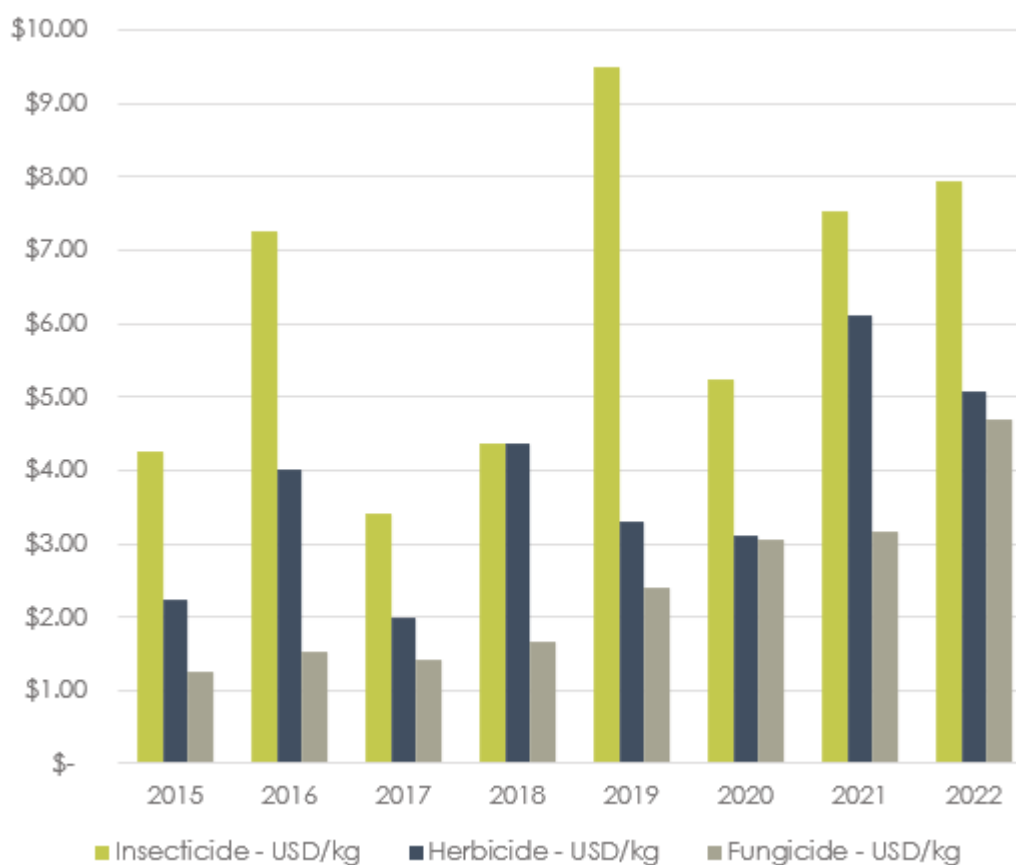


Figure 21: Pesticide prices over time

Source: (RRA, 2022)

Pesticides are often improperly used with the result that crops do not benefit, and the chemicals are potentially hazardous. Stakeholder interviews revealed that pesticides are applied in improper proportions and at the wrong times, using inappropriate health and safety protocols.³⁹

4.2. Mapping of pesticides value chain

The structure of the value chain is simple and direct. Aside from support from NAEB to coffee farmers, there is no government involvement in the distribution of pesticides. The import market is less concentrated compared to fertilizer, and the provision of pesticides is also less consistent at the district level. The marketing and distribution channel of the pesticide value chain within Rwanda is displayed in Figure 22.

³⁹ Interview with Western Seeds Company, March 2022, Kigali.

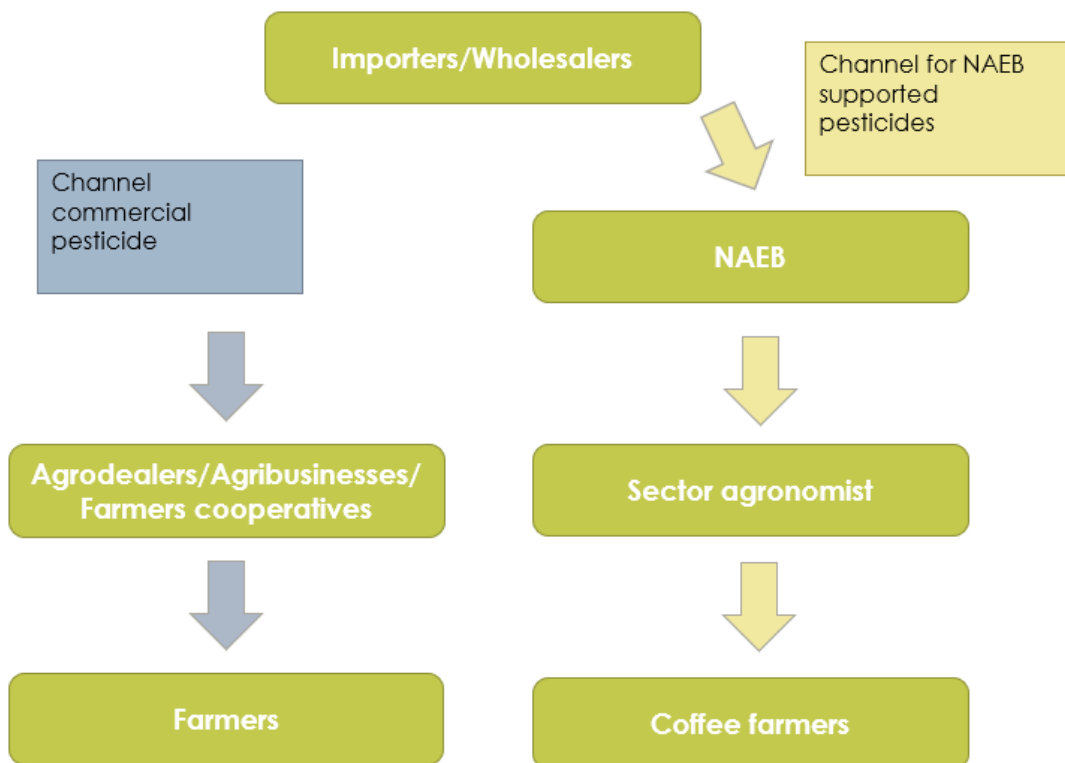


Figure 22: Stages of the pesticide value chain in Rwanda

Source: (Unique landuse, 2022)

For coffee growers, NAEB provides some support to farmers, however there are some farmer complaints surrounding the quantity supplied. Similar to the fertilizer case, for coffee growers, sector officials are involved in the distribution of pesticides supplied by NAEB. Coffee farmers complained that the provision of pesticides through NAEB is not efficient because NAEB use old lists of coffee farmers and provide inputs to some farmers who do not produce coffee anymore.

Pesticides are imported by a wide array of different companies with less market consolidation than seen in the fertilizer import market. The breakdown of pesticide imports by importer is shown in Figure 23. In recent years, Balton Rwanda, ETG Inputs and Safari Center have been the largest importers. Within the “Other” category are close to 1,000 different firms of various kinds. Looking at only the past 3 years, there were nearly 100 different companies which imported more than 500 tons of pesticide. This shows the diversity in the pesticide market.

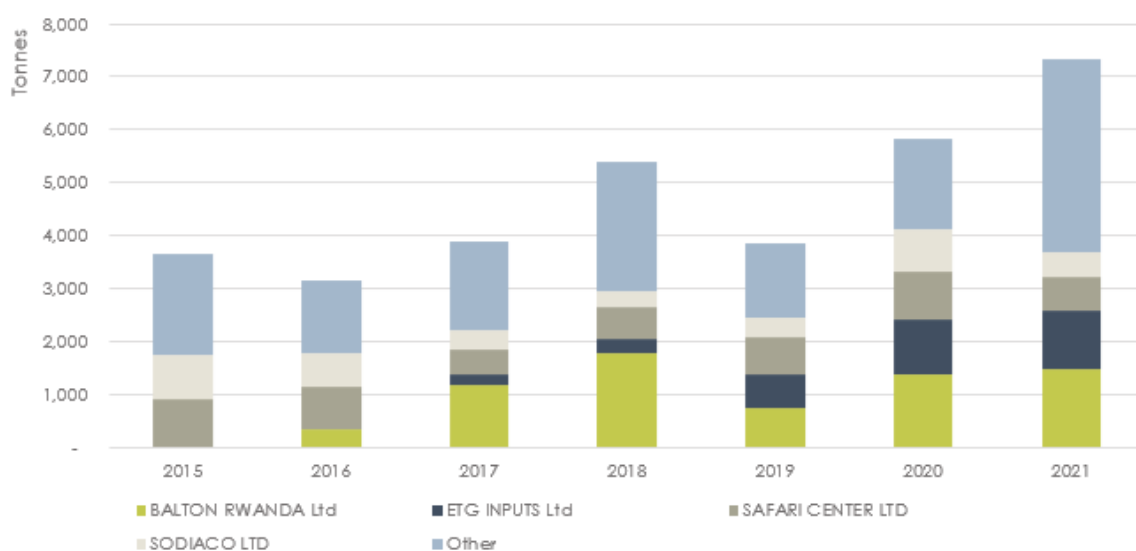


Figure 23: Pesticide imports by importer, 2015 to 2021

Source: (RRA, 2022)

Not all agrodealers and other distributors in the districts stock pesticides and demand is substantially lower than for fertilizer.⁴⁰ The number of distributors stocking pesticide was substantially lower than the number stocking fertilizer in the district surveys conducted. However, there are companies that supply pesticides to agrodealers and other distributors in every district. In Musanze there are Ingabo Plant Health Ltd and AgroPy, in Nyagatare there are Agrotech and Megavet, and in the remaining districts ETG supply pesticides. There is little price differentiation between the different districts.⁴¹

4.3. Cost build-up

On average the import price represents 50% of the final retail price. This share is lower compared to the fertilizer value chain. Due to the hazardous nature of the products, health and safety regulations may require that the quality of storage and transport facilities required for these products be of a higher quality than for fertilizer. The survey of pesticide prices in the different districts could not discern any impact of distance on pesticide prices.

⁴⁰ Nyagatare District field report, 2022

⁴¹ This was also confirmed by the district survey of pesticide sales.

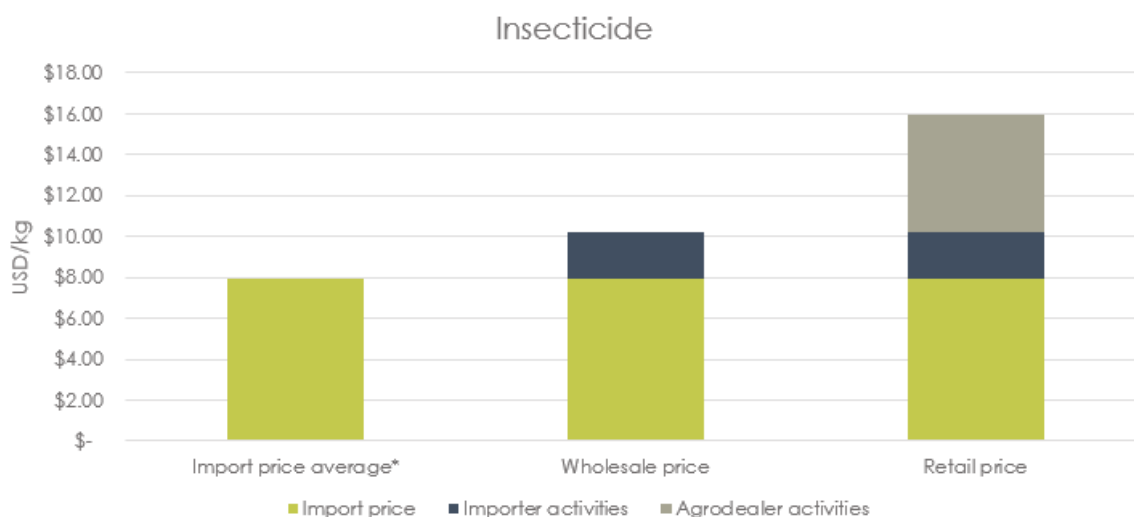


Figure 24: Insecticide price build up

Source: (RRA, 2022) (Unique landuse, 2022)

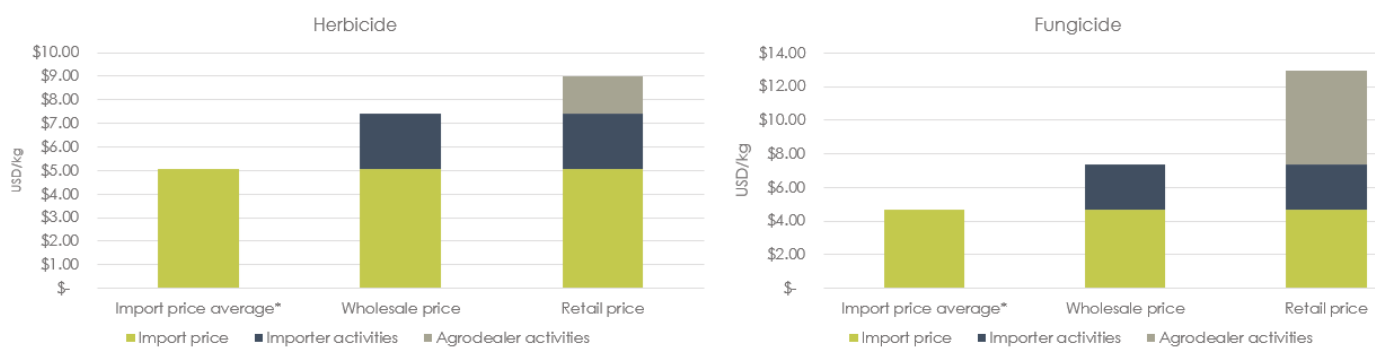


Figure 25: Fungicide and herbicide price build up

Source: (RRA, 2022) (Unique landuse, 2022)

Compared to fertilizer, the cost of operations along the value chain such as storage and transport are higher for pesticides in general on a per kg basis. This could be due to several different reasons. Firstly, it may be that because there is less overall demand for pesticides, and greater diversity in terms of the number of importers, price economies of scale are less available to importers and other agents along the value chain. Further, due to the lack of government intervention in pricing, the free-market prices are experienced for all services along the value chain – prices are not limited by a ceiling price. Another reason could be the inelasticity of demand for pesticide products; in other words, when a disease or pest attacks the crop, farmers have little choice but to purchase pesticides, whereas other agricultural inputs make a marginal difference to the yield. This would allow actors in the value chain to extract a higher price from farmers.

Summary

Issues

- Pesticides are expensive for farmers and sometimes it is difficult to access pesticides in a timely fashion in some parts of Rwanda.
- Rwanda is at risk of frequently being affected by pest and disease outbreaks.
- There is evidence that pesticides are not applied in a proper manner – meaning that they are both less effective and potentially harmful.
- There may be a substantial market in unregistered pesticide products that is not captured in official statistics.
- The size of NAEB support to the coffee sector is non-trivial and faces issues related to effectiveness and efficiency. This support will not be affected by the upcoming subsidy reform process.

Opportunities

- Imports of pesticides have been steadily increasing over the last half decade, also associated with a growing horticulture sector
- Import costs represent a lower fraction of the retail price for pesticides than for fertilizer. Hence, there is potentially a stronger case for cost reduction at retail stage.

5. Regulatory environment

This chapter assesses two key aspects of the regulatory environment surrounding agricultural inputs: the process to register a new input and the role of input inspections. Both aspects have an important impact on the availability and quality of products in the market, and also introduce administrative barriers to agricultural imports that increase prices and reduce the availability of products in the market.

Rwanda's overall 'Enabling the business of agriculture' (EBA) score in 2019 was 41.4 out of 100, which is average compared to neighboring countries. The EBA is an average measure which accounts for various aspects of the business environment. Rwanda is judged to be very good in terms of access to finance and food trade, while weaker in terms of metrics such as supplying seed, sustaining livestock and protecting plant health. According to this metric, Rwanda's business environment was assessed to be inferior to that of neighboring Tanzania (57.2) and Uganda (52.2), but superior to Burundi (35.8), and a large step ahead of DRC (29.8)⁴². However, in terms of registering fertilizer, Rwanda outperformed all of neighbors with a score of 44.7.

The regulatory environment on fertilizer and pesticides in Rwanda is described in various laws and Orders. The quality and safety of fertilizer and pesticides in Rwanda are regulated by Law No. 30/2012 of 01/08/2012 governing use of agrochemicals, and its ministerial orders. The Ministerial Order No 002/11.30 of 14/07/2016 determining regulations governing agrochemicals determines the (i) registration of a product, (ii) registration of premises, (iii) licensing of agrochemical dealers, (iv) packages, labels and transportation of agrochemicals, (v) advertising, storage, use of agrochemicals, (vi) testing of agrochemicals, and (vii) disposal of agrochemicals.

Other laws and regulations also used in agrochemical regulation include:

- Prime Minister's Order determining the members of the Advisory Council on the use of agrochemicals and their responsibilities.
- Ministerial Order determining confidential data that is not recorded and non-confidential data to be recorded in the register of agrochemicals.
- Ministerial Order appointing a registrar of agrochemicals and determining his/her responsibilities.
- Ministerial Order appointing Inspectors of agrochemicals and determining their powers and responsibilities.

These laws and regulations served as framework for an assessment of protocols and procedures for (a) new input product registration/licensing and b) inspections and sampling. The desk assessment was combined with key informant interviews and a field survey to collect data and information on the business environment.

⁴² World Bank. (2019). Enabling the Business of Agriculture. World Bank, Washington, DC.

The main regulatory bodies associated with implementing agrochemical law are RICA, RAB and RSB. RAB is the only body allowed to conduct testing of agricultural products in Rwanda – however the laboratory testing facilities are housed within the Rwanda Standards Board compound. RICA is responsible for developing the testing protocols and the oversight of the registration process for new products.

5.1. Registration

Registration of fertilizer and pesticides is mandatory in Rwanda before importation, sale or use upon evaluation of comprehensive scientific data. The registration of new products is open to anyone that can comply with the requirements and regulations. All registered and prohibited agrochemicals are available in the annex of the ministerial order determining regulations governing agrochemicals published in official gazette 30 of 25/07/2016 and on RICA web site.⁴³

5.1.1. Registering a new agri-input product

This section describes the process required to register a new agriculture input product. At 44.7, Rwanda's EBA⁴⁴ score in 2019 on the sub-category of 'Registering fertilizer' was in the mid-range; however, the time required to register a new fertilizer product was very long at 730 days. This study investigated this issue and conducted a process analysis. First the steps needed to register an agri-input product were identified and second the time and expenses to register a new product were analyzed.

The time and expenses required to register a new agricultural input varied widely among stakeholders interviewed, but the process can be prohibitively expensive. While on paper the process appears to be relatively straightforward, experiences shared by stakeholders indicate different experiences and understanding of the requirements to register a new product. In the ideal case, after fulfilling and submitting all requirements requested, the advisory council may issue a certificate of provisional registration of an agrochemical within fifteen days from the date of submission. Emergency measures to allow new products are also available at the discretion of the Agriculture Minister. However, in the worst reported case, one major importer interviewed had incurred costs of up to USD 60,000 and five years waiting time to register a new agri-input product (which at the time of writing has yet to be approved). The process, estimated time required, and responsible agencies are shown in Figure 26.

⁴³ While this is publicly available, many stakeholders interviewed were not aware of the existence of this list.

⁴⁴ World Bank. (2019). Enabling the Business of Agriculture. World Bank, Washington, DC.

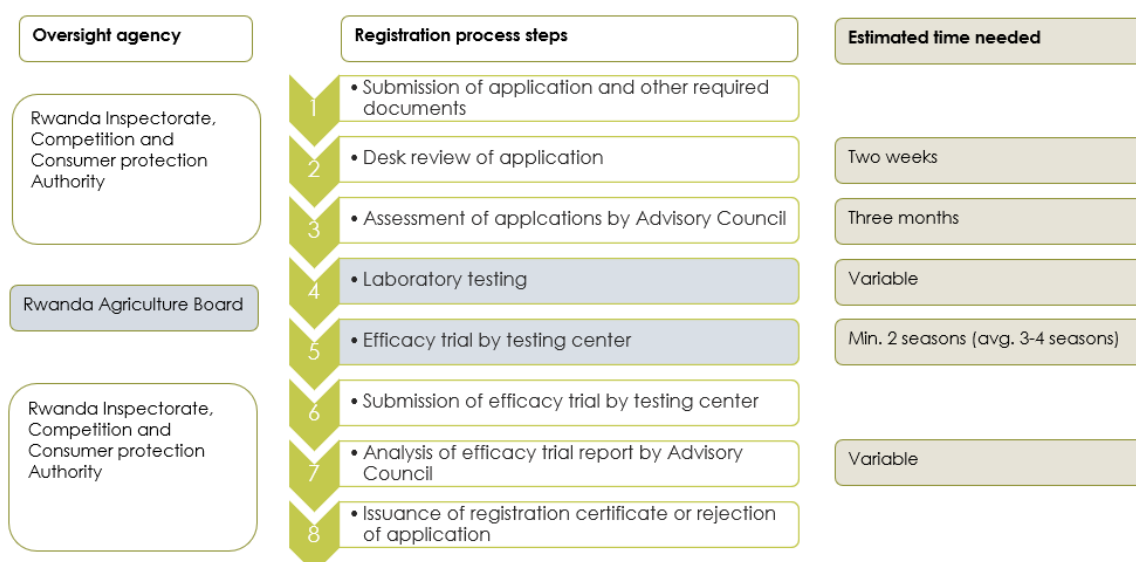


Figure 26: Registration process for new agrochemical products

Source: (Key stakeholder interviews, 2022)

The length of the process to register a new agri-input product is mainly dependent on the efficacy trial results and laboratory testing. Stakeholders reported that the time taken to register a new agri-input product is a minimum of one year (two agricultural seasons) and usually takes two to four years. Costs for laboratory testing and efficacy trials are borne by the applicant. The registration process is cited by stakeholders as a significant barrier to bringing in new kinds of fertilizer. RAB suffers from a lack of testing capacity, which leads to significant delays in product inspections as well as product registration.

...on the side of the regulatory authority (RICA), the process is comprehensible and transparent, however, on the side of the laboratory testing boards, the process is not yet well understandable

Stakeholder interview

The registration process is very thorough and imposes a significant administrative burden on applicants. Each new agri-input product requires that an advisory council is formed which includes ten members including laboratory researchers, members of the Rwanda Standards Board, farmers and a six-person technical team appointed by Cabinet.⁴⁵ For each new product, a product dossier must be submitted. If the dossier is approved, an import permit for the new product is provided by RICA. Trials are conducted by RAB, and a findings report is prepared based on the data collected during the field trials. This report is reviewed at several stages until it is approved by the Director General and sent to RICA. A final approval is provided by the advisory council before the product can be registered.⁴⁶

Improved coordination between RICA and RAB could improve the agri-input product registration process and avoid costly errors. The registration process is conducted by two

⁴⁵ Interview with RICA, March 2022.

⁴⁶ (Stakeholder interviews, 2022)

separate agencies, with RAB responsible for laboratory and field efficacy trials, and RICA responsible for assessment and approval. Together with the applicant, RAB determines a protocol for the trials, but this protocol is not checked again by RICA. This can lead to confusion and delays if RAB and RICA have a different understanding. There have been instances where efficacy trial results were rejected because of such a misunderstanding; that is, the trial results were in order, but the trial itself was not conducted in the manner expected by RICA. Such instances are very frustrating for the applicant and act as a disincentive for future applications.

5.1.2. Regional harmonization

Currently, there are no arrangements in place whereby Rwanda recognizes international standards for agricultural inputs and no approvals are given without testing.^{47,48} The aim of regional harmonization of regulations is to harness limited resources within the region, improve trade by reducing the time and cost associated with registration of inputs and to increase the quality and quantity of available inputs in the region. For example, harmonized pesticide registration in the region would play a crucial role in facilitating fast-track registration of innovative pest control technologies by ensuring that systems are transparent, predictable, and utilize common data to support the regulatory review process.

With respect to the harmonization of Fertilizer regulation across the EAC, the process has started and the situation is dynamic. There has been an ongoing process to finalize regulation involving Common Market for Eastern and Southern Africa (COMESA) and other regulatory bodies.⁴⁹ In 2019, EAC partner states validated a draft EAC Fertilizer Policy and Draft EAC Fertilizer Bill, however progress on the ground has been limited to date.⁵⁰ To illustrate the issues, there is a high degree of variance when it comes to the Enabling the Business of Agriculture (EBA) scores for registering fertilizers as shown in Figure 27. The variability of fertilizer regulations may be one reason for the difficulty in developing harmonized regulations.

⁴⁷ RICA interview, March 2022.

⁴⁸ With support from AGRA (Alliance for a Green Revolution in Africa), the EAC Secretariat conducted a regional assessment on domestication and implementation of EAC Harmonized Pesticides Guidelines within the 6 Partner States and the findings validation workshop took place in Nairobi, Kenya from 17th to 18th November 2021.

⁴⁹ In 2014, the Common Market for Eastern and Southern Africa (COMESA) and its agency, the Alliance for Commodity Trade in Eastern and Southern Africa, launched a Joint Program on Fertilizer Policy and Regulatory Harmonization in partnership with the African Fertilizer and Agribusiness Partnership. The program intends to harmonize fertilizer policies and fertilizer financing mechanisms .

⁵⁰ <https://www.eac.int/press-releases/141-agriculture-food-security/1622-eac-partner-state-validate-draft-eac-fertilizer-policy-and-draft-eac-fertilizer-bill> Accessed 18.05.2022

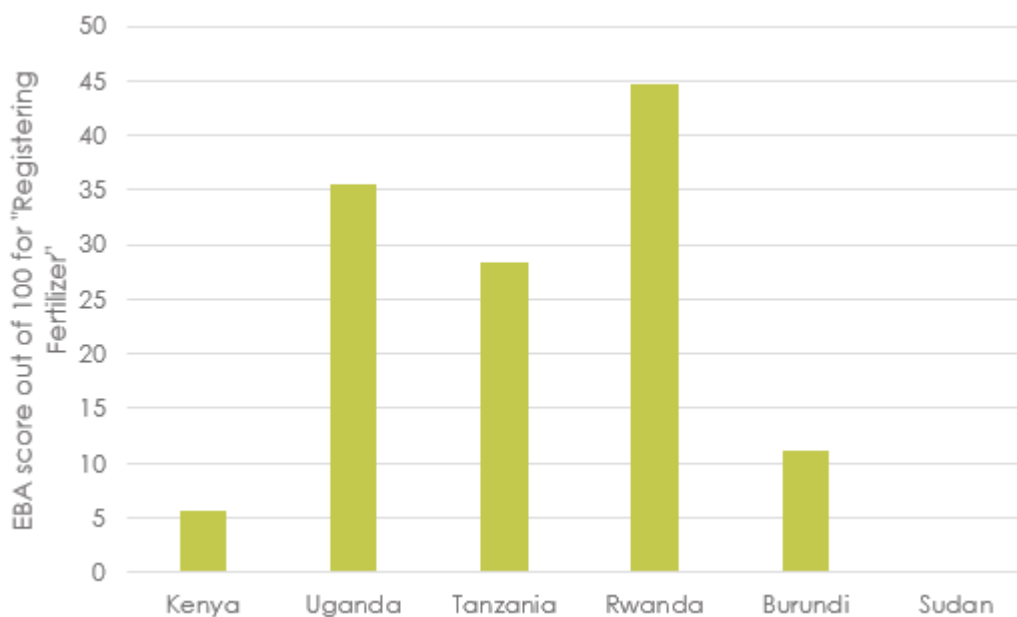


Figure 27: Registering Fertilizer – EBA scores in EAC member states (2019)

Source: <https://eba.worldbank.org/>

A Draft Policy on Fertilizer for the EAC is currently before the EAC Council of Ministers. This policy will seek to:

- promote local production of fertilizer through the exploration of local resources to ease access and reduce the cost of fertilizers;
- provide an enabling environment that fosters trade, innovation, and private sector investment;
- harmonize standards.⁵¹

Once the fertilizer bill is approved, Rwanda will need to adapt its own legislation to match the EAC level regulations.

Transboundary crop pests and diseases are still a major threat to agricultural production and productivity in the East African Community (EAC) and the rest of Sub-Saharan Africa causing tremendous damage to crops and threatening food security. To address this challenge, the EAC, with support from USAID, FAO and USDA, initiated the process of harmonizing EAC pesticide management guidelines in September 2016. For example, if EAC regulations were implemented in Rwanda, the length of the efficacy field trial will be reduced from 2 seasons to one season. Further, harmonization would allow private sector testing of agrochemicals which may also improve the efficiency of the process.

The EAC harmonization process could facilitate availability of pesticides in Rwanda. While current Rwandan Ministerial order no 002 11 30 determining the regulations governing agrochemicals contains both a list of banned substances and approved pesticides, it is generally viewed as more efficient to have a list of banned substances only, to allow for more innovation and provide incentive to product developers. EAC harmonization would lead to a general recognition of internationally banned substances according to the Stockholm

⁵¹ EAC Secretariat in Arusha Tanzania (interview 18.05.2022)

and Rotterdam conventions on hazardous materials. In Rwanda there would still be a longer list of banned substances because of a lack of capacity in handling some substances which leads to a risk of environmental or health impacts. However, EAC harmonization would potentially allow for a greater variety of pesticides.

So far, the EAC Council of Ministers has approved several guidelines for domestication and implementation by the Partner States:

- EAC harmonized guidelines for the Registration of Bio pesticides and Bio Control Agents for plant protection
- Guidelines for evaluating and reporting the efficacy of pest control products for plants
- Guidelines for the conduct of supervised pesticide residue field trials on crops
- Guidelines for the Protection of Confidential Business Information Submitted for Pesticide Registration Actions in the EAC Partner States
- Guidelines on Data Requirements for the Registration of Conventional Chemical Pesticides Used in Agriculture and Forestry
- Technical criteria for designating efficacy trial centers

Furthermore, the following 2 guidelines are in the advanced approval process stage after being discussed by the respective 6 Partner States Technical Working Groups (TWG).

- EAC Guidelines for Approving Pesticide Emergency Uses for Managing Invasive Pests and Pest Outbreaks in Agriculture
- EAC Mutual Recognition Mechanism for Testing and Registration of Pesticides

Implementation across member countries is uneven. In terms of pesticide management, the EAC recently conducted an assessment to determine the extent to which member states have adopted EAC legal and administrative measures (EAC, 2021). The indicators assessed are:

- Development and or review of a Policy on pesticides management
- Development and or review of legislation on pesticides (Law (Act/Decree)
- Development and or review of legislation on pesticides regulations to implement EAC guidelines
- Establishment and or review of a system (authority, office of the registrar, review committee) for regulation of pesticides – registration and post registration management
- Establishment and or review of mechanisms for public awareness, education and participation

For each category, member nations were given a score to show the extent of alignment to the guidelines in a (Likert-ordinal) scale of 1-5 defined thus:

- 0: No action taken
- 1: Process initiated (25%)
- 2: Process at 50%

- 3: Process at an advanced stage (75%)
- 4: Process at finalization stage (90%) and
- 5: Process completed (90-100%)

As shown in Figure 28, Rwanda's score of 20% is inferior to that of EAC Partner States of Tanzania (60%), Kenya (56%), Uganda (40%), Burundi (40%), and ahead of the Republic of South Sudan (8%).

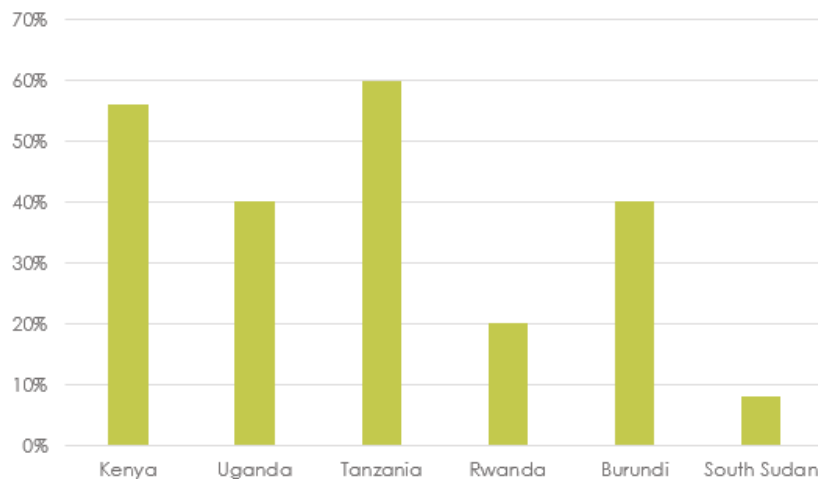


Figure 28: Overall EAC implementation status

Source: (EAC, 2021)

MINAGRI has started the development of a new law that will govern plant production in Rwanda. The law will be combining three existing laws, namely the law governing seed and plant varieties, the law governing agrochemicals, and the law on plant health protection. This new law would drive the EAC harmonization process in Rwanda. A first consultation meeting on that new law was held in June 2022, but more work is needed to complete that process. In addition, investments in infrastructure, human capital, and financial and governance resources are needed (see Table 5).

Table 5: Status and gaps on Fertilizers and Pesticides Management Systems in Rwanda

CAPACITY AREA	STATUS	GAPS
Infrastructure	<ul style="list-style-type: none"> Physical facilities to support registration in place include office space; computers; internet and email facilities Testing sites are adequate and consider agroecological zones Laboratory facilities exist but not sufficient 	<ul style="list-style-type: none"> Appropriate mechanisms (IT related equipment, dossier rooms, registers etc.) to secure Confidential Business Information Library is not adequately equipped with reference material for staff use, including databases or online library for reference Existing laboratories are not well equipped for pesticide testing and some lack accreditation
Human Resources	<ul style="list-style-type: none"> Currently there are six members of the advisory council technical team with a mix of skills and competencies in agronomy and soil science among others. The office of registrar has one staff and four agrochemical inspectors 	<ul style="list-style-type: none"> Inadequate capacity in the dossier evaluation and especially interpretation of toxicological and ecotoxicological data Inadequate staff to regulate all inputs Inadequate laboratory personnel
Financial Resources & governance	<ul style="list-style-type: none"> A clear administrative structure with Advisory council whose membership integrates expertise from the national ministries and agencies with various aspects of pesticide management Office of the pesticide registrar and respective tasks and duties are set out in the implementing legislations. 	<ul style="list-style-type: none"> Insufficient financial resources The council only holds four ordinary sessions for dossier review in a year

5.2. Inspection

Public inspection of fertilizers and pesticides is important for ensuring the quality and integrity of the agrochemical supply chain in Rwanda, which is a determinant for sustainable demand. The EBA score assessing laws and regulations ensuring farmers' access to high-quality, unadulterated fertilizer in 2019 was very low at 1 out of 6.

In line with FAO guidance, types of inspections carried out in Rwanda by RICA include regular inspections, ad hoc inspections and surprise inspections, and all actors in the agrochemical input value chain are inspected including importers, wholesalers, retailers and end users. Inspectors look for a variety of issues including packaging and labelling deficiencies, incorrect storage, as well as counterfeit products. Inspectors reported that problems occur at all stages of the supply chain. At the importer level, none of the four importers interviewed reported any major issue with their most recent inspection of their storage facilities and products.⁵²

The joint inspection report of September 2021 states that there are significant problems with defect agricultural inputs and the distributor practices in the districts.⁵³ According to the report "a huge amount of counterfeit, expired, prohibited, unregistered and damaged agrochemicals sold and disposed agrochemicals in the local compost area have a high negative effect on human, plant, and animal health, environment and decrease in agricultural production" (REMA & RICA, 2021). The number of districts where incidents of malpractice were detected is shown in Table 6. The most detected instance of malpractice is illegal repacking of agrochemicals, followed by selling non-registered agrochemicals. It should be noted that *no instances of counterfeit chemicals* are reported. In a smaller 2021 survey of only two districts, Nyabihu and Rubavu conducted in October 2021, the vast majority of malpractices detected were unregistered and repackaged agricultural inputs (RICA, 2021).

Table 6: Number of districts where incidents of malpractice were found

	EASTERN PROVINCE	NORTHERN PROVINCE	SOUTHERN PROVINCE	WESTERN PROVINCE
Total number of districts assessed	7	5	8	8
Illegal repacking of agrochemicals	5	1	5	5
Non-registered agrochemicals	5	1	1	3
Non-licensed agrodealers	0	0	3	1

⁵² (Stakeholder interviews, 2022)

⁵³ District inspections in provinces across Rwanda were carried out by staff from the Rwanda Environment Management Authority (REMA), Rwanda National Police (RNP) and staff from RICA.

Mixing agrochemicals with other consumables	0	1	1	2
Banned chemicals	0	0	2	1
Employing unqualified staff	1	1	4	5
Illegal use of plastic carry bags	0	0	1	2
Expired agrochemicals	2	0	0	0

Source: (REMA & RICA, 2021)

While counterfeiting is widely considered to be a major issue in Africa, Unique field surveys found limited evidence of counterfeit products during the district survey. In the long term, counterfeit products reduce the uptake of fertilizer use, because they increase production uncertainty among farmers and reduce trust in the importer brands. As such, it is important for the government to have a reliable estimate of the prevalence of counterfeit products. The district survey conducted by Unique only found three reported instances of fake fertilizer (one of which was disputed by the supplier) in 191 reported sales, and one instance of fake pesticides in 131 reported sales.⁵⁴ More generally, counterfeiting was not mentioned by stakeholders as a major issue in Nyabihu or Musanze, and in Rusizi, stakeholders explicitly stated that counterfeiting is not a problem in the district. One instance of fake fertilizer was reported in Nyaruguru. In Rubavu and Nyagatare, however, stakeholders did mention that there is a problem with fake products in the districts.⁵⁵

Inspection capacity is limited by the number of inspectors and the laboratory testing capacity of the RSB. Other bodies with laboratory capacity have expressed interest in providing testing services for RAB, among them the University, but the regulatory framework for such public or private service providers does not exist yet. At the time of writing, there are only 5 officially appointed inspectors in Rwanda, although a reform process is underway to increase the number of official inspectors.⁵⁶ These inspectors are tasked with inspecting imports of agrochemicals among other types of inspections. Imports must be stored while samples are tested at RSB laboratory facilities. The laboratory facilities at RSB have limited capacity in terms of testing materials and qualified staff. Importers report experiencing long delays while imported products are inspected.

Laboratory testing of agrochemical inputs is generally not carried out in the districts. Inspections in the districts focus on storage facilities, whether agrodealers possess a trading license, whether appropriate pricing is being used and whether the Mobile Ordering and Processing Application (MOPA) system is being employed. Inspections at the district level are carried out by RAB, RICA and sector agronomists. In most districts, testing is limited to observational inspections rather than sampling. This could mean that fake fertilizer is

⁵⁴ While the sample size is relatively small, a large shipment of counterfeit impacts can have long run consequences for farmers who have a significant amount of their income tied up in their production process.

⁵⁵ (Unique landuse, 2022)

⁵⁶ See Ministerial order N° 001/11.30 OF 04/01/2017 (Official Gazette n°02 of 09/01/2017).

underreported. Storage conditions are assessed for aspects such as aeration, appropriate clothing and equipment, and handling processes.⁵⁷

Inter-agency coordination may be a source of delays for agrochemical imports. RICA performs the customs duties at the border and collects samples of imported agricultural inputs for testing, but the actual testing is carried out by RAB at the RSB testing facility. Importers claim that the delegation of responsibilities across multiple agencies leads to a situation where staff involved in the testing process are unwilling to risk being responsible for a batch of defect agrochemicals being approved. This is thought to reduce the efficiency of the testing process.⁵⁸

Summary

Key Issues

- Importers looking to register new agricultural input products face a significant administrative burden
- A lack of coordination between RICA and RAB in terms of the protocols for product testing creates long delays and costs for the private sector.
- Inspection of imports can cause long delays due to limited laboratory testing capacity.
- Pests and diseases still pose a strong threat to Rwandan agriculture – at present the most serious threat is the Fall Army Worm which attacks maize crops
- Quality of inputs in the field is impaired by malpractice among agrodealers in the districts

Opportunities

- There is a harmonization process underway for both fertilizer and pesticide regulations at the EAC level, which will drive reform of the Rwanda regulations on agrochemicals.
 - The pesticide EAC regulations have been developed and must now be adopted in Rwanda,
 - The fertilizer EAC regulations are in the process of being finalized
- Both reform processes offer huge opportunities to improve market efficiency:
 - recognition of international standards would accelerate the registration process and allow more products to enter the market
 - reduced testing requirements on new products would allow better market access

⁵⁷ (Unique landuse, 2022)

⁵⁸ (Stakeholder interviews, 2022)

6. Recommendations

The current situation on world fertilizer markets has severely impacted Rwanda. It is also transitioning out of fertilizer subsidies. Going forward, it will be very important to help farmers access inputs and enable private investment in the input markets. This report has highlighted areas of focus within the fertilizer and pesticide markets. Entry points for interventions exist along both chains and within the regulatory framework.

It is very important not just to focus on the immediate crisis and short-term measures. Every country going forward needs to continue to transform its food system and make it more resilient in the long term. Food systems were already reeling from multiple crises prior to Russia's invasion of Ukraine. Governments, private businesses, and international partners need to work toward more productive and resource-efficient production systems to ensure food and nutrition security in the face of rising climate, conflict, and economic risks. Mobilizing private funding and investing in innovation and dissemination will be key, because everyone needs to "do more with less": produce more nutritious, more diverse and more high-value food for a growing population - and to do so with less chemical fertilizer and less chemical pesticides, while limiting land use change and greenhouse gas emissions.

This chapter is structured into the following three sections: priority recommendations; medium term, market related recommendations; and long term, capacity building recommendations.

A. Priority recommendations

Recommendation A.1: World Bank and IFC to support the Government of Rwanda (GoR) with the implementation of the reform roadmap for the agriculture Input Subsidy Program as stipulated in the Cabinet paper (01.03.2022). GoR should provide clear communication about the transition out of the ISP and commit to the reform transition process.

The Government of Rwanda is planning to liberalize the fertilizer market, reducing current public sector intervention in fertilizer procurement and distribution, and transitioning out of the subsidy. The Government of Rwanda has released a Cabinet paper to this effect, outlining the proposed reform roadmap. This reform process creates the opportunity and responsibility for the private sector to fill the void and move into the space left by APTC and RAB. This will require investment from importers into distribution networks and investment by agrodealers into supplier management and client relationships. This reform of the ISP is an excellent initiative by the Government of Rwanda. A crucial next step for the Government to implement the cabinet paper reform is to provide clear communication about the transition out of the ISP and commit to the reform transition process – particularly regarding the timing of changes given the current upheaval in the market. While the Cabinet paper outlining the reform roadmap for agricultural inputs provides official and final guidance as to the transition process, *implementation* of the transition will be difficult, particularly under the current circumstances. Regular, clear communication about the status of the reform

process will provide investors with certainty regarding the future of the reform and allow them to position themselves accordingly.

Recommendation A.2: IFC should facilitate the harmonization process of fertilizer and pesticide regulations within EAC by providing technical assistance to the Government of Rwanda to help implement the guidelines, review existing laws and regulations, and promote the adoption of the new EAC regulations

EAC harmonization offers several different benefits that would impact the fertilizer and pesticide value chains and the agricultural sector more broadly. Increased inter-state trade can foster economic development, and result in increased efficiency in import and export markets. Small, fragmented markets tend to hamper economic development and trade, while large regional integration can also provide opportunities for larger markets – not just in terms of imports but also exports (Tharani, 2017).

Harmonization also allows for the possibility for expertise, capital and technology to flow across international borders. Harmonization also tends to result in reduced times for regulatory approvals, and this can have significant impacts on the GDP of member states. There is a lot of scope for harmonization within the EAC due to the high amount of variance in the member states' regulations (Tharani, 2017). Many of the regulatory issues highlighted above will be improved or solved by EAC harmonization. For example, the long waiting time and costs of registering and testing new products will be reduced to be in line with EAC regulations. Further, more products will be recognized and approved via EAC recognition will which increase the availability of agrochemicals more generally.

Recommendation A.3: IFC should provide technical assistance to MINAGRI's efforts to draft a new law on plant production.

The law will be combining three existing laws, namely the law governing seed and plant varieties, the law governing agrochemicals, and the law on plant health protection. This new law would drive the EAC harmonization process in Rwanda. This would include a thorough review of Rwanda's existing law N° 30/2012 of 01/08/2012 (Law on governing of agrochemicals) and related regulations (Orders). The EAC harmonized pesticides guidelines cover many important areas which will all need to be reviewed to ensure that Rwanda can comply. The list of guidelines is presented below:

- EAC harmonized guidelines for the Registration of Bio pesticides and Bio Control Agents for plant protection
- Guidelines for evaluating and reporting the efficacy of pest control products for plants
- Guidelines for the conduct of supervised pesticide residue field trials on crops
- Guidelines for the Protection of Confidential Business Information submitted for Pesticide Registration Actions in the EAC Partner States
- Guidelines on Data Requirements for the Registration of Conventional Chemical Pesticides Used in Agriculture and Forestry
- Technical criteria for designating efficacy trial centers

- EAC Guidelines for Approving Pesticide Emergency Uses for Managing Invasive Pests and Pest Outbreaks in Agriculture
- EAC Mutual Recognition Mechanism for Testing and Registration of Pesticides
- Other EAC guidelines that may be introduced

While the EAC draft fertilizer policy is not yet approved by the EAC Council of ministers (see section 5.1.2), it is not possible to provide a comprehensive list as above in the case of pesticides.

Recommendation A.4: IFC should assist RAB/RICA/RSB to improve coordination regarding the process for testing and registering new agri-input products and assist them in the development of a regulatory framework that will allow other public or private service providers conduct testing.

The regulatory assessment found that there is a strong disconnect between RICA and RAB regarding the testing and registration of new agricultural input products. This leads to significant delays and costs for importers. It also disincentivizes innovations and reduces the usefulness of other public goods – for example soil mapping efforts are predicated on the assumption that blended fertilizer tailored to the soil test results can be applied. If such products cannot enter, the usefulness of the public good is reduced.

B. Recommendations for further analytical work and technical assistance

Recommendation B.1: IFC should profile several firms that have demonstrated the profitability of private sector extension services, to encourage and promote this type of business model.

Private sector companies that provide a full package of support alongside the sale of inputs, such as training, and access to finance have achieved success in marketing their products and developing new customers. The One Acre Fund is an important example whereby smallholder farmers are provided with inputs and training to improve their productivity. The success of the program is shown in the increasing number of farmers registered. To encourage demand in the long term, other agrochemical importers conduct extension programs, which entail supplying farmers with inputs and training for free. This is meant to demonstrate the effectiveness of the products, and simultaneously provides farmers with cashflow to be able to afford agricultural inputs for the coming season. This system is not limited to agrochemical inputs but is also practiced by seed suppliers.⁵⁹ The outgrower scheme operated by Proxifresh is similarly successful. This system operates slightly differently, in that the price of inputs is deducted from the price paid to outgrowers for their produce. This model has led to business growth and increased profits for Proxifresh since its inception in 2014. A prudent step for IFC would be to profile a number of firms that have demonstrated profitability using this approach, to encourage and promote this type of business model.

⁵⁹ Examples include Yara Ltd and Western Seeds.

Recommendation B.2: To encourage professional spraying services, IFC should conduct a market study to demonstrate the effectiveness of this approach/business model in Rwanda.

Professional spraying services are a potential investment opportunity for private sector service providers to improve pesticide application. Improper pesticide application is wasteful and dangerous, and often farmers do not have the right kind of protective clothing or equipment to carry out the practice properly. Several private sector Spray Service Providers have emerged in recent years throughout Africa to address this market gap. One example is the company SprayPros, which has emerged in Kenya. SprayPros carry out farm visits to recommend the right pesticides and spray fields using the full protective equipment for a charge to farmers of around 100 Kenyan shillings (0.86 USD) per farm. The firm also offers group training, and a range of other agricultural services such as soil and water conservation, proper disposal of agrochemicals, pruning, and grafting among others. CropLife has successfully introduced this concept in fourteen different African nations.⁶⁰ USAID has supported similar schemes outside of Rwanda as well. Within Rwanda, NAEB offers this service, however only within the coffee value chain. There are several concrete actions that could be taken to encourage professional spraying:

- As outlined above, IFC should conduct a market study to demonstrate the effectiveness of this approach/business model in Rwanda. This might encourage SprayPros or similar companies to expand their operations to include Rwanda.
- Further to this, IFC should discuss with current input providers about their views on this type of service, and invite Croplife for a presentation, near term

Recommendation B.3: IFC or World Bank should investigate organic fertilizer production in Africa.

The current agri-input price situation has brought the concept of resilience into focus and actors across the agricultural sector are being forced to reassess their approach to food production. Improving the efficiency of resource use is an obvious way to expand production within existing limitations. Current agri-food production models rely on abundant supplies of water, energy, and arable land and generate significant greenhouse gas emissions in addition to forest and biodiversity loss. Given the high prices for synthetic fertilizer and pesticides, bio-products potentially offer a viable alternative. Demand for bio-products is highly likely to intensify in the medium term. In the longer term, developing the bio-product market will improve Rwanda's resilience to supply shocks in the future. There are existing private sector initiatives in this space as described in Box 2. While public support for the enabling environment would be useful, investments in this space should be private sector driven to ensure economic sustainability and efficiency.

It is likely that the rising prices of inorganic fertilizer will lead to increased demand for organic fertilizer. While the organic fertilizer market remains highly fragmented, market research firms suggest that organic fertilizer production will grow strongly over the coming

⁶⁰ <https://www.croplifeafrica.org/our-work/crop-protection/stewardship/spray-service-provider> Accessed 5.05.2022 <https://www.croplifeafrica.org/our-work/crop-protection/stewardship/spray-service-provider> Accessed 5.05.2022

years.⁶¹ Organic fertilizer can be produced using readily available resources; however, it does require specialist knowledge⁶². It would be prudent for IFC/World Bank or a similar institution to conduct a thorough investigation of the market potential of this sector and assess the potential for private sector investment into this area.

Recommendation B.4: IFC or World Bank should investigate insect farming for the production of biofertilizer in Rwanda.

The World Bank estimates that within a year, African insect farming can generate crude protein worth up to US\$2.6 billion and biofertilizers worth up to US\$19.4 billion⁶³. The report estimates that through black soldier fly farming, the continent could replace 60 million tons of traditional feed production with BSFL annually, leading to 200 million tons of recycled crop waste, 60 million tons of organic fertilizer production, and 15 million jobs, while saving 86 million tons of carbon dioxide equivalent emissions, which is the equivalent of removing 18 million vehicles from the roads. IFC may wish to engage firms that are active in this business to explore the possibility of insect farming in Rwanda. This could take the form of a market study. Box 2 provides an example of existing insect farming in Rwanda.

Box 2: Example of Insect farming for biofertilizer in Rwanda

At their fertilizer plant in Bishenyi, COPED in cooperation with Sucafina is producing fertilizer using the black soldier fly larvae. These can consume large amounts of organic waste (including coffee pulp) very quickly. The COPED landfill takes in up to 1.5 tons of organic waste daily, covering significant tracts of what would otherwise be arable land. With the new program, food waste is kept separate and, instead of adding to the landfill's growing bulk, it's mixed with coffee pulp from Rwacof's Washing Stations, and treated with the larvae, which can transform it into nutrient-rich compost in as little as 10 days. The firm expects a production of around 11 tons of low-impact, high-yield biofertilizer per month through bug power. In addition to being cheaper and more environmentally friendly, this innovative biofertilizer is designed with the specific needs of Rwandan soils (and farmers) in mind.

Source: <https://sucafina.com/na/news/making-biofertilizer-in-rwanda>

⁶¹ <https://www.researchandmarkets.com/reports/5012179/africa-organic-fertilizers-market-growth> accessed 5.05.2022; <https://www.businesswire.com/news/home/20220215005892/en/The-Global-Organic-Fertilizers-Market-is-Expected-to-Reach-Profits-of-15.9-Billion-by-2030---ResearchAndMarkets.com>

⁶² Ikirezi have found that organic fertilizer can produce around eighty percent of the yield benefits of inorganic fertilizer. Ikirezi produce organic fertilizer using cattle and rabbit waste products, as well as worms. The compost is distilled and fermented to produce fertilizer. Pesticide production involved urine mixed with herbs and fermented to produce liquid pesticide. This product, while less hazardous than inorganic pesticide, still requires training to ensure appropriate health and safety standards are followed. The case of Ikirezi demonstrates that it is possible for small and medium sized enterprises to achieve self-sustaining levels of production with little formal training.

⁶³ Verner, Dorfe, Nanna Roos, Afton Halloran, Glenn Surabian, Edinaldo Tebaldi, Maximillian Ashwill, Saleema Vellani, and Yasuo Konishi. 2021. *Insect and Hydroponic Farming in Africa: The New Circular Food Economy*. Agriculture and Food Series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1766-3. License: Creative Commons Attribution CC BY 3.0 IGO.

Recommendation B.5: IFC or World Bank should investigate the use and production of bio-pesticides in Rwanda/Africa

Bio-pesticides can provide a cost-effective alternative to synthetic pesticides. There is strong evidence on the performance of biopesticide performance in preventing disease and insect outbreaks in Rwanda.⁶⁴ Biopesticides can also enhance other measures such as Integrated Pest Management. Biopesticides should not be subject to the same quality and inspection standards as synthetic pesticides because they pose significantly less harm to humans and the environment. The EAC has developed a separate set of guidelines for the registration of bio-pesticides and bio control agents for plant protection.⁶⁵ The availability of harmonized guidelines for biopesticides will facilitate trade between partner states and improve access to biopesticides (see below).

Recommendation B.6: World Bank together with MINAGRI should review NAEB's current support to coffee sector

The size of NAEB support to the coffee sector is non-trivial in comparison with ISP support provided to CIP crops. NAEB sources only from one importer and faces criticism with respect to irregularities in its distribution and targeting processes. This support will not be affected by the upcoming subsidy reform process. A review of NAEB's support to the coffee sector similar to the review of the ISP might improve the efficiency and effectiveness of these public expenditures. The World Bank is well placed to conduct this review as it is very much in line with the recently completed Input Subsidy Review⁶⁶ which was also commissioned by the Bank.

Recommendation B.7: Government of Rwanda should incentivize innovations in demand management and access to finance

Innovative approaches to demand management are having some success in regional areas, with more possibilities on the horizon. Broadly speaking, digital demand management systems are developing quickly and can enhance efficiency and competitiveness. Such initiatives should be encouraged by policy makers. Regarding the SNS and MOPA systems, there is potential to utilize these systems to provide access to finance, and BK Techouse is currently in the process of developing a credit provision scheme based on the SNS data. The idea behind the system is to use SNS data on farmers, to develop an automatic credit worthiness rating for individual farmers. The SNS database contains information on farmer plot size, which crops they produce, how much and what type of agricultural input they have purchased over time. The app also encourages farmers to set up bank accounts. This concept represents a good opportunity for the private sector to leverage off the existing distribution system to develop new services for farmers.

⁶⁴ https://www.ishs.org/ishs-article/917_12 Accessed 5.05.2022

⁶⁵ See "EAC harmonized guidelines for the registration of bio-pesticides and bio control agents for plant protection", Approved by the council of Ministers, 28th November 2019.

⁶⁶ See (Unique Landuse, 2022)

C. Long term capacity building recommendations

Recommendation C.1: GoR should develop human and physical capacity along the registration process

Several important steps can be taken to improve the agri-input product registration process. The main agencies that would be targeted by the following interventions are RAB, RICA and RSB.

- Build capacity and offer study tours on fertilizer and pesticide management, risk assessment of pesticide, residue trials and post registration monitoring
- Address the quality and consistency in dossier reviews through continuous improvement of the technical capacities of the personnel, establishment of missing procedures on re-registration, post registration monitoring, and requirements for registration of biologicals
- Consider utilization of regional experts in dossier review under Technical Working Group, sharing of data or mutual recognition of data provided and or assessments done in EAC permanent secretariat

Human Resources:

- Hire permanent staff qualified in; chemistry, residues, toxicology, efficacy, eco-toxicology, environmental chemistry, bio-control agents, and bio-pesticides for successful support in implementation of the EAC guidelines or additional staff members of technical team to cover the 6 -7 basic/ minimum required staff in the disciplines indicated. These can be increased depending on the volume of dossiers over time.
- Offer regular, incremental training in dossier evaluation – for both conventional and biological products
- Ensure the availability of four basic minimum staff for the laboratory with skills in analytical chemistry
- Consider replacing the missing members of the advisory council (only 6 members are active)

Infrastructure:

- To equip and improve existing laboratories by incorporating pesticide testing
- Equip library to include online facilities for easy access to pesticide registration information references, tools and models for risk assessment etc.
- Establish laboratory facilities for pesticides analysis and or collaborations and linkages with existing ones to support in needed pesticides analysis

Financial Resources & governance:

- Make provisions (resources) for the Council to hold extraordinary sessions, specifically during pest emergencies and technical meetings

- Although the Council's membership is drawn from national ministries and agencies; other expertise pertinent to dossier review – risk assessment should be considered to form a technical team to support the registrar's office.

Recommendation C.2: GoR should develop human and physical capacity along the inspection and testing process

Capacity building and regulatory reform is needed to improve the efficiency of the inspection process. There are several regulatory reforms that could be considered that would swiftly increase the testing capacity of import inspections:

- The number of agri-input inspectors is artificially low. An amendment to the Ministerial order N° 001/11.30 to allow a higher number of inspectors would improve the efficiency of inspections. In particular, this applies to inspections of imported agricultural inputs that are already approved for sale within Rwanda.
- The GoR should allow third party laboratory testing of imported agricultural inputs – for example by universities, or other qualified private testing facilities. This would significantly reduce the pressure on RSB facilities and improve the efficiency of the testing process for inputs arriving in Rwanda. It would also free up capacity for laboratory testing of new products that are in the process of being registered.
- The Rwanda Standards Board is trying to increase laboratory testing capacity through recognition of the ISO 17025 Certification in Rwanda. ISO/IEC 17025 certification helps the organizations that contain laboratories to possess a consistent premium quality system, however at present only RAB is authorized to conduct laboratory tests.⁶⁷ Under EAC regulations, testing would be more widely permitted.
- Given the substantive amount of unregistered input products on sale at agrodealer stage, customs offices and RICA should closer work together. As soon as these products have entered Rwanda, it is very difficult to keep them off the shelves.

⁶⁷ <https://factocert.com/rwanda/iso-17025-certification-in-rwanda/> Accessed 20.05.2022

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8. Annex

8.1. Regulatory Assessment Methodology

8.1.1. Secondary Data Review

A desk review has been conducted to appraise existing Rwanda's fundamental Law/Constitution as amended to date, agrochemical Law and regulations, prime ministerial and ministerial Orders as well as procedures/protocols among others. In this regard, information was gathered through review of available documentation to fertilizers and pesticides regulations in Rwanda and the country's adoption of the EAC (East African Community) harmonized pesticide guidelines. A review of documentation provided by the Ministry of Agriculture and Animal Resources (MINAGRI), Rwanda Agricultural and Animal Resources Development Board (RAB), Alliance for a Green Revolution in Africa (AGRA), EAC Headquarters, RICA (Rwanda Inspectorate, Competition and Consumer Protection Authority), MINAGRI appointed Advisory Council on agrochemicals and appointed agrochemical inspectors among other key stakeholders was conducted. Available documentation was provided in the form of official gazettes published, presentations, reports of previous activities related to the current Rwanda's agrochemical regulatory framework, domestication and implementation of EAC harmonized guidelines (training sessions, re-ports).

The secondary data review also included the national agricultural inputs (fertilizer, pesticide) strategies, policies, and reports on use and performance, national agricultural policy and strategy (PSTA-4). Reference was made to other studies/publications like the recent World Bank funded report on Rwanda's Agricultural Subsidy Review and Reform, including policy priorities of the Government of Rwanda, as well as fertilizer and pesticides laws and regulations applicable in other countries, such as within the other 5 EAC member States (Kenya, Uganda, Tanzania, Burundi and Southern Sudan) among others. The team also considered a comparison of Rwanda fertilizer and pesticide Law and regulations to international best practices. The review also looked at the overall "Enabling the Business of Agriculture" (EBA) score to assess Rwanda's business regulatory environment.

8.1.2. Respondents to the Regulatory Assessment Exercise (From Public And Private Sector)

The assessment utilized purposive sampling during identification and selection of respondents. Purposive sampling is often used in implementation research to identify and select key informants and or respondents who are information-rich, in this case, related to the experiences in Rwanda's fertilizer and pesticide regulatory framework area.

Respondents to the assessment exercise were selected from key stakeholders from both public and private sectors. Key stakeholders from private sector include mainly (i) fertilizer importers, (ii) fertilizer blending plant promoter, (iii) pesticide importers, (iv) crop protection products producer, (v) producer and exporter of organic products as well as (vi) producers and ex-ports of horticulture. Public sector stakeholders included the main institutional bodies associated with the agricultural sector including MINAGRI, RAB, and RICA.

Table 7: Stakeholder interviews

NAME	TITLE/POSITION	INSTITUTION
Frederic Gacondo	Legal Affairs Specialist	MINAGRI Central
Gatari Egide	Agricultural Subsidies Program Manager	MINAGRI, RAB Agricultural Subsidies Program
Munezero Elise	Agrodealer development officer	RAB/ Agricultural Subsidies Program
Beatrice Uwumukiza	Director General	RICA (Rwanda Inspectorate, Competition and Consumer Protection Authority)
Goretti Mujawamariya	Registrar of Agrochemicals (Fertilizers, Lime, Pesticides) and Agrochemical Inspector	RICA
Claudine Berababyeyi	Agrochemical Inspector	RICA
Leon Hakizamungu	Agrochemical Inspector	MINAGRI/RAB
Priscille Ingabire	Agrochemical Inspector	MINAGRI/RAB

NAME	TITLE/POSITION	INSTITUTION
Peter Ngugi	Commercial Manager Yara Rwanda Ltd	Yara Rwanda Ltd
Kaddar Naoufal	Country Manager	Rwanda Fertilizer Company Ltd
Mr. Eric Pohlman	Co-Founder & Rwanda Country Director	ONE ACRE FUND/TUBURA Ltd
Susan Asiiimwe	Rwanda Legal Counsel	ONE ACRE FUND/TUBURA Ltd
Shakil Shaikh	Country Manager	ETG INPUTS LTD
Jean Paul Ndagijimana	Country Manager	Alliance for a green Revolution in Africa (AGRA)
Margaret Anderson	Senior Director, Programs	USAID/FEED THE FUTURE HINGA WEZE PROJECT
Robert Nzabamwita	Agronomist marketing officer	AGROTECH LTD
Cadeau Grace Mukundiyabo	Service Manager-Crop Protection	AgroPy Ltd
Dannisen Chellen	General Manager	PROXIFRESH RWANDA
Aimable Gakirage	Managing Director	GARDEN FRESH RWANDA
Samuel Ntawiheba	Operations Director	IKIREZI NATURAL PRODUCTS
Athanasie Mukeshiyaremye	Division Manager of National Standards	Rwanda Standards Board (RSB)
Jean Baptiste Bizimungu	Statistician	Rwanda Revenue Authority (RRA)
Hakiziman Protais	Coffee Value Chain Officer	National Agricultural Export Development Board (NAEB)
Safari Evariste	Marketing Manager	BALTON Rwanda
Valens Nsabimana	Executive Director	RAIDO (Rwanda Agriculture and Inputs Development Organization)

Source

8.1.3. District survey

Figure 29 shows the districts selected for the field survey. These are a mix of different areas particularly in terms of crops produced. The selection of these districts also allowed for a comparison of transport costs to different regions.

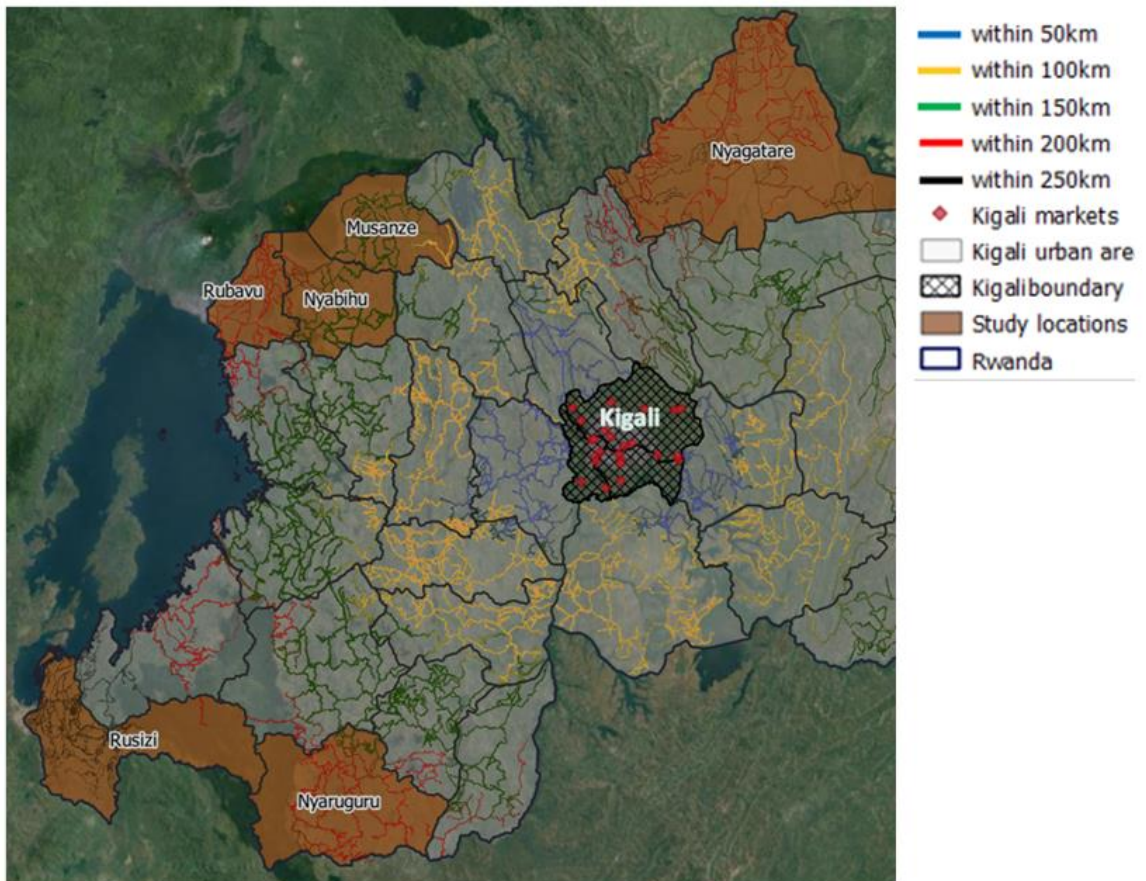


Figure 29: Districts for data collection

SURVEY INSTRUMENT for quantitative district surveys

Please record the location of the stakeholder, if possible using GPS coordinates.

SECTION A: IDENTIFICATION-AGRODEALERS & FARMER COOPERATIVE					
A1. District [1] Musanze [2] Nyabihu [3] Nyamasheke [4] Nyaruguru [5] Rubavu [6] Rutsiro	A2. Type of actor in the value chain: [4] Agrodealer [5] NGO (specify) [6] Agribusiness/private companies [8] -Farmer Cooperative	A3. Size [1] SSF/ less than 10Ha [2] LSF/ 10 Ha and above	A4.a. Are you registered with RAB/CIF? [1] Yes [0] No A4.b. If yes, since when? /__ / year A4.c. If no, why? [1] [2] [3]	A5.a. If Agrodealer, are you licensed with RICA? [0] No [1] Yes [2] N/A (If not agro-dealer) → Skip to A6.a A5.b. If yes, since when? /__ / year A5.c. If no, why? [1] [2] [3]	A6.a. Are you a member of RAIDA? [1] Yes [0] No A6.b. If yes, since when? /__ / year A6.c. If no, why? [1] [2] [3]

SECTION B: PRODUCT MARKETING- FERTILIZERS							
B1. Which {fertilizer types} do you sell/buy? [see Appendix B]	B2. For each {fertilizer type}, what is the volume (in ton) did you buy in this season? /__ / tons	B3. What is the bag size? <i>[Choose multiple]</i> [1] 5 Kg [2] 10 Kg [3] 25 Kg [4] 50 Kg [5] 100 Kg	B4. What is the price (FRW) did you pay for each bag size? /__ / Frw	B5. From where did you buy it? [1] [2] [3]	B6. Who are you selling to? [1] [2] [3]	B7. At what price (FRW) have you been selling the {fertilizer type} this season? /__ / Frw	B8. Was the {fertilizer type} subsidized? [1] Yes [0] No
B9. How are the fertilizers distributed to customers? [1] [2] [3]	B10. Have ever bought fake or spoilt {fertilizer type}? [1] Yes [0] No	B11. From where do you buy it? [1] [2] [3]	B12. Did you communicate the issue to the supplier? [1] Yes [0] No	B13. Explain how it went:			

SECTION C: PRODUCT MARKETING- PESTICIDES							
C1. Which {pesticide types} do you sell/buy?	C2. For each {pesticide type}, what is	C3. What is the bag size?	C4. What is the unit price (FRW) did you	C5. From where do you buy it?	C6. Who are you selling to?	C7. At what price (FRW) have you	C8. Is the {pesticide type} subsidized?

[see Appendix C]	the volume (in ton) did you buy in this season? / __ / tons	[1] [2] [3]	pay for each {pesticide type}? / __ / Frw	[1] [2] [3]	[1] [2] [3]	been selling the {pesticide type} this season? / __ / Frw	[1] Yes [0] No
C9. How are the fertilizers distributed to customers? [1] [2] [3]	C10. Have ever bought fake {pesticide type}? [1] Yes [0] No → Skip to C...	C11. For which products? a. Fertilizers (See Appendix B) b. Pesticides (See Appendix C)	C12. From where do you buy it? [1] [2] [3]	C13. Did you communicate the issue to the supplier? [1] Yes [0] No	C14. Explain how it went:		

SECTION D: STORAGE FACILITY OF FERTILIZERS/PESTICIDES

D1. Do you have an appropriate storage facility for fertilizers and/or pesticides? [1] Yes [0] No → Skip to D11	D2. What is its capacity? / __ / tons	D3. What was the cost of establishing it? [This includes investment cost and cost of meeting regulatory requirements (e.g. licenses, permits, duties, taxes...)] / __ / Frw	D4. How many permanent workers do you have for it? / __ / Number [If 0, skip to ...]	D5. How much are they paid on monthly basis? / __ / Frw	D6. How many casual workers do you have for it? / __ / Number [If 0, skip to ...]	D7. Generally, how much are they paid on monthly basis? / __ / Frw	D8. What is the cost of electricity per month for it? / __ / Frw
D9. Any other cost associated to it? [1] Yes [0] No → Skip to D11	D10. How much per month? / __ / Frw	D11. If no in D1, where do you store fertilizers and/or /pesticide? [1] [2] [3]					

SECTION E: NETWORKING
[For agricultural cooperatives]

E1. Is there any NGOs providing you with fertilizers/pesticides? [1] Yes [0] No → Skip to E8...	E2. If yes, which ones?	E3. Do you get fertilizers/pesticides from them for free? [1] Yes → Skip to E6 [0] No	E4. If no, what is the cost of {fertilizer types} from them? /___/ Frw/Kg	E5. If no, what is the cost of {pesticide types} from them? /___/ Frw/Kg	E6. How do they distribute fertilizers/pesticides to you? [1] [2] [3]	E7. Do you have any type of supply agreement/contract with them? [1] Yes [0] No
E8. If no in E1, why? [1] [2] [3]						

SECTION F: INSPECTION

F1. In the past 12 months, has your institution been inspected? [1] Yes [0] No → Skip to F..	F2. If yes, by who?	F3. How many times? /___/ number	F4. Were inspection results shared with your institution? [1] Yes [0] No	F5. How do farmers know they are getting the right and good quality products? [1] [2] [3]
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APPENDIX to district survey:

Appendix A: Guiding questions for qualitative interviews

1. Would you describe the key players in the fertilizers / pesticides value chains in this district? (For each actor, probe for overall market size and potential trade volumes, production and import trends, demand supply scenario, distribution channels, status of infrastructure, product storage, handling, labelling and other aspects).
2. What are the main marketing channels within the pesticide and fertilizer value chains in this district?
3. What factors determining the retail price in this area? (Probe VC players knowledge about issues of procurement, transport and transaction, and other local distribution charges) (mostly for importers and wholesalers).
4. Do you offer paid agricultural advisory services? If yes, explain these services and how farmers benefited from each of them.
5. What was the establishment cost for the storage facility? *Probe for the costs related to meeting regulatory requirements*
6. How do you collaborate with district/sector officials in your dealership? Alternatively, what is the role of district/sector in the agri-input dealership? If no, why?
7. What do you find as main challenges in the demand/supply of fertilizers/pesticides? *Probe for different types of fertilizers and pesticides*
8. What are the benefits of
 - (i) Membership to RAIDA versus not being a member?
 - (ii) Licensing with RICA versus not being a licensed?
9. Market assessment (separate fertilizers from pesticides)
 - (i) For which products do you expect growing market demand in the next 5 years? Why?
 - (ii) For which products do you expect shrinking market demand in the next 5 years? Why?
 - (iii) For which product is the demand higher than the supply? Why?
 - (iv) For which is supply higher than demand? Why?
10. Inspection
 - (i) What are the inspection practice, process and protocols?
 - (ii) At which stage of the value chain do most of the problems of counterfeits occur?
 - (iii) How could inspections or sampling be made more effective?
 - (iv) Do pilot initiatives exist that could be scaled up to mitigate against quality risks?
11. Private sector involvement
 - (v) Can you comment on the latest innovations in fertilizer/pesticide supply? E.g. digital tracing or seals, phone applications to help with fertilizer/pesticide use
 - (vi) Do you see any role for private sector in improving pesticide/fertilizer supply? E.g. customized/diversified products, locally produced fertilizer/pesticides, improved quality assurance or product tracing.

Appendix B: List of fertilizers

Organic fertilizer
NPK
Urea
DAP
Lime
Blended

Appendix C: List of pesticides and fungicides

Dithane	Rodazim	Atoce	Commando	Millmax
Ridomil	Thiovit	Lambdex	Confidor	Miovit
Dimethoate (DUDU)	Safari max	Evisect	Cypro	Octiva
Cypermethrin	Victory	Prove	Easygrowth	Orius
Dursiban	Copper (akaribata)	Abamectin	Endofil	Ramdan
Tilt	Supra	Fenvalerate	Indofil M 45	Profex super
Pilkare	Alfatox	Copper oxychloride	Safari Zeb	Round all
Rocket	Daconil	Othello	Jacket	Safari Zeb
Beam	Vendex	Balcolex	Lambda	Scower
Lava	Ortivatop	Cabrio	Mancozeb	Sumithio
				Vital

BOX 2 QUANTITATIVE DATA COLLECTION AT AGRODEALER		
Agro-dealer	Total MT traded product (fertilizer)	
	RWF	USD
<u>Gross revenue (qty sold * price)</u>	a	
Product purchases (payment to importer/wholesaler)	x	
other variable costs	y	
<u>Total var costs</u>	z	
<u>Agrodealer's income</u>		
Gross margin (revenue - total var costs)	a-z	
Agro-dealer	Total MT traded product (fertilizer)	
	in RWF	USD
Variable Costs		
Purchase from wholesaler		
Licences, Permits, Taxes and duties		
Storage		

Vehicle O&M/Transport Labor for handling, repacking, etc other		
TOTAL		

8.1.4. Key informant interviews Kigali

Table 8: Key Informant Interviews, Kigali March/April 2022

NAME	TITLE/POSITION	INSTITUTION
Peter Ngugi	Commercial Manager Yara Rwanda Ltd	Yara Rwanda Ltd
Margaret Anderson	Senior Director, Programs	USAID/Feed The Future Hinga Weze Project
Dannisen Chellen	General Manager	Proxifresh Rwanda
Jean Paul Ndagi-jimana	Country Manager	Alliance for a green Revolution in Africa (AGRA)
Samuel Ntawiheba	Operations Director	Ikirezi
Athanasie Mukeshiyaremye	Division Manager Of National Standards	Rwanda Standards Board (RSB)
Dr. Octave Semwaga	Director General	MINAGRI
Ms. Marie Goretti Mujawamariya	Registrar of Agrochemicals	Rwanda inspectorate, Competition and Consumer Protection Authority (RICA)

