Institute of Research and Dialogue for Peace

Ikiraro cy'iterambere

CROP INTENSIFICATION PROGRAM (CIP) CITIZEN'S SATISFACTION SURVEY - 2018

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FOREWORD

Institute of Research and Dialogue for Peace (IRDP) received funding from Ikiraro Cy'Iterambere Project. This financial support from Ikiraro Cy'Iterambere aims to meet programme objectives in contributing to the Rwandan objective of promoting citizens' participation and accountable governance. It provides technical and financial support to civil society and government partners to engage constructively with each other, leading to more effective policy, planning, budgeting and accountability processes, which in turn contribute to poverty reduction and economic growth.

IRDP commissioned the study on Crop Intensification Programme satisfaction survey with the aim of to gain farmers' perspectives on their experiences and perceptions regarding Crops Intensification Programme and assess the inclusiveness in the designing, planning, and implementation of CIP, to documente and analyze the level of satisfaction of Citizen (agriculture famers) about services provided through the 4 components of CIP; to identify the key gaps and challenges faced by citizens in designing, planning and implementation of the CIP; to identify farmers' needs, expectations and the level to which they are met under CIP; to identify and highlight key advocacy issues for a better implementation of the agriculture policy and CIP programme; and to formulate recommendations to relevant partners and stakeholders on what to do for a better implementation of agriculture policy and the CIP Programme.

The findings of this study will help Institute of Research and Dialogue for Peace (IRDP), Ministry of Agriculture (MINAGRI), Rwanda Agriculture Board (RAB), Agriculture partners and other stakeholders to provide relevant key policies in strengthening and promote farmers' engagement in increasing agriculture productivity, sustained nutrition, and agriculture market expansion and to provide an advocacy on highlighted issues in the agriculture sector. In this Study, IRDP provides proposed policy actions and recommendations to address the observed challenges in four pillars of Crop Intensification Programme for ensuring its effectiveness and efficiency.

The final results of the analysis of CIP satisfaction survey are reported in form of statistical tables, figures and testimonials from Focus Group Discussions (FGDs) agriculture actors and deep analytical paragraphs for each component of CIP process. Each pillar of CIP is complemented with proposed policy action and recommendations to the identified gaps.

On this occasion, I would like to convey my thanks to Ikiraro Cy'Iterambere Project for the financial support for the success of this study, Ministry of Agriculture and Animal Resources, IRDP staff and, Districts Authorities.

I would also like to thank the team of consultants for their expertise in conducting this study. A special gratitude goes to all farmers, key informants and partners for their sincere cooperation and dedication to success of this study.

Rt Archbishop Emmanuel Kolini,

Chairman of the Board of Directors,
Institute of Research and Dialogue for Peace (IRDP)

ACKNOWLEDGEMENT

Institute of Research and Dialogue for Peace (IRDP) has published several analytical reports of evidence-based advocacy, community dialogue at different levels, illustrating the efficiency and effectiveness of policy implementation at the central and local levels.

IRDP is pleased to release the final results of the conducted study on CIP satisfaction Survey in 10 Districts in Rwanda. The execution of different phases of the study needed engagement and cooperation of different institutions and individuals.

On this occasion, I would like to extend our sincere gratitude to the Government of Rwanda, Ministry of Agriculture, Rwanda agriculture Board and other stakeholders. Special recognition goes to the Ikiraro Cy'Iterambere Project for the financial support, Researchers and Administrative staffs of IRDP and consultants for their efforts in the success of the study.

I also wish to express my appreciation to the local Government authorities (Districts and Sectors) for facilitating the data collection in sampled households and to form Focus Group Discussions at Sector level. Also, special gratitude goes to the National Institute of Statistics of Rwanda for availing VISA for conducting research and staff from the institutions that deals institutions that deal with agriculture activities as key informant interviewees and farmers as respondents from selected Districts and sectors. Equally, IRDP recognizes their painstaking efforts throughout the whole process as crucial for the success of this study.

Thank you!

Dr. NDUSHABANDI Eric, PhD

Director of Institute of Research and Dialogue for Peace, (IRDP)

EXECUTIVE SUMMARY

Rwanda remains a largely agricultural country, and agriculture remains the backbone of the Rwandan economy (MINAGRI, 2006). Agriculture in Rwanda is the main economic activity as it provides employment to about 72% of the labor force, contributes to about 33% of the Gross Domestic Product (GDP), meets 90% of the national food needs, and generates more than 70% of the country's export revenues (Bizoza, 2015). About 81 % of all households in the country depend on agriculture. Rural areas accommodate nearly 83 % of all households in the country, and 87% of rural households depend on agriculture (NISR, 2014). In addition to this, the majority of those households practice subsistence agriculture. Rwandan agriculture is mainly based on small-scale family farming units (with an average plot size of 0.75 hectares), concentrating their activities on production for household consumption and local market exchange (Ansoms, 2010). Given the importance of the agricultural sector and the specific challenges it faces, the GOR undertook important reforms and put in place important policies and programs since the beginning of this decade. These included those related to the land use and management, such as, the National Land Policy, the Land law, and related programs and strategies.

The Government also initiated specific policies and programs to address the agricultural sector challenges, such as the National Agricultural Policy, the Strategic Plan of Agricultural Transformation (PSTA) I, II III and IV to address the specific challenges related to the low productivity and the very limited use of agricultural inputs, an important program was put in place in 2007: The Crop intensification Program (CIP) which has four major components: 1) distribution of improved inputs, 2) land use consolidation, 3) proximity extension services, and 4) post-harvest handling and storage. CIP aims to raise the productivity of priority crops, increase the revenues in smallholder farms 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 of maize, rice, wheat, beans, soy bean, cassava, Irish potato and banana. To achieve this objective, CIP pursues the following specific objectives:

- Increase the effectiveness of the farm inputs by improving the appropriateness of their use and response to the inputs
- Shifting focus from supply to enhancing the demand for inputs by farmers and market-driven forces within the system
- Progressively exit from subsidy program while ensuring the initial purpose of subsidies are achieved
- Strengthen the smallholders' links to market for inputs and outputs through improved access to finance and market information
- Minimize the post-harvest losses and facilitate linkages upstream of the value chain through improved storage, and
- Develop areas with superior production potential as breadbaskets of Rwanda to ensure food security and promote exports to regional markets

This document reports the findings of a study commissioned by the Institute of Research and Dialogue for Peace (IRDP), under the auspices of programme objectives in contributing to the Rwandan objective of promoting citizens' participation and accountable governance, with the

financial support of Ikiraro Cy'Iterambere Project. IRDP consultants and Staff, who are specialists in agriculture research, public policy programs, initiatives and projects carried out the study. The aim was to assess farmers' perceptions and satisfaction with regards to the planning and implementation of Crop Intensification Programme in selected districts and to assess the efficiency and effectiveness of CIP in Rwanda, and to identify gaps, best practices and lessons learned, as well as existing bottlenecks in that the process of CIP implementation.

The study surveyed 1500 farmers in four provinces and Kigali City, 20 sectors from 10 districts across the country. Data was collected using a questionnaire; focus group discussions and key informants' interviews whereby stakeholders from agriculture sector were interviewed.

The main demographic characteristics of the respondents include: High proportion (77.1%) of farmers aged 35 to 54 engaged in agriculture compared to others famers falling in other age groups. Elderly people aged 74 and above, as well as young people aged 15-24 are less represented in agricultural activities (3.7%). This indicates that the agriculture sector has potential to provide greater employment to the youth.

A large share of respondents, It also showed the big share had completed primary education (50.1%) while few had completed, secondary and TVETs education represented (6.0%). Those who had never attended formal school represent (42.9%). The findings did not reveal any of none of the interviewed farmers who had completed masters courses or PhD. These findings indicated that the predominant farmers who engage in agriculture activities are belong in low education level. The survey had roughly balanced gender participation: 57.9% of respondents were men and 42.1% women.

Regarding these findings, the researchers recommend that there is need to strengthen and introduce agriculture programmes in middle level schools and universities. Another alternative is to develop agriculture based technology and grassroots training of farming practices based on farmer-to-farmer orientation.

Farmers' perceptions regarding Crop Intensification Programme in as far as access to extension services; access to agricultural inputs and the land use consolidation are concerned.

65% of surveyed farmers were satisfied with services provided through the four components of CIP. The highest level of satisfaction is for the access to inputs in average of 84% for using fertilisers and 93.7% in using improved seeds, proximity and extension services at 77.4%, land use consolidation 64.3%, postharvest services and storage handling 64.3%

Majority of the farmers appreciated the government program of land use consolidation because their small plots were consolidated and formed cooperatives which helped them to improve agriculture productivity in terms of food security, earning agriculture income, and solving other household needs.

The usage of improved seeds and fertilizers is at high level (over 80%). The survey findings revealed that 86.8% of interviewed farmers' land is under LUC while 13.2% are not. The farmers' perception on CIP varies from sector to sector within the districts. In some sectors, the farmers appreciated CIP benefits and others have misconception on CIP benefits. These variations reflect differences in the way the CIP has been presented by local agronomists. For example some farmers believe that Land Use Consolidation is used by government as a way to take hold of their land. Farmers in Kirehe (Gatore) and Nyamasheke (Bushekeri) appreciated the benefit from CIP at more than 80%, while in Gicumbi district (Kageyo) and Kayonza District (Ruramira) the CIP was less appreciated at 48% and 54 % respectively.

Many farmers reported that the CIP had improved their livelihoods. 89.2% of respondents reported that the CIP had helped them to buy agriculture inputs (89.2%). 75.3% reported that the CIP had helped them to attain household food security and to buy basic needs. 67.2% reported that the program had enabled them to construct and rehabilitate houses, and 79.9% reported that they had been able to buy other land and livestock.

There are questions about the sustainability of these benefits if government removes or reduces its subsidies. The survey findings point to the need for improved education to sustain knowledge and new practices brought by the CIP.

The level of understanding and application of different CIP components by beneficiaries and other actors

The study established that the CIP is not well understood by the farmers. Lack of awareness, fixed mindsets, beliefs and resistance of farmers are key obstacles. Some farmers refuse to consolidate their land on the assumption that the size of their land is small, while others reason that the CIP is for the benefit of the government and not for the farmers. Other farmers believe that the inorganic fertilizers contaminate the land and reduce fertility in subsequent seasons. (Kugundura Ubutaka).

While farmers have benefitted from CIP, such as from access to inputs and extension services, most of them are not aware that these services are provided under the CIP program. Most of the farmers are not aware of the existence of an initiative known as Crop Intensification Program, but are aware that government supports the sector. The study observed that the communities are not sensitized on the concept of CIP at village levels.

Some of the farmers do not appreciate land use consolidation because they do not understand the policy and may believe that it serves as a means for government to grab their land. They also reported that growing one crop on a piece of land (mono-cropping) could increase risks and cause hunger. Farmers indicated that when they used to grow many crops in one plot, one crop could fail while the others could thrive. Some farmers are for the opinion that CIP is beneficial to the government and not to the farmers.

The findings showed that in some districts, most farmers are consolidating lands, which belong to the government, as opposed to their own land. Farmers also reported existence of inequality

in leasing the government land (marshland) whereby rich farmers get larger acreage than poor farmers.

The farmers identified some constraints regarding access to inputs (improved seeds, fertilizers) which are supplied by certified agro-dealers, the key ones being delay in delivery, high prices, delivery of seeds that are not adapted to the local climatic conditions and poor knowledge of the importance of improved seeds.

The findings show that the process of input supply starts from farmers and agronomists who assess needs and collect lists of beneficiaries to be sent to the cell, sector by Umudugudu and cooperatives to agro-dealers up to RAB. The delivery depends on the availability of seeds, and fertilizers to the dealers. During distribution priority is given to large famers and big cooperatives. Small farmers' claim that they are not favorably considered. Advocacy should address these issues in order to promote greater equality in access to seeds, fertilizers and access to the markets.

The challenges faced by farmers

- Involvement of the farmers in planning of agriculture decisions is still negligible at the local level (Village, cell and Sectors); Sector agronomists and certified agro-dealers take decisions and request small-scale farmers to implement without sufficient consultation.
- Not having insurance for agriculture crops in case of drought and flooding is a serious challenge for farmers, which prevents them from making investments on their farms.
- Limited knowledge in reducing postharvest losses and marketing, are key challenges to the farmers.
- Insufficient market for maize, Irish potatoes and tomatoes produce. The feeder road infrastructures are still poor in some sectors (example in Ruramira, Kayonza), thus posing a problem to transport the farm produce to the markets.
- Some districts have high yields and yet do not have community storage facilities (example in Nyaruguru) while other district have underutilized community storage facilities (example in Gicumbi, Rubavu).

Proposed key policy actions or recommendations to address identified challenges and gaps in the achievement of CIP objectives

❖ *The proposed avenues for improvement of access to agricultural inputs, proximity service delivery in agriculture and land use consolidation and to better respond to citizens needs and to achieve the CIP objectives in this area*

- Farmers should be sensitized on the benefits of CIP with clear information on the four pillars of CIP. Given the benefits of CIP to the farmers as identified in the survey, the farmers should be informed on their roles in CIP, as well as the role of all the other actors. This will ensure more take up of CIP. This should be carried out through community dialogue, which should be held in every village within the country so as to reach all farmers

- Farmers should be consulted in the implementation of CIP and their proposals taken into consideration. For instance the ideas of citizens should be consulted through local meeting before recommendations are given on the type of crops to be grown.
- To achieve strategic objectives of CIP, specifically in the components of access to inputs, Ministry of agriculture, development partners and other stakeholders that involved in supporting agriculture activities; should monitor and regular follow-Up in assessing the standards of improved seeds and fertilizers before their distribution to the farmers.
- The improved seeds and fertilizers should be distributed on time and certification of the suitability of improved seeds to Rwandan conditions should be carried out.
- Soil surveying or soil inspection should be put in place before deciding the type of crops to be grown in a specific region.
- The supply of improved seeds and fertilizers should be in form of market competition instead of monopolistic supply. This will help farmers to choose their agro-dealers.
- To ensure the increase of agriculture productivity, priority should be given to the use of organic fertilizers (manure and compost) together with the inorganic fertilizers (RAB should conduct the inspection of soil acidity in order to advise farmers on correct fertilizer application.
- Increasing crop yields will be more profitable and feasible than expanding the cropped area.
- Given limited land availability there is need to create off-farm employment and promote the use of modern technology to increase agricultural productivity.
- There is a need to undertake feasibility studies on volume of production and capacity of farming activities before constructing post-harvest storage facilities in Districts.
- Strengthening access to finance for agriculture business and farming activities is needed.

Further research

The study findings indicate that the farmers' satisfaction with CIP is high at 65%. However, there is a need to assess the economic benefits of the CIP. Qualitative data shows that CIP impacted positively increasing production in the 20 sectors covered in the study. A future study should aim to cover more sectors and provide information on measurable economic variables by household.

CHAPTER1: BACKGROUND OF THE STUDY

1.1 Introduction

Rwanda remains a largely agricultural country, and agriculture remains the backbone of the Rwandan economy (MINAGRI, 2006). Agriculture in Rwanda is the main economic activity providing employment to about 72% of the labor force, contributing about 33% of the Gross Domestic Product (GDP), meeting 90% of the national food needs, and generating more than 70% of the country's export revenues (Bizoza, 2015). About 81 % of all households in the country depend on agriculture. Rural areas accommodate nearly 83 % of all households in the country, and 87% of rural households depend on agriculture (NISR, 2014). The majority of farmers are primarily subsistence farmers. Rwandan agriculture is mainly based on small-scale family farming units (with an average plot size of 0.75 hectare), concentrating their activities on production for household consumption and local market exchange (Ansoms, 2010).

Given the importance of the agricultural sector and the specific challenges it faces, the GOR undertook important reforms and put in place appropriate policies and programs since the beginning of this decade. These included those related to the land use and management, such as, the National Land Policy, the Land law, and related programs and strategies. The Government also initiated specific policies and programs to address the agricultural sector challenges such as the National Agricultural Policy, the Strategic Plan of Agricultural Transformation (PSTA) I, II III & IV. To address the specific challenges related to the crop low productivity and the very limited use of agricultural inputs, an important program was put in place in 2007: The Crop intensification Program (CIP) which has four major components: 1) distribution of improved inputs, 2) land use consolidation, 3) proximity extension services, and 4) post-harvest handling and storage. CIP aims to raise the productivity of priority crops, increase the revenues in smallholder farms 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 of maize, rice, wheat, beans, soy bean, cassava, Irish potato and banana. To achieve this objective, CIP pursues the following specific objectives:

- Increase the effectiveness of the farm inputs by improving the appropriateness of their use and response to inputs
- Shifting focus from supply to enhancing the demand for inputs by farmers and market-driven forces within the system
- Progressively exit from subsidy program while ensuring the initial purpose of subsidies are achieved
- Strengthen the smallholders' links to market for inputs and outputs through improved access to finance and market information
- Minimize the post-harvest losses and facilitate upstream linkages in the value chain through improved storage, and
- Develop areas with superior production potential as breadbaskets of Rwanda to ensure food security and promote exports to regional markets

According to different information sources, the implementation of the Crop Intensification Program contributed, during these last years, to important changes in the Rwandan agriculture (Kathiresan, 2011, MINAGRI, 2011, Nkurunziza, 2015), and it helped to facilitate the access and the use of agricultural inputs and there has been increase in agricultural production. The beneficiaries also recognize important improvements achieved in the reorganization of land use and related increase in agricultural yields. However, these studies also mention some challenges in the CIP implementation. Other studies such as the Rwanda Governance Board scorecard only provide the farmers satisfaction level in aggregate percentages without breaking this down to the level of the various CIP components. For example, RGB (2016), indicate the citizens' appreciation on CIP at *53.7%.* The previous studies also do not provide proposals on how to improve the farmers' satisfaction with various services provided under CIP. It is in this context that IRDP was supported by IKIRARO to conduct a customer satisfaction survey of CIP.

To enable an in-depth analysis and a better understanding of the level of beneficiaries' satisfaction with CIP, IRDP conducted a detailed satisfaction survey in the country measuring perceptions of the local population and other actors intervening in the agricultural sector regarding the results and benefits from four components of the CIP that relate to the improved input, the land use consolidation sub-program, improvement of post-harvest handling and storage mechanisms and that on the proximity extension services. It is envisaged that the findings from this research will help the decision makers to improve the services delivery systems taking into account the beneficiaries wishes.

The objectives of this assessment are:

- To document and analyze the level of satisfaction of Citizens (agriculture famers) about services provided through the four key components of CIP
- To identify the key gaps and challenges faced by citizens in designing, planning and implementation of the CIP;
- To identify farmers' needs, expectations and the level to which they are met under CIP;
- To identify and highlight key advocacy issues for a better implementation of the agriculture policy and CIP programme;
- To formulate recommendations to relevant partners and stakeholders on what to do for a better implementation of agriculture policy and the CIP.
-

1.2 CIP Policy Context

Rwanda's agricultural policies have been pronounced as successful in alleviating poverty and enhancing food security (IMF, 2011). The Rwanda Vision 2020 (MINECOFIN, 2000) aims at reaching (lower) middle-income status by 2020. The most important objectives of Vision 2020 with respect to agricultural development are to promote agricultural intensification and achieve yield growth rates of 4.5 % to 5% per year. It also lays focus on the production of high value crops; aiming to replace subsistence farming by a fully business oriented, commercial agricultural sector. To elaborate further the role of agriculture in the Vision 2020, the Agricultural Policy of 2004 was

developed. The policy aims to promote intensification through the increased use of inputs (selected seeds, organic and mineral fertilizers, pesticides) and improved agricultural practices. The policy further adopts an approach that focuses on the development and dissemination of technological packages, which include inputs as seeds, fertilizers (mineral and organic) and pesticides, accompanied by sufficient information on the appropriate agricultural practices. The new Agricultural Policy of 2016 builds on the 2004 policy with the principal goal of ensuring a productive, green and market-led agricultural sector through promotion of productivity and commercialization for food security and incomes; resilience and sustainable intensification and inclusive employment and improved farmers' skills.

The Strategic Plan for the Transformation of Agriculture (SPAT I: 2005-2008, SPAT II, 2009-2012 and SPAT III 20013-2018), details the operationalization of the policy objectives whereby CIP is elaborated as programme 1 of SPAT III. SPAT I (2004) encouraged a concerted, multi-stakeholder approach to raise economic growth by increasing productivity of factors of production and diversification of income sources while conserving natural resources. SPAT II (2009) focused on transforming agriculture from a subsistence to commercial sector to raise incomes and alleviate food insecurity with emphasis on encouraging production of export crops. SPAT III (2013-17) expands on SPAT II, emphasizing nutrition, food security and inclusive economic development and improving fertilizer distribution and markets through policy actions. In the new Strategic Plan (SPAT-4), to be rolled out in 2018/2019 FY is characterized by a number of notions emphasizing broad sector transformation.

CIP as an agriculture green revolution policy

Over the past decade, African agriculture sectors have been the object of numerous initiatives advancing a 'new' Green Revolution for the continent. The green revolution is portrayed as a technological breakthrough in the development of new high-yielding varieties of cereal grains, especially wheat, rice and maize, between the early 1940s and the late 1970s.The low productivity of African smallholders is attributed to the low use of modern, improved agricultural inputs. African countries are expected to catch up with the Green Revolution in other parts of the world. Rwanda is one of the countries that embarked on a process of agricultural modernization via a Green Revolution approach and Crop Intensification Programme (CIP) is a case of the application of the African Green Revolution.

The Rwandan government policies have the vision to modernize and professionalize the agriculture sector. These policies fit into a broader call to implement a Green Revolution in Sub-Saharan Africa (SSA). It is believed that formalization of land tenure; investment in modern inputs, and commercialization will drive increased production of selected marketable crops, which will be profitable for smallholders if they are integrated into commercial commodity chains. This, in turn, is expected to lead to increased national food security, exports and growth at the national scale (Knickel et al. 2009).

The Crop Intensification Programme started in 2007 and entails 1) land use consolidation; (2) sale of fertilizers and improved seeds; (3) provision of proximity extension services; and (4) improvement of post-harvesting handling and storage. It aims to transform Rwanda's smallholder

farming into a professionalized sector, (Cioffo et al, 2016). The Crop Intensification Programme (CIP) is the main policy adopted by the Rwandan government to bring about agricultural modernization. The CIP aims for the prioritization of six food crops (maize, wheat, cassava, beans, Irish potatoes, and rice), and at promoting uniformity in farming practices across the country. The introduction of CIP was in in line with the emerging rhetoric of a 'New Green Revolution for Africa'. It is the World Bank's opinion, that ensuring food security and the profitability of agriculture for African farmers will require a 'revolution in smallholder farming' based on the introduction of professionalized inputs such as improved seeds and chemical fertilizers and pesticides, distributed through private-friendly state interventions in input markets (World Bank, 2007:) In 2006, Alliance for a Green Revolution in Africa (AGRA) was formed with funding from Rockfeller Foundation and the Gates Foundation with the aim of making African farming systems more productive and competitive.

Rationale for CIP in Rwanda

Rwanda's current population is an estimated 12.43 million people, with 71 percent rural and 29 percent urban; additionally, population growth averaged 3.18 percent between 2005-2015 (FAO, 2015). Population density for the country is very high for Africa, estimated at 434 persons/km2 (EU, 2014). Significant improvement in the productivity of food crops is required to support the growing rural and urban population in Rwanda. Owing to the limited land resources and the demographic pressure on land, intensification of existing production systems represents a tangible approach for increasing food production in the country. Other studies have noted that many regions in Sub-Saharan Africa have experienced a substantial increase in rural population densities in the last decade. Yet, few regions can increase food production through expanding arable land (Chamberlin, Jayne, & Headey, 2014) and farmers have no other options than to intensify production (Sam Desiere & Marijke D'Haese 2015), as is the case for Rwanda. This view is also shared by other authors who affirm that intensification of agricultural production is one of the strategic pillars for agricultural and economic growth in Sub-Saharan Africa (NEPAD, 2003:24), and a must be pursued in the more densely populated areas in order to feed the rapidly growing and urbanizing population (Vanlauwe et al., 2014:16).

According to Pretty et al. (2011:7), agricultural intensification is a concept that has a traditional definition articulated in three different ways: increasing yields per hectare, increasing cropping intensity per unit of land or other inputs (water), and changing land use from low value crops or commodities to those that receive higher market prices. The need to transform Rwandan agriculture so as to meet the national food security is expressed in the EDPRS, 1 & 2 and the goal is to move Rwandan agriculture from a largely subsistence sector to a more knowledge-intensive, market-oriented sector, sustaining growth and adding value to products (MINAGRI, 2013:4). The CIP launched by the Rwandan government in August 2007 is seen as an attempted solution to the issue of low productivity and smallholder agriculture transformation. The Crop Intensification Program (CIP) has been introduced to guide production through designation of regions for crop types, to ensure wide- spread use of new technologies through making approved seed types and subsidized chemical fertilizers available and to set targets to make sure that the desired production of those crops is achieved. The CIP policy has been implemented nationally through ''Imihigo" targets, for which local officials are held accountable (MINAGRI, 2008).

1.3 Theories of crop intensification in relation to CIP in Rwanda

Agricultural intensification is described as a model with two internal concepts (Figure 1). The first is to increase the inputs of capital (machinery, biotechnology and energy) in the agricultural activities and the other concept is to increase the inputs of labour (high input of manual labour). Land is a constant in the process of agricultural intensification since the core in the concept is to increase the inputs of labour or capital to raise the yield of a land area during a fixed period of time (Börjesson, 2004).

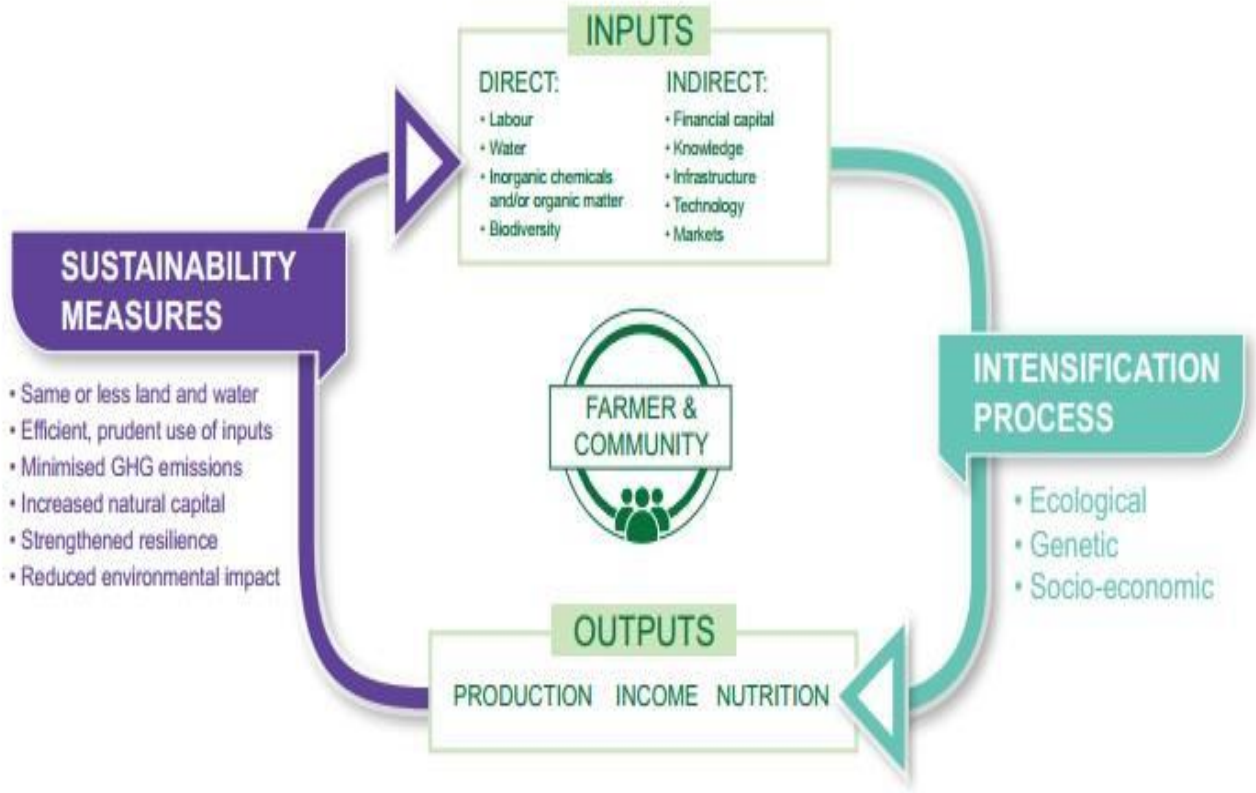

Figure 16: Theoretical model of agricultural intensification (Montpellier Panel, 2013, p.12)

Börjesson notes that the underlying factor for most academics and politicians regarding the issue of agricultural intensification as development method lies in the concern of producing enough food for everybody. Population growth in combination with limitations to cultivate more land stresses the issue of intensifying the agricultural productivity. This is indeed observed in Rwanda, being a small country in size with a total area of 26338 square kilometers a population of approximately 12 million, land represents the major input of the Rwandan agriculture and also the scarcest resource. Land size is a crucial challenge for the Rwandan farmer as the household's available land has been decreasing over the time due to the continuously growing population and the

traditional practices of the land inheritance existing in the country before the land reforms put in place in 2004.

Boserup's Agricultural Intensification Theory

Boserup's (1965) theory on agricultural intensification in response to land constraints due to population growth remains highly relevant to the Crop intensification program in Rwanda. Agricultural intensification is the process whereby land-use practices are adjusted to increase in production on a plot. Production can be stimulated by an increase in the amount or kind of labor invested, the incorporation of crops that yield more food or fiber, or the use of a novel technology (Scarborough, 2012).

According to The World Bank. (2016), the general model of the evolution of farming systems originates in the work of Ester Boserup (1965) and Hans Ruthenberg (1980a,b), popularly referred to as the BR Theory or framework. Under the BR model of intensification, both population growth and market access can lead to a virtuous cycle of intensification of agriculture. Boserup predicted that increased population pressure reduces the size of land holdings, which induces land intensification through a higher usage of fertilizers and labour. Population growth provides the necessity for intensification (Figure 2), while market access provides the opportunity. Boserup (1965) suggested that farmers themselves would respond to population growth through bottom-up innovation. Ruttan and Hayami (1984) developed the idea further to suggest that shifts in demand and prices should incentivize ‘‘induced innovation” among farmers, attributing a significant role to institutions operating at different scales and to the design and implementation of policies which facilitate innovation by affecting input supply, factor prices, land markets and tenure and output markets.

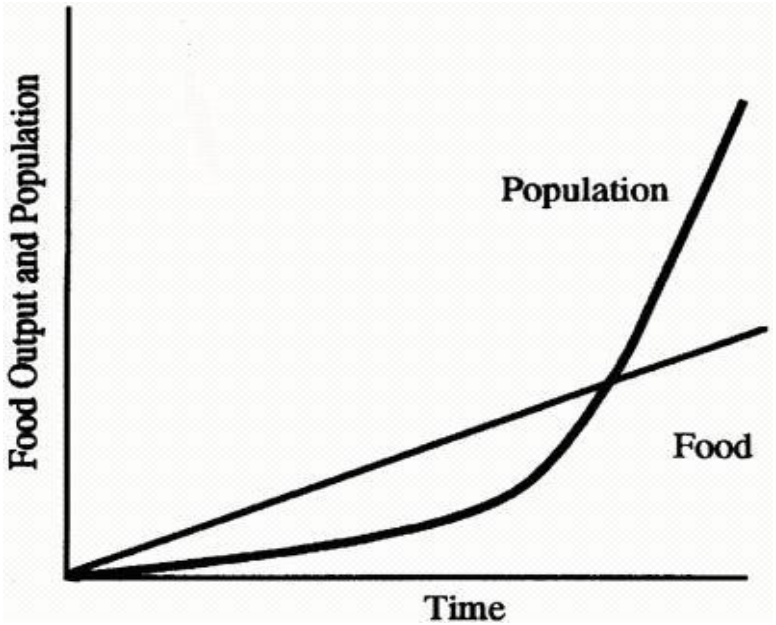

Figure 17: Population growth as a major factor governing agricultural developments.

Source: Boserup, 1965

The BR effects of higher population density and improved market access in the past have led to various impacts as outlined in table 1. Most of these dimensions of intensification have ben experienced in Rwanda under CIP.

- The progressive reduction in fallow length until the land is permanently cultivated, and from there onwards, to multiple cropping per year.
- Soil fertility must be restored via the incorporation of nearby vegetation into soils, preparation of compost and/or manure, and/or artificial (inorganic) fertilizers.
- The appearance of grassy weeds makes hand hoe cultivation much more difficult, and, as tree stumps disappear in the short fallow stage, the plough is introduced via animal draft or tractors.
- Cultivation moves from lighter soils on mid-slopes to heavier soils in lower slopes and depressions that have higher water retention capacity, and to more fragile soils on the upper slopes.
- Cultivation in these new areas often requires investment in land for the prevention of soil erosion, and/or drainage and irrigation.
- Farmers and herders start to trade crop residues for cattle dung, the start of crop–livestock interaction. Eventually, farmers acquire animals and herders sometimes acquire cropland, which leads to livestock integration.
- Labor requirements per unit of land increase for restoring of soil fertility, weeding, land preparation, for investments in land, and for the maintenance of draft animals.
- Land rights evolve from general rights of the communities, which occupy an area to cultivate in their territory to individualized property and use rights to specific plots of land. This process radiates from the homesteads to more distant areas, including land under fallows and pastures. Common property resources are progressively privatized.
- Intensification leads to increases in yields, which is faster where new technology or irrigation is introduced, and often to the diversification from basic staples to higher value crops.
- Value of output per acre increases, but, on account of higher input costs and/or declining farm sizes, profits per acre and agricultural incomes per households may increase or decrease.

Source: H.P. Binswanger-Mkhize, S. Savastano / Food Policy 67 (2017) 28.

Malthusian theory

Malthusian theory however contradicts Boserup theory whereby Malthusim theory suggests that there are limits to further land intensification. Other studies also found increasing land intensification and yields up to a population density of 450 to 600 persons/km2 and stagnating

net incomes (Jayne et al., 2014). As predicted by Boserup, increased population pressure reduces land-holding size, which induces land intensification through a higher usage of fertilizers and labour. However, when examining associations between population pressure and yields, food production and income, Malthusian forces seem to be equally or even more important than Boserupian intensification. While yields increase substantially with increasing population pressure at relatively low population densities, they do not seem to continue to increase in regions with a population density of more than 500 persons/square km. Both Malthusian and Boserupian perspective are observed under CIP, considering that CIP was set up to address the falling trend in soil productivity and the low land use and limited availability of fertilizer in the country (Turioner and Rukazambuga, 2009) and currently Rwandan population density is at 434 persons / square km (NSIR, 2015).This is in line with, Sam Desiere & Marijke D'Haese 2015 who indicate that Malthusian and Boserupian processes co-exist.

Induced innovation' theory

The model of induced technical change was formulated in the 1970s by Ruttan, Hayami, and Binswanger (Hayami and Ruttan, 1971, 1985; Binswanger and Ruttan, 1978). This model emphasizes the importance of relative resource abundance as a determinant of technical change pathways. There are some parallels of the BR model with the 'induced innovation' theory which states that, as populations grow and markets expand, the values of land and labor changes inducing the discovery and the adoption of needed new technologies (Ruttan and Hayami, 1990). Adaptation by the agricultural sector to changes in factor-factor and factor-product price ratios involves, not only the movement along a fixed production surface but also innovations leading to a new production surface. For example, even if fertilizer prices decline relative to the prices of land and farm products, increases in the use of fertilizer may be limited unless new crop varieties are developed which are more responsive to high levels of biological and chemical inputs than traditional varieties.

According to Hayami and Ruttan (1971), the dominant factor leading to the growth of labor productivity has been progress in mechanization, and the dominant factor leading to growth in land productivity has been progress in biological technology. They cite the case of America and Japan, where they observe that for both the United States and Japan vigorous growth in the industries, which supplied machinery and fertilizers at continuously declining relative prices, has been an indispensable element in the process of agricultural growth. The development of effective research and extension systems to exploit the opportunities created by industrial development has also been of critical importance. In the absence of fertilizer responsive crop varieties only limited economic gains could have been realized from lower fertilizer prices. They conclude that, the success in agricultural growth in both the United States and Japan seems to lie in the capacity of their farmers; research institutions and farm supply industries, to exploit new opportunities according to the information transmitted through relative price changes.

The CIP Policy takes the induced policy theory into consideration by supporting research of new varieties for the six priority crops. New improved varieties adapted to Rwanda agro ecological conditions are developed and released to farmers. According to RAB (2014), researchers have developed and released new varieties for maize, wheat beans and Irish potatoes. The CIP policy

also emphasis on improved access of extension services to all farmers. At the onset of CIP, the Farmer Field School extension approach was widely used to disseminate extension and advisory services to farmers. However, by 2010 only 32% of Rwandan farmers were accessing extension services (KIT, 2011). This led to designing and implementation of TWIGIRE MUHINZI national extension system, which includes both the FFS and the Farmer Promoters approaches, was introduced so as to improve the access of extension services (MINAGRI 2014).

Market driven growth model theory to crop intensification

Boserup's model was not developed to account for the complexities of African agricultural transformation at the present time (Frankema, 2014), and a major limitation of the Boserupian model is that it is based on an ideal closed economy and cannot account for the exogenous factors relevant in today's global economy, such as access to urban or foreign markets. Barbier (1996) uses a detailed model in order to distinguish the effects of population driven agricultural intensification from market driven intensification. An important difference between this market-driven growth model and the Boserupian population pressure-driven growth model is that, in the former, favorable market conditions could accelerate the incorporation of new land to production and accelerate intensification, introducing intensive use of chemical inputs with high yielding varieties even in low population density regions.

For Boserup, the intensification process leads not only to higher yields but also to increasing production per capita. Based on the observation that there are sparsely populated regions with high agricultural productivity and, conversely, highly populated regions with low productivity, other authors have suggested that high rural population density is not a prerequisite to intensification. Better access to markets, infrastructure and sound agricultural policies may also lead to intensification and better incomes (Pingali et al., 1987; Lele and Stones, 1989). Göran Djurfeldt et al. (2005) argue that agricultural intensification in poorer countries does not only occur when there is a population growth or not enough land to cultivate, but can also happen due to commercial forces.

1.4 Relevant Case Studies on effects of Green Revolution on Small-Scale Farmers

The agriculture transformation introduced in the Asian and Latin American countries during the 1960s and 1970s, experienced yield increases and accelerated agricultural output growth due to the adoption of high yielding varieties of wheat, rice, and maize combined with intensive use of inputs such as fertilizer and irrigation (Alejandro and McBride, 2014). On attaining independence most of the African countries developed and implemented policies and programs to increase production, inspired by the Asian Green Revolution (Crawford et al., 2003). An "African Green Revolution" similar to the Asian one was, emerging during the 1970s but failed because of economic crises and the SAPs Göran Djurfeldt et al. (2005). The African agricultural productivity declined during the 1980s much because of the changed agricultural conditions during the SAPs where the smallholder rural farmers' subsidies on improved seeds and fertiliser disappeared and left the farmers' with decreasing harvests (Havnevik et al., 2007). The second World Development

Report on agriculture in 2008, Agriculture for Development, states that agricultural development is a vital tool to get people out of extreme poverty and hunger. This led to the World Bank in collaboration with such institutions as Rockfeller foundation and Bill and Melinda Gates foundation supporting agricultural intensification in various African countries.

In Zambia, the Farm Input Supply Programme (FISP) was introduced in 2009 as an upgrade of the previously existing subsidy program. Subsidies rose from 50% on fertiliser and seed in 2002, to 79% on fertilizer and 53% on seed, in 2011/12. FISP expanded the range of crops subsidized; whereas previously only maize had been subsidized, the programme was amplified to include rice, sorghum and groundnuts. There was a sharp increase in average annual maize production following the launch of the input subsidy programme, from an average of 1m tons in the 1990s to 1.2m tons in the 2000s, and 2.9m tons from 2010–2014. While an increase in production may be welcome, there are costs to this exclusive focus on a single crop. It directs farming households towards maize production even in marginal conditions, thus reducing ecological sustainability and ultimately production diversity. It also has negative implications for production diversity and hence the diversity of nutrients available in food. Other challenges which have been levelled at the programme, include the following: questions about whether the cost of the programme justifies the outcomes; the beneficiary criteria which may exclude a large number of poorer farming households that cannot plant 1 ha of maize or cannot afford membership fees to farmers' groups or cooperatives; in practice the programme tends to benefit better-off farming households; not all farmers receive the full input package; and the problem of the late delivery of inputs has been frequently encountered (ACB,2015).

These challenges faced in implementation of agricultural intensification in Zambia, are more or less similar to those posed on CIP in Rwanda. For instance according to the Seasonal Agricultural Survey (2015- Season A), there are still some limitations in access to inputs by small holders farmers. The explanation lies in the marketing of inputs, levels of subsidies offered in the particular sector, seeds and inputs dealers, and individual farmers' capacity to afford the costs, household and farm characteristics, and allocative efficiency in the use of inputs by farmers (Bizoza and Graff, 2010, Bizoza el. 2007, Maniriho and Bizoza, 2015)

In Malawi, the previous subsidy program was terminated under the recommendation of the World Bank structural adjustment program in the mid-1980s, as was the case across many of the countries in SSA. The Malawi government introduced a new "smart" subsidy program under a targeted Farm Input Support Program (FISP) in 1998. FISP provides vulnerable households with a package of subsidized farm inputs consisting of nitrogen-phosphorus-potassium (NPK) fertilizers, hybrid maize seed, and improved legume seeds as part of an integrated soil fertility management package. The smart subsidies under the FISP aim to increase farm productivity by combined use of chemical fertilizers and biological soil amendments, such as the integration of legumes in crop. The increased use of chemical fertilizers masks major soil micronutrient depletion and therefore provides a short term and unsustainable solution to the problem of low farm productivity (Beedy et al. 2013). This is a lesson, which CIP should adopt, thus incorporating the aspect of biological soil amendments to the chemical fertilizers since intensification driven by chemical fertilizers and pesticides could strongly reduce soil fertility and organic matter. Although CIP programs recognize soil protection as an important measure to preserve soil fertility, the CIP

strategies target the fertilizers use but not the use of organic fertilizers.

In Tanzania, Alliance for a Green Revolution in Africa (AGRA) cooperates with the government of Tanzania to provide subsidies for inorganic fertiliser, where half of the cost for the subsidies is financed by a loan from the World Bank to the Tanzanian government. Various staple and cash crops have been targeted fpr intensification and more efficient use of inputs. Food crops include Maize, sorghum, wheat, pulses, cassava, potatoes, plantains and millet. Cash crops include coffee, cotton, cashewnuts, tobacco, sisal, tea, cloves, horticultural crops, oil seeds, spices and flowers.

In Tanzania however, government efforts are underway to revamp agricultural productivity. Such efforts include the introduction of the fertilizer subsidy scheme famously known as the fertilizer voucher system. The national agriculture input voucher scheme (NAIVS) was introduced in 2008 intended to facilitate fertilizer use in targeted, high-potential areas, boost the return to fertilizer use and ultimately increase food production. The voucher system enables a farmer to get a maximum of two bags of fertilizers to be used on only one acre. According to a study by Hepelwa et al, 2013, the amount allocated is insufficient given the farm sizes owned and cultivated by the households. The quantity of fertilizer available to famers via the voucher system is low compared to the actual demand. In addition, the fertilizer under the voucher system is reported to be unavailable to farmers at the right time because of distribution delays. In most cases, farmers end up not using fertilizer especially for the basal application. M Hepelwa et al (2013), further observe that the majority poor households cannot afford to purchase fertilizers from the supplier - agents. Thus the well-off families tends to buy the vouchers from those who are unable to top these up.

1.5 CIP Pillars

CIP aims at increasing the production of food crops across the country by focusing on six priority crops namely maize, wheat, rice, Irish potato, beans and cassava. It uses a multi- pronged approach that includes i) facilitation of inputs (improved seeds and fertilizers) ii) consolidation of land use iii) provision of extension services, and iv) improvement of post-harvest handling and storage mechanisms (Kathiresan, 2011:13).

Facilitation of improved inputs (Improved Seeds and fertilizers)

According to Kathiresan, 2011, lack of access to improved inputs inhibited the farmers from raising the productivity levels. Access was curtailed by the low demand and high costs, which are further amplified by the difficulties in transportation to rural areas. To overcome these constraints, CIP took a ‘supply-push’ approach whereby the government initially supplies the inputs and encourages farmers to use them. The CIP aimed at creating awareness of the benefits of using fertilizer among small farmers; using subsidy vouchers to promote and stimulate fertilizer markets; refining outdated technical recommendations; implementing regular quality control; implementing land consolidation; and providing credit facilities for fertilizer and seed buyers.

To reduce food security by raising agricultural incomes, the GoR has from 2007 subsidized fertilizer for CIP's priority crops: maize, wheat, rice, Irish potatoes, beans and cassava. In 2008 the government started privatizing fertilizer importation and distribution (IRG, 2015) under the USAID-funded project, Privatizing Fertilizer Import and Distribution for Rwanda (IFDC PREFER). The specific procedures for delivering subsidies have changed over the years. For example, for maize and wheat, the subsidy on fertilizer through early 2014 was delivered through vouchers distributed to smallholder farmers cultivating at least 1 ha under the priority crops. Through early 2013, fertilizer subsidies for potatoes and rice were calculated on the basis of transport cost from Pacific ports to Kigali. While rice received the larger portion of the CIP development funds, maize took a significant amount of the subsidy allocation to fertilizer (Diao et al., 2010). In 2013 and again in 2014, the GoR revised its program to subsidize fertilizers in an effort to encourage greater private sector participation in fertilizer import and distribution. In mid-2014, MINAGRI took a further step toward competitive markets, approving five importers and arranging for them to compete (at least three in every district), setting maximum retail prices for three subsidized fertilizers (NPK, DAP and urea) and cutting subsidies by about a third compared with the previous year. At the same time, MINAGRI also stopped trying to target fertilizers through vouchers to reduce controls on trade at the retail level and, at the same time, to reduce costs to administer and track subsidies – moving from a targeted subsidy to a flat rate subsidy. However, due to programmatic challenges and some reports of corruption that observed in the distribution of agriculture inputs, the APTC-Inkeragutabara won the certificate of controlling the distribution of fertilizer in –country as big supplier. Some other 900 small private agro-dealers allied to APTC-Inkeragutabara in selling fertilizers and other inputs, connected to the subsidized distribution system (IRG, 2015).

To augment increases in productivity of these crops, CIP imported improved seeds from neighboring countries such as Kenya and Tanzania. In 2008, 765 tons of seeds of maize and wheat were imported for cultivation in season A. The amount gradually increased from 1200 t in 2009A to 3512 t in 2011 A. In addition, improved planting materials (cuttings) of cassava and potato were also distributed to farmers. By encouraging farmers to use improved seeds, CIP has substantially increased the local demand and the capacity for seed production. With the exception of hybrid seeds, the open pollinated varieties of maize and self-pollinated varieties of wheat, rice and beans are multiplied by the Rwanda Agriculture Board and entrepreneurial farmers in the country.

Consolidation of land use

The first pillar of the CIP strategy is 'land use consolidation' (LUC), a policy that aims to rationalise land use for profit maximisation and ecological sustainability[i]. Farmers keep their land rights, but they must use their land in such a way that 'farmers in a given area' grow 'specific food crops in a synchronized fashion that will improve the productivity and environmental sustainability' (MINAGRI 2011: 15). LUC seeks to consolidate small individual land holdings into larger-scale farming enterprises. The rationale for LUC is that joining small plots together to farm as a single unit would deliver important economies of scale in the acquisition of inputs, processing and marketing, as well as efficiencies in access to extension services (USAID 2014). In Rwanda, LUC is defined as ""the unification of land parcels with an estimated easier and productive farming than

the fragmented parcels"(GoR, 2010). LUC was launched in 2007, and implementation began in 2008 under the CIP. This was linked to the resettlement of the people from agricultural to village areas in order to avail free land for agriculture and concentrate dwellings in villages to facilitate access to services (Muhinda & Dusengemungu, 2011). According to USAID 2014 in Rwanda, land consolidation is defined by consolidation in use of land and not consolidation in ownership. Land is joined together, but the original individual households retain ownership of component smaller plots. LUC is a large-scale initiative, and by 2011 approximately 13% of the total land area under cultivation in Rwanda was under LUC, with approximately 40% of the farmers in the country participating (MINAGRI, 2012).

The government actively promoted the cultivation of a single crop by multiple farmers within a large area in order to increase agricultural production (Musahara, Birasa, Bizimana, & Niyonzima, 2014). Kathiresan 2012 showed that consolidated areas increased from 28,016 ha in 2008 to 502,916.55 ha in 2011. Although this approach is criticized by some authors who contest its beneficial effects for small-scale farmers and equity in the society (see for example Huggins, 2009:302 and Pottier, 2006:509), it is regarded as one solution to the pervasive low productivity and scarcity of arable land in Rwanda. Indeed, its economic rationale has been acknowledged in many developing countries where the approach has been enacted (Bizoza and Havugimana, 2013:65), and particularly in Rwanda, a positive experience has been recorded especially in terms of increasing inputs accessibility and land and crop productivity, improving household food security and reducing the number of people living in hunger and poverty (Katherisan (2011:17). For this approach, the extension services and provision of improved seeds, and fertilizers were considered to be easier to access if farmers were all undertaking similar activities.

Demetriou (2014) distinguished three main stages in land consolidation. The first step is the administrative preparation that involves the request of land consolidation for a specific area, sensitization of farmers about the project, setup of an executive committee, and recruitment of a cadastral surveyor for the delineation of the study area. The second step relates to the planning of activities that require the update of landowners' information for the consolidated area, land valuation, and the approval of the proposed project by all stakeholders. Implementation of land consolidation is the third step of the project. It involves demarcation of the boundaries of the new parcels, compensation to land owners, registration of new parcels and new landowners, followed by the issuance of land titles.

In Rwanda these main stages are also followed as observed by Muhinda and Dusengemungu (2011) who showed that in Rwanda, LUC is a multi-sectoral process where the implementation is driven by MINAGRI, its agencies, and in conjunction with local leaders. Through the mobilization of farmers in the villages, the priority crop is cultivated in the consolidated area. MINAGRI is mandated for technical implementation of LUC through the Rwanda Agriculture Board (RAB). Based on the suitability of an area for a specific crop, and available land for every district, RAB, in collaboration with local leaders, estimates the size of the area to cultivate the selected crop. The crop types allocated to each administrative area are based upon a higher-level spatial planning exercise utilizing data on soils, climate, and government judgment on the needs of the national economy, including export demand (Huggins, 2014).

The agreed figure is captured in the performance contract, which the districts mayors sign with President of the Republic of Rwanda. After the agreement on the crop and the size of lands to be consolidated, the district and agronomist sectors, along with farmers' advisors, start mobilization. The farmers of selected schemes are encouraged to join the program based on the forecast benefits they will gain. Everyone willing to join the program receives fertilizers, seeds and others extension services. For those who accept to join, they receive fertilizers and seeds based on the size of each parcel. The government (MINAGRI) or private companies supply the seeds and fertilizers after harvesting, the farmers are requested to pay. The steering committee at national level is composed of MINAGRI, MININFRA, MINIRENA, MINALOC, Private sectors, Provinces and District authorities (Muhinda & Dusengemungu, 2011). Although LUC is voluntary by law, according to USAID 2014 survey on assessment of Land use in Rwanda, many farmers felt some degree of pressure to participate and initially exhibited resistance to the program. Twenty-four percent of farmers in the survey indicated that their participation in LUC was not voluntary, with the farmers raising concerns about coercion in joining the program. According to the Rwanda Governance Board's 2016 assessment of farmers' perception of various services of offered to them via the agricultural sector, the appreciation land use consolidation was rated at 40.3 per cent.

Provision of extension services

Agriculture extension is an important means in alleviating poverty and achieving food security. Broadly speaking, agricultural extension is the "delivery of information inputs to farmers" (Anderson and Feder, 2007). Studies show that Sustainability and productivity of agricultural sector worldwide depends on the quality and effectiveness of extension services among other factors (Kimaro et.al, 2010). In recognition of this fact, and in line with CIP strategy, the Government of Rwanda, in 2009 adopted the National Agricultural Extension Strategy to ensure ideal conditions for the dissemination and exchange of information between producers, farmer organizations and other different partners in order to transform and to modernize the agricultural sector(NAES,2009). At the onset of CIP, the extension services were performed by agronomists (A2 and A1), within the areas under crop intensification. Each extension agent covered about 500 hectares of consolidated land use areas. The contracted private service providers in each district managed the materials and knowledge distributed by the extension agents. Rwanda Agriculture Board (RAB) coordinated the extension services and served as a nodal agency for knowledge dissemination -and other consulting services for farmers. The frontline basis of extension system was organized around agriculture officers at the level of decentralized entities, (from District to Cell) supported by service providers. This system had limitations of not reaching the maximum number of farmers, as the basis of the frontline extension agents was very narrow. To improve the access to extension and advisory services to farmers, a decentralized model was introduced, TWIGIRE MUHINZI, which is farmer oriented and gives FFS facilitators and farmer promoters a key role in agriculture extension as farmers' trainers.

Post-Harvest Handling and Storage (PHHS)

The success of the Crop Intensification Program (CIP) in increasing in crop yields resulted in unanticipated surpluses in key staple grains and cereals. To better address the issues of post-harvest loss resulting from the lack of capacity in post-harvest handling and storage, MINAGRI introduced the Post-harvest handling and Storage program. The program has taken several initiatives to minimize the post-harvest losses of priority crops. These initiatives aim to improve the handling and storage of harvested farm produces. An inventory of available community storage facilities in the country and attempt repairing of such facilities was carried out under CIP. The program provides hands on training to farmers at two levels - farmers' cooperatives and household levels.

The PHHS program also embarked on construction of public drying areas in each district. It also acquired small tools and equipment for improving the current practices of post harvest processing and storage by farmers. Models of storage house were established in each district through CIP.

1.6. Success of CIP Implementation

Under CIP, the cultivated area covered by the programme has increased from 28,788 hectares in 2007 to 254,000 hectares in 2010 (Kathiresan, 2011:15). The program is considered successful since the production level was improved: Gains in production of the six prioritized crops of maize, wheat, potato, cassava, rice, and beans all exceeded their national targets in 2008 on the way to a 30% proposed increase during 2006–12 (IMF, 2011). According to Nkurunziza, 2015: 118, since 2011, rice yields have improved and passed from 3 to 6.3 tons per hectare; potato yields from 17 to nearly 20 tons/hectare; and maize yields from 1.6 to nearly 5 tons per hectare. In 2013, a growth of 5.5% has been recorded for agriculture sector, resulting from the increase in food crop production of 5.4% and export crops of 27.8% (GoR, 2013:27). According to MINAGRI (2011), the CIP has provided the much needed foundation for a positive change in Rwanda's agriculture development and also revealed the massive potential that exists in the country in increasing the smallholder agricultural productivity.

Land Use Consolidation

The majority of households (about 84%) in LUC have acceptable food consumption score. Nearly 66% of all households have a food consumption score > 50): Hence, food security is more sustainable among households that adopted the LUC (Habyarimana and Nkunzimana 2016). With CIP, land husbandry and soil fertility techniques have been promoted. An increase of 37.4% for radical terraces and 52.3% for progressive terraces is recorded between 2013 and 2015. As of end June 2015, the established soil conservation infrastructure was 122,319.5 ha of radical terraces and 902,844 ha of progressive terraces, and additional 2,272 ha of marshland and 903 ha of hillside were developed and equipped with irrigation infrastructure (GoR, 2015:23).

Distribution of improved inputs

Rwanda's national fertilizer utilization has increased dramatically over the past decade. Since the

implementation of CIP in 2007, inputs use by smallholders increased markedly. According to the Ministry of Agriculture, fertilizer use was 4 kg/hectare in 2006 and increased to 30 kg/hectare in 2013, with the Ministry's goal to reach 45kg/hectare coverage by the 2017/18 cropping seasons (ROR-MINAG, 2014). Estimates suggest that the national average fertilizer use per year has increased from 8 Kg/Ha to 23 Kg/Ha in 2010 (Kathiresan, 2011:14). To encourage their widespread use by grouped farmers, input subsidies have been introduced. Subsidies for distributed inputs range between 15% and 35% for mineral fertilizers and between 50% and 80% for improved seeds.

Before the CIP was launched in 2007, fertilizer application averaged 4.2 kilograms per hectare (kg/ha) per year – well below sub-Saharan Africa's average of 16 kg/ha (WB, 2011). More recent estimates indicate that fertilizer application rates in Rwanda reached an average of 29 kg/ha/year in 2012 (MINAGRI 2013), an impressive growth. Pre-CIP, fertilizer imports averaged 8,000 mt, mostly for tea, coffee and other commercial or cash crops. Under CIP, fertilizer imports increased significantly, driven by the subsidy, and reached 35,000 mt by 2013, covering an estimated 240,000 beneficiaries (Wolfe, B., 2013).

Fertilizer is mainly used on cereals, roots and tubers, legumes, fruits and vegetables and tea and coffee. The main types of fertilizers used are urea, diammonium phosphate (DAP) and NPK formulations (mainly 17-17-17). The 25-5-5 and 20-10-10 NPK formulations are used on tea and coffee, respectively.

Provision of extension services

Farmers' capacity has been strengthened through easy access to inputs, extension services and finance through agricultural cooperatives, and proximity advisory services to farmers with the promotion of the use of Twigire Extension model. In 2014, the Government of Rwanda launched the Twigire Muhinzi extension system with the objective of improving access to agricultural advisory services, increasing agricultural productivity, and, in turn, transforming and modernizing the agriculture sector. This model is based on two farmer-to-farmer extension approaches: the Farmer Promoter and Farmer Field School (FFS) approaches. There are 14,200 farmer promoters and 2,500 FFS facilitators who train the farmers groups through demonstration plots, field days and village meetings. Through the Twigire Muhinzi extension 59,453 farmer groups composed of 1,013,782 farmers countrywide have been established (GoR, 2015:23). According to KIT, 2015, 68% of Rwandan farmers' access extension and advisory services through the Twigire Muhinzi extension model.

1.7. Challenges towards CIP Implementation

Integration with other policies

Agricultural policies need also to be integrated with infrastructure and environment-related or other relevant policies areas (Garnett and Godfray, 2012:3). According to Meijers and Stead

(2004:1-2), policy integration help to avoid fragmented decision-making and enable adequate management of cross-cutting issues in policy-making that transcend the boundaries of established policy fields, and which do not correspond to the institutional responsibilities of individual departments. However, the land use consolidation policy in Rwanda, is criticized for not having considered the fact that most of small-scale farmers do not have enough means to diversify the source of income to buy other needed foodstuffs not produced on their consolidated lands (Kabandana, 2016:12). According Musabanganji et al (2016: 12), CIP policy integration with other relevant policies appears not to have been fully considered to allow an evaluation of possible environmental side effects of the new farming approach before its implementation.

Environment protection

The ecological and economic sustainability of intensification was highlighted as a key threat to agriculture intensification (RAB, 2013). The importance of environmental sustainability through such interventions as crop rotation, land protection and a range of other integrated management of resources has not yet been given due consideration in CIP. This has raised concerns about the ecological and economic sustainability of increased production in the absence of such programs. The Ministry of Agriculture and Animal Resources (MINAGRI, 2013:9) recognizes that there has been a lack of consideration of environment sustainability following recorded progress and significant development in land husbandry and irrigation, and this needs to be addressed through soil and water conservation mechanisms and adequate land management practices.

Farmers' involvement in decision-making

The decentralization act of 2010, aimed at bringing services closer to the people and improvement of citizens' involvement in decision-making on development issues. According to Pretty et al. (2014:40), a supportive policy environment acts as a significant catalyst for sustainable intensification. Therefore, agricultural policies have to create favorable conditions to enable farmers to increase household food security and have the added advantage of increasing farmer's income, generating employment and increasing expenditure within the local economy (Pretty et al., 2014:18). However, Ansoms (2013:7) has characterized the relationship between authorities and farmers in Rwanda as a top-down, state-centered governance approach especially in regard to policy implementation. According to Musabanganji, et, al.2016), with the on-going administrative decentralization process, improvements have been recorded, although actions are still needed for the betterment of the situation as agriculture-related policies implementation need a full involvement of the farmers so far considered as the last implementers. This would require prior consultation with them to seek for their consent and to take into account (to some extent) their wishes and local context before any action. Farmers need to know and understand that they are first stakeholders rather than being like 'always ready-actors' often requested to put into practice what is decided by authorities. Stakeholders have to counteract this way of policy implementation in order to enable farmers to understand and act accordingly, and to avoid facing any local resistance to initiated changes.

Challenges from the implementation of the inputs subsidy

IFDC (2014) reports the following as the key challenges in implementation of the subsidy

programme in Rwanda:

(a) A significant number of subsidized farmers have contributed to millions of dollars in accumulated credit arrears – mostly government credit transferred from distributors to farmers who reneged on the payments of 50 percent of the retail price. However, farmers who were not eligible for the subsidy had to pay by cash and therefore were not part of the defaulters, e.g., potato and rice farmers.

(b) Local officials lacked the capacity and facilities to produce vouchers for distribution to eligible farmers, leading to an ad hoc approach to distribution and poor targeting of the subsidy to maize and wheat farmers who met land consolidation criteria.

(c) Subsidized fertilizer reportedly leaked across the borders to neighboring countries as a result of the transportation subsidy from ports to Kigali.

Control of side effects of inputs use

Mineral fertilizers usage needs an adequate application in order to mitigate their effects given their negative impacts on human well-being and the environment as well. Unfortunately, Kabandana (2016:2) stresses that most of farmers in Rwanda are not aware of those effects neither on their health nor on the environment. Therefore, this appears to be a big challenge to be addressed to ensure that agricultural intensification is done in a sustainable way.

Sustainability of inputs subsidies

Inputs use involves the disbursement of cash by the farmers. This may be the explanation behind the introduction of subsidies by the government. Nonetheless, the sustainability of these subsidies on inputs is a raising and a questionable issue. According to Bizoza and Byishimo (2013:16), it is envisaged that the government will pull out his hand in direct support towards agricultural transformation and specifically in inputs supply. The same authors add that there is little likelihood that farmers will adequately continue using inputs if subsidies are removed, which may be the case if the responsibility is transferred to private sector stakeholders. In this line, a study conducted on smallholders in Rwanda by Willoughby and Forsythe (2011:12) reports that "a number of farmers suggested that although private sector services were available near to their household (for example, to purchase fertilizers) they felt that they were unable to afford these inputs without external support". Therefore, there is a need to work on this issue of inputs subsidies sustainability before the withdrawal of government from providing services to ensure the sustainability of the on-going small- scale farming intensification.

CHAPTER TWO: METHODOLOGY

2.1 Introduction to Methodology

In this specific chapter on methodology the main purpose is not only to clearly show the research strategy and the empirical techniques chosen and applied but also to demarcate the real scope and limitations of this research design on satisfaction survey regarding perceptions of local population and other actors intervening in the agricultural sector on the results and benefits of the CIP.

This study used both quantitative and qualitative approaches with the aim to gather quality information. The study included desk review (documentary research to draw on the in-depth knowledge of previous studies on similar topics, relevant policy documents and other related reports), face-to-face interviews through structured questionnaires, focus group discussion and individual interviews.

The participatory approach was also used; to this end, a Working Group (WG) was identified bringing together stakeholders that are familiar with agriculture in Rwanda. The members of the WG met on a regular basis throughout the study process... They enriched the process with respective expertise and information to make the study more focused and useful to all stakeholders. Members of the WG were selected from relevant Government institutions, CSOs, private sector, academic and research institutions, this working group include IRDP staff, RAB, NAEB, UR-Agriculture departments, MINAGRI technicians, Civil society representatives, and experts from Ikiraro Cy'Iterambere

2.2 Specific methods used in data collection

Desk Review

The Research team undertook the task of reading all possible key documents and publications on crop intensification program including land consolidation, Thus, the consultants read all the relevant public reports, books, consultant documents and publications on crop intensification program including land consolidation (March 2011). Key documents consulted include the Ministry of Agriculture and Animal Resources, Government Program (2010-2017), EDPRS II and Integrated Household Living Conditions Survey (EICV) (2013-2014), among others.

First workshop on CIP objectives and study materials testing

The purpose of the two-day workshop was to clearly present and discuss the objectives of the CIP and make sure that IRDP team, supervisors and field surveyors understood in the same way all the tools to be used in the data collection process. As the fieldwork was to assess the satisfaction of end-user farmer one of the objectives of this workshop was to highlight the research questions, which were as follows:

- What are the farmers' perceptions regarding Crop Intensification Programme in as far as access to extension services; access to agricultural inputs and the land use consolidation are concerned?
- What is the level of understanding and application of different CIP components by beneficiaries and other actors?
- To what extent the needs and expectations are met under CIP?
- What is the level of inclusiveness and participation of farmers in the CIP?
- What are the challenges faced by different concerned actors?
- To what extent does the CIP contribute to improving the food security and to alleviating poverty in Rwanda?
- What could be the avenues for improvement of access to agricultural inputs, proximity service delivery in agriculture and land use consolidation and to better respond to citizens needs and to achieve the CIP objectives in this area?

The approaches to be used, both quantitative and qualitative, were explained and discussed by participants to make sure that everyone grasped the whole picture of the data collection process. The questionnaire and interview guide were pre-tested to check their suitability, reliability, coherence and clarity.

Quantitative survey

The purpose of this technique is to contribute to a body of knowledge or school of thought that is conceptual and theoretical in nature, which is based on the meanings that life experiences hold for the interviewees. In this regard, we collected citizens' perceptions on all components of the CIP, which are:

- Land Use Consolidation
- Access to Inputs (improved seeds and fertilisers)
- Post-harvest handling and storage
- Provision of extension services

As presented above, this survey was carried out country- wide. In order to obtain both qualitative and quantitative data a structured questionnaire related to Crop Intensification Program was elaborated covering a broad range of issues including access to extension services; access to agricultural inputs, land use consolidation, the needs and expectations met under CIP, the level of inclusiveness and participation of farmers in the CIP, the challenges faced by different concerned actors, the contribution of CIP to improve food security and poverty alleviation in Rwanda, the avenues for improvement of access to agricultural inputs, proximity service delivery in agriculture and land use consolidation.
Quantitative data provided information that was used to measure satisfaction brought by project interventions. Household survey questionnaires were used to collect this information at household level as per the sampling structure.

Target population, sample size and research tools

The proposed CIP satisfaction assessment was a national perception survey. A nationally representative sample was drawn, putting into consideration the following criteria:

- Representation of consolidated land in each province by selecting 2 districts with the highest share of consolidated land area;
- Representation based on the CIP priority crops, which have different land use and land quality requirements. At least two priority crops were selected in each district. Clustering the respondents based on the topography of the consolidated use land with the assistance of local leaders: covering uplands, lowlands and valleys.
- Clustering respondents by demographic variables such as sex and age (18 years old and above);

This study involved ordinary citizens aged 18 and above and beneficiaries of the services provided by the CIP. As per the Integrated Households Living Condition Survey (EICV4) indicated that the working population (16 years and above) in Rwanda was 6,400,000 composed of 3,430,000 females (54%) and 2,970,000 males (46%); also revealed that the majority of workers (68%) employed in agriculture sector and Independent farmers represented 55% of total citizens working in the agriculture sector. The target population for the survey was farmers working on independently owned farms. The weighted data from EICV 4 show that the total number farmers in 30 districts is 4,539,159 independent farmers representing 70.9% of working population in Rwanda (EICV4-Micro-data, Excel Spreadsheet).

Based on population characteristics, Raosoft sample size calculator is used to calculate the required global sample size of farmers with respect of the following formulae:

$$X = Z(c/100)^2 r(100-r);\ n = Nx/((N-1)E^2 1)x);\ E = \text{Sqrt}\left[(N \text{ Sq} n)x/n(N-1)\right]$$

Where N is the population size, r is the fraction of responses that you are interested in and Z(c/100) is the critical value of the confidence level. Based on this sample population universe with a margin of error of 2,81 %, a confidence level of 97%; as per the calculation by the Raosoft Sample Size Calculator, the sample size for this survey is placed at approximately to 1491. This figure is rounded to 1,500 for the purpose of geographical coverag

Table 1: The number of farmers targeted by province, district, suitable crops and proportion of consolidated land

Province	District	Sectors	Selected Suitable Crops	Consolidated land (%)	Consolidated Land (Ha)	Number farmers/EICV4-(Weighted)	Interval k= N/n	Sample size
1.East	1.Kirehe	Gatore, Kirehe	Maize, Cassava	55	32442	171,677	954	180
	2.Kayonza	Nyamirama, Ruramira	Maize, Beans	49	24664	169,495	1087	156
2. North	3.Burera	Gahunga, Nemba	Beans, irish potatoes	49	18337	168,864	1141	148
	4.Gicumbi	Kageyo, Byumba	Maize, Beans, wheat, Irish potatoes	44	27193	195,166	957	204
3.South	5.Nyaruguru	Kibeho, Cyahinda	Wheat, Maize, Beans	36	22599	127,748	1006	127
	6.Nyamagabe	Buruhukiro, Gatare	Wheat, Maize	29	19511	147,775	1063	139
4.West	7.Rubavu	Rugerero, Nyundo	Maize, Beans	28	7815	124,860	991	126
	8.Nyamasheke	Bushekeri, Kagano	Beans, Maize	26	14066	202,634	960	211
5.Kigali	9.Kicukiro	Masaka, Gahanga,	Maize, Vegetables, Sorghum	24	2158	33,375	355	94
	10. Gasabo	Nduba, Rutunga	Beans, Maize	21	6177	120,685	1049	115
	10	**20**			**174962**	**1,462,279**	**975**	**1500**

The second category of people targeted by this study include local leaders and other local actors such as CSOs and agriculture officers at grassroots levels, connected in one way or another to the process of the CIP.A survey research instrument, in the form of a structured

questionnaire, was developed jointly by IRDP researchers and other experts in close consultation with WG members and other key stakeholders. The instrument includes quantitative indicators designed to measure citizen satisfaction and opinions on CIP and its main interventions.

The survey was conducted in 10 Districts based on the proportion of consolidated land compared to the existing agriculture land. In each of these, a minimum of two places were selected purposively based on the characteristics mentioned above. Local leaders played a big role in the selection of the places where CIP priority crops are located. In order to select the respondents, the list of farmers at selected district and sector level was compulsory, the systematic sampling was used (k=N/n) where k is the interval to be respected in selecting individual to another, N is the total number of farmers in District and n is specified sample size.

Table 2: Criteria of selecting respondent and the data gathering methods

Steps	**Key target**	**How to reach the individual target**
Step 1	Identify list of farmers with respect of CIP beneficiaries.	In support of agriculture District or sector office, identify the individuals who benefited from the CIP
Step 2	Select randomly the respondents/Farmers in relation to the desired number of informants in each sector (Using systematic sampling)	Using the list of farmers and register of consolidated land by sector location
Step 3	Arrange the interviews for the structured questionnaires and focus groups	Enumerators/data collectors were hired and trained for data collection.
Cross-cutting consideration	Each District/sector, the sample consisted of male and females. The thumb rule is 3/7 or 7/3 male to female ratio to avoid gender imbalance in the sample (Unisex)	

Qualitative data collection

Focus Group Discussions

Focus Group Discussions are a type of in-depth interview conducted in a group with particular characteristics defined with respect to the proposal, size, composition, and interview procedures. FGD allows richness and flexibility in the collection of data that are not usually achieved with a survey. At the same time FGDs allow for spontaneity of interaction among the participants. In this regard, we conducted 10 FGDs (one FGD in each of the selected districts of intervention) and each group included between 8 and 12 participants. Thus, FGDs included:

- Local Agronomists/staff in charge of agriculture (1)
- Village leaders where CIP is implemented (2)
- Satellite farmers (5)
- Agents from provision of extension services (2)
- Agro-dealers in the area (2)

Table 3: Administrative entities included in the assessment

No.	Name of the districts	Sector	Participants in FGD
1	Kirehe	Gatore	12
2	Kayonza	Ruramira	12
3	Burera	Gahunga	12
4	Gicumbi	Kageyo	10
5	Nyamagabe	Buruhukiro	12
6	Nyaruguru	Kibeho	11
7	Nyamasheke	Bushekeri	12
8	Rubavu	Nyundo	10
9	Kicukiro	Masaka	11
10	Gasabo	Rutunga	12

During discussion sessions, participants had an equal opportunity to express their views freely. We conducted 10 FGDs (one selected in various villages, therefore the village in which everybody could access taking into account the landscape. A total of 10 FGDs in were conducted each of the sectors and each group had between 10 and 12 participants. An IRDP Focal person resident in the selected district was put in charge of necessary formalities and preparations for the focus group discussions.

Key Informant Interviews

FGDs results were aligned with in-depth interviews, which supplemented and extended our knowledge about individual perceptions on the studied topic. According to Martin Woods (2011), the primary advantage of in-depth interviews is that they provide much more detailed information than that made available through other data collection methods, such as surveys. They also may provide a more relaxed atmosphere in which to collect information—people may feel more comfortable having a conversation with you as opposed to filling out a survey questionnaire[1].
In order to obtain more in-depth information relevant to the Crop Intensification Program, the team of researchers conducted key informant interviews. These were conducted with the representative of central government authorities (Government Ministries, Agencies, etc.), local government officers, development partners in agriculture sector, CSO representatives and academics operating in the field of Agriculture.

Household survey data collection

To generate these three types of evidence three data collection tools were developed: namely, a household quantitative questionnaire, a guide for Focus Group Discussions and an interview guide for key informants. Before starting field work, enumerators were recruited in order to perform the duty of data collection. The enumerators and supervisors were trained about the key concepts of the survey, ethical considerations of fieldwork and tools to be used in data collection. The training of the enumerators aimed to increase the capacity of enumerators and supervisors and to enhance their performance in collecting quality, reliable, relevant and accurate data. In additional to this, each enumerator has to understand each question properly and recognise the type of answer to be expected to each question. The training was held on 16th December 2017 from 8:30am to 17:00 at conference hall of IRDP. The participants were composed of 20 enumerators, 4 supervisors and 2 consultants (The list is attached to this report). Supervisors were recruited basing on their academic and research profiles. They work at the University of Rwanda in the college of Agriculture. Most of enumerators were selected from the National Institute of Statistics database.

A pilot survey was conducted in Kigali city in Kicukiro District, Gahanga Sector. A second pilot was conducted in Gasabo District, Rutunga Sector for the purpose of checking the reliability and validity of the questionnaire. The Cronbach's alpha test was computed (reliability statistics was 0.72) revealing that some questions were not user friendly and were difficult to answer (e.g. what are your season income in FRW., this question was changed to refer to earning assets instead of money). The pilot survey allowed the team of researcher to improve and finalise the research tools.
After the pilot survey the 20 trained enumerators and supervisors were deployed in different districts with a ratio of two to three enumerators per district according to the sample size. One supervisor was deployed in two to three districts. The survey took place over the period 27th December 2017 to 08th January 2018.

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[1] WOODS Martin, presentation on "*interviewing for research and analysing qualitative data: An Overview*", School of Public Health, Massey University, May 2011, p.2

For quality control purposes the daily performance of enumerators was checked using daily report submitted by the supervisor. Each enumerator was supposed to collect at least 7 questionnaires per day. In total they used 13 days to collect 1500 questionnaires in the 10 sampled districts.
It is important to note that these tools were based on the detailed approved program results, theoretical framework which shows the program, performance indicators and variables to be analysed, as well as the source of data (community, household or literature). At the time of interview, enumerators were supervised by Supervisors to ensure the high quality of the data.
After deploying the enumerators, the supervisors randomly travelled around the cluster to track and confirm that all enumerators were gathering information from identified households. At the end of each working day, all enumerators showed the filled-in questionnaires to their team leader for final crosschecking.

Some enumerators faced challenges including the transport cost, which was higher than expected such as heavy rains, which interrupted surveys and sometimes prevented enumerators to meet their daily target. The meeting with the farmers during festive days was difficult particularly in Rubavu.

2.3. Data processing and analysis

Data entry operators were trained on the data base entry process. Based on the questionnaire, a specific data entry application was designed using CSPro data capturing and then transferred in Statistical Package for Social Sciences (SPSS) for data analysis. The IT specialist created a mask for the data clerk to enter the data. After the data entry there was tabulation of data, which helped to facilitate the data analysis.
Quantitative data, completed questionnaires were reviewed on a daily basis by the researchers to ensure their completeness and accuracy. The quantitative data was analysed using the Statistical Package for the Social Sciences (SPSS). In addition, descriptive analysis was adopted, graphical and tabular expositions of the satisfaction of citizen of crop intensification program assessment in the 10 selected districts of Rwanda. Responses from semi-structured questions were coded and entered along with pre-coded responses and were analysed using SPSS. Descriptive analysis using frequency tabulation was undertaken to give the extent to which they are satisfied with CIP in the 10 districts.
Qualitative data were analysed thematically. This involved developing broad themes and examining relationships underlying the land consolidation and crop intensification, Qualitative data was used by the researchers to understand the ideas and opinions that emerged and were compared to the analysed quantitative data. The analysis led to the findings and interpretations contained in this report.

Second workshop on preliminary feedback from the field

The aim of this second workshop, which was organized at the end of fieldwork, was to collect preliminary feedback from all 20 enumerators, 4 supervisors, as well as the IRDP research team. The methodology used in this workshop was to review the completed questionnaires in working groups, discuss emerging issues and identify priority questions for data analysis. The discussion covered the following:

- What issue was of key interest to the participants and what did they consider as the most surprising dynamics in the findings.
- Gaps between policy/ programme intentions and actual implementation in the field?
- What kinds of resistance to the policies and programmes have been observed?
- Beyond the written responses what did the enumerators observe about the way in which respondents communicated their views on the programme (mindset issues, common expressions, non-verbal communications)?

Ethical considerations

During the survey work, the research team followed principles of ethical research. Individual identifications were not used to guarantee anonymity of the respondents.
In addition, the survey was subjected to ethical approval by the National Institute of Statistics of Rwanda (NISR) with research visa authorization before the actual field work in the field to collect data. Statistical secrecy of data confidentiality was strictly respected and observed at all stages of the survey activities in accordance with Organic Law N° 01/2005 of February 14, 2005 on the organisation of statistical activities in Rwanda, especially its Chapter VI.
Respondents were assured that their responses would remain confidential and that information would not be used for any purpose outside the study.

CHAPTER THREE: FINDINGS

This chapter presents the findings of satisfaction survey regarding the perceptions of the local population and other actors intervening in the agricultural sector in relation to the results and benefits of the four main components of CIP, namely: distribution of improved inputs, the land use consolidation sub-program, proximity extension services, and post-harvest handling and storage.

3.1 Profile of interviewed farmers

Demographic and socio-economic characteristics

It is important to collect data on the demographic and socio-economic characteristics of surveyed farmers because these factors affect their participation in the CIP. Data on age of farmers can be used to measure the size of the active population and dependency ratios. The education level determines the professionalism and the capacity of farmers to acquire advisory services and training about agriculture concepts and practices. Gender and marital status also determine participation in agriculture activities. Table 4 illustrates the demographic and socio-economic characteristics of the surveyed farmers.

Table 4: demographic and social characteristics of surveyed farmers

Demographic and Social characteristics		Both sexes		Female		Male	
		Count	% share	Count	% share	Count	%share
Marital status of surveyed farmers	Married	1075	71.7	390	26	685	45.7
	Living Together	225	15	90	6	135	9
	Divorced	16	1.1	11	0.7	5	0.3
	Widower	130	8.7	116	7.7	14	0.9
	Single	54	3.6	24	1.6	30	2
	Total	**1500**	**100**	**631**	**42.1**	**869**	**57.9**
Education level of surveyed farmers	Never attended formal school	644	42.9	312	20.8	332	22.1
	Completed primary education	751	50.1	291	19.4	460	30.7
	Completed Secondary education	83	5.5	21	1.4	62	4.1
	Completed Post-Secondary/TVET	7	0.5	1	0.1	6	0.4
	Completed at least A1 or A0	15	1	6	0.4	9	0.6
	Have Masters or PhD	0	0	0	0	0	0

	Total	**1500**	**100**	**631**	**42.1**	**869**	**57.9**
Age group of surveyed farmers	15-24	42	2.8	20	1.3	22	1.5
	25-34	316	21.1	150	10	166	11.1
	35-44	461	30.7	197	13.1	264	17.6
	45-54	337	22.5	142	9.5	195	13
	55-64	244	16.3	87	5.8	157	10.5
	65-74	86	5.7	27	1.8	59	3.9
	74 +	14	0.9	8	0.5	6	0.4
	Total	**1500**	**100**	**631**	**42.1**	**869**	**57.9**

Source: Primary data, CIP satisfaction Survey; 2017

Regarding demographic and socio-economic variables, the findings in the table above revealed that a high proportion (77.1%) of farmers aged 35 to 54 engaged in agriculture compared to other famers falling in other age groups. The findings further revealed that elderly people aged 74 and above, as well as young people aged 15-24 are less represented in agricultural activities (3.7%). This indicates that the agriculture sector has potential to provide employment to the youth.

Regarding education level of surveyed farmers, the findings revealed that the largest share had completed primary education (50.1%). Only 6% of surveyed farmers had secondary and TVET education, and 42.9% had never attended formal school. The findings did not reveal any of interviewed farmers who had completed masters or PhD. These findings indicated that the most of farmers who engage in agriculture activities are belonging in low education level. There is need to strengthen and introduce agriculture programmes in middle level schools and universities. Another alternative is to develop an agriculture based technology and grassroots training of farming practices based on farmer-to-farmer orientation. Taking gender into consideration the surveyed farmers included more males (57.9%) than females (42.1%).The average family size was 5.7 (standard deviation 4.05).

Strategic recommendations on socio-economic characteristics of farmers

The above statistics highlight the large number of family members and young people that are actively involved in agriculture sector, as well as the small size of cultivated land per family (see Section 3.3). The government of Rwanda and other development partners should take into consideration this potential labor force and the need to support the transition from farming to off-farm employment (e.g. agro-processing and technical vocation employment).

3.2 Status of farming activities in surveyed locations

The status of farming activities either as individuals, groups or in cooperatives in surveyed location was very important, because, the government prefers to channel its support such as subsidized agricultural inputs through farmers' organizations. In addition some farmers opt to get organized into agriculture cooperatives for economies of scale.

Membership into agricultural cooperatives

CIP undertakes a multi-pronged approach that includes facilitating creating farmer organisations among other initiatives.

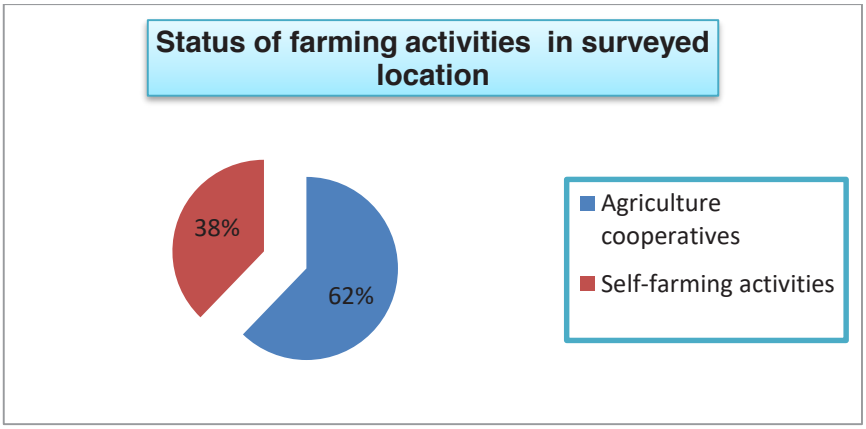


Figure 18: Status of farming activities.

Source: Primary data, CIP satisfaction Survey; 2017

The survey findings revealed that out of 1500 farmers interviewed, 933 farmers (62.2%) reported that they were members of agricultural cooperatives. Mismanagement of some agriculture cooperatives and poor involvement of members in decision-making process are some of the factors hampering some farmers from joining cooperatives.

According to qualitative information obtained from the field in one of the visited districts, some farmers particularly youth reported that cooperatives often delay disbursing their dividend and sometimes the cooperative management embezzle money and other assets. In additional to this, before disbursement of dividends, authorities of agriculture cooperatives make various deductions and indeed, some of these deductions are not explained. For example, 15 Frw/kg of maize or rice are deducted from each member as is observed in Nyamasheke District, Kagano sector, Kamiranzovu marshland. These are the main challenges in achieving government initiatives in improving and supporting agriculture activities.

Strategic recommendations to the status of agriculture cooperatives

The solution to alleviate the above challenges is that each farmer's cooperative must be recognised by attaining a legal status and be registered by the Rwanda Cooperative agency (RCA) and Ministry of Agriculture or Rwanda Agriculture Board. Regular audits, monitoring and

coaching for membership and financial management should be provided to agriculture cooperatives.

3.3. Land ownership and size

The size of land cultivated was considered in this survey and the survey aimed to establish the size of the land owned by the farmers. The table below indicates the ownership of land.

Table 5: Cultivated land by status of ownership

Owned Land in square meters	Rented land in square meters	Land from Relatives in square meters
7,970,369 (66.5%)	2,336,304 (19.5%)	1,681,647 (14.0%)

The results in the above table 5 indicate that 66.5% of cultivated land are possessed by the landowners, 19.5% are used as rented land and 14.0% of land are from family relatives. This revealed that the largest proportion of land covered by the CIP is owner occupied.

Table 6: Land Quantiles in CIP

Quartiles	% Share of surveyed farmers	Land Square meters by quartiles
Q1	25%	78,385
Q2	50%	253,003
Q3	75%	663,165
Q4	100%	11,979,470

Total Land in CIP		
Percentiles	25	1,806.75 Sqm of land
	50	3,617.50 sqm of land
	75	10,977.75 sqm of land

The results in the Table 6 shows that the land per family is small compared to the average family size of 6 persons. The surveyed land was divided into quartiles and percentiles for assessing the land cultivated by certain percentage of farmers. The results revealed that Rwandan agriculture is mainly based on small-scale family farming units (with an average plot size of 0.75 hectare), concentrating their activities on production for household consumption and local market exchange (Ansoms, 2010). The CIP is very important programme to increase the agriculture productivity using agriculture inputs, providing farm-based training, post-harvest and storage handling.

Table 7: Land ownership and size.

Status of cultivated land	*Percentage share of ownership*
Individual farmers	46.80%
Cooperatives	53.20%

For all of the land covered by this survey 46.8% was farmed by individual farmers, and 53.2% by cooperatives. Cooperative lands are mainly on government owned marshland areas. Hillside land is mainly individually owned, and the high level of fragmentation caused by inheritance practices is a major factor constraining productivity.

Strategic recommendations to the land ownership and size

The results from EICV4 (2013-2014) revealed that Rwanda's economy is still largely based on agriculture, with more than 67.6 percent of the population involved in farming related activities. 76.2% of citizens in rural areas and 22.6% in urban areas belong in agriculture sector. Additionally, agriculture activities contribute more than 30 percent to national output (GDP) (NISR-National Accounts, 2017). The scarcity of cultivated land and small family plot sizes is a major challenge. To manage this situation, technology needs to be applied to agriculture to increase productivity and sustain food security. This includes hillside irrigation systems, green house, and land management with considering housing status (shifting modern settlements from arable land to low productive land, and reduced dependency on rain fed agriculture. The second is to create many opportunities to shift young people from agriculture farming activities to off-farm jobs.

3.4 Farming purpose

The current policy thrust is for the sector to move from subsistence to a commercial mode of production. The CIP was initiated with the aim of increasing the productivity of high potential food crops and to provide Rwanda with greater food security and self-sufficiency. The figure below illustrated the purpose of farming in visited districts.

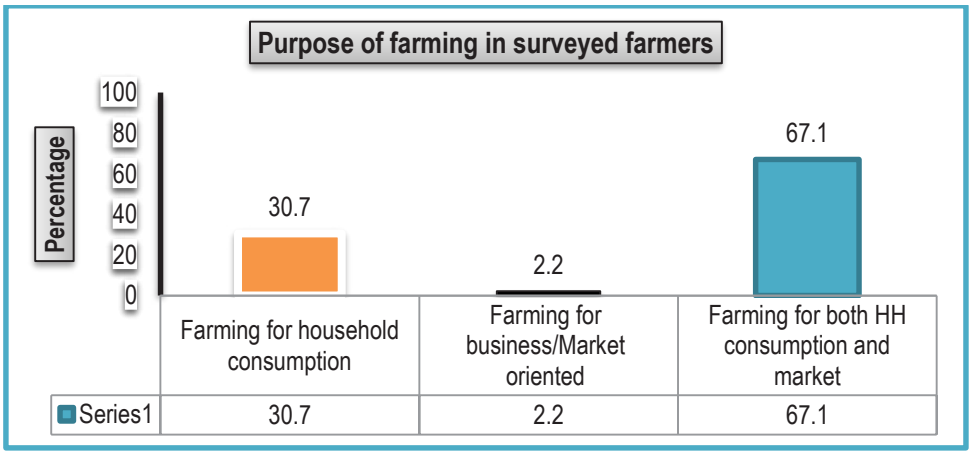


Figure 19: Purpose of farming activities in surveyed farmers

Source: Primary data, CIP satisfaction Survey; 2017

In line with all of these government initiatives, the survey investigated farmers' purpose for being engaged in agricultural activities and the findings revealed that only (2.2%) of interviewed farmers were farming for business/Market-oriented purpose. (67.1%) were farming for both household consumption and the market, while (30.7%) were farming for only household consumption.

Strategic recommendation on purpose of farming

The message from these results is that the purpose of farming for business market oriented is still low. Farming for both household consumption and for market should be strengthened. To achieve this there is a strong need for government and development partners to strengthen policies and programs aimed at increasing the share of farmers engaging in business market oriented agriculture.

3.5 Status of crop intensification program in surveyed districts

This section contains information about the level of farmers' awareness on CIP, as well as their level of interest in CIP.

Level of awareness about CIP by farmers

The findings revealed that, generally, farmers are aware of some programs of CIP but awareness varied towards the different components of the CIP. For example, qualitative information collected from Kirehe district revealed that the level of awareness with regards to land use consolidation is totally different in the two sectors where the survey was conducted. In Gatore sector, farmers are very aware of land use consolidation while in Kirehe sector, they are not aware at all. Empirical results are shown in the figure below:

Table 8: Level of awareness and interesting by farmers to CIP

Level of awareness by surveyed farmers on CIP	Percent
Nil level of awareness of CIP by surveyed farmers	3.9
Low level of awareness of CIP by surveyed farmers	13.7
Medium level of awareness of CIP by surveyed farmers	57.4
High level of awareness of CIP by surveyed farmers	18.2
Very high level of awareness of CIP by surveyed farmers	6.8
Total	**100**
Level of interesting by farmers to CIP	**Percent**
Farmers were not interested to CIP	48.2
Farmers were interested to CIP	51.8
Total	**100**

The survey results showed very high to medium level of awareness of CIP by farmers whereby 57.4 % of interviewed farmers were aware of CIP. The cumulative % of medium awareness to very high level represents 82.4%.

Regarding the level of interest in the CIP, 51.8% of farmers reported that they are interested in the CIP, whereas 48% are not interested. According to the qualitative information from FGDs and interviews with farmers, low awareness and interest is due to various reasons including misconceptions by some farmers about the program, especially the component of land use consolidation, the provision of seeds which are not adapted to the agroecological areas and seasons, lack or inadequate involvement of farmers in selecting a crop to be cultivated, etc. Some farmers do not understand land use consolidation, as they believe that it is an attempt by government to grab their land.

Moreover, a small proportion of farmers reported that monocropping promoted under the CIP can cause hunger. When they were growing multiple crops in one plot, one crop could fail and another would perform well. Some farmers refused to consolidate their land assuming that the size of their land is small and some others imagined that CIP is for the government not for the farmers. They believe that the program is beneficial to the government and not farmers. All these are examples of the factors stimulating low level of interest of farmers within CIP.

Strategic recommendations to increase awareness and to be interested about CIP by farmers

a) ***Helping farmers to change mind-sets with regards to CIP and to increase understanding for some farmers who have low level of education***: Some farmers refused to consolidate their land claiming that the size of their land is small and that monocropping would increase risks of crop failure. To counter these beliefs, the Ministry of agriculture with the support of local

government should organize study tours among farmers, in the sectors where CIP is well applied and has contributed to increased income of farmers and food security. Those sectors would be considered as best practice for CIP. For example, Bushekeri sector in Nyamasheke District, Gatore Sector in Kirehe Districts. Outreach campaigns about the role of CIP should be organized at grassroots level for increasing the level of understanding of the programme. Interviews with farmers participating in the CIP could be utilized in radio and television programmes.

b) Insufficiency or inadequate involvement of farmers in selecting a crop to be cultivated: The District and Sector agronomists should take time to explain to farmers why the crops are selected to specific region. Sometimes they can give the citizens a greater role in putting forward their suggestions on crop selection.

3.6 Access to inputs (Improved Seeds, Inorganic fertilizers)

Under CIP, the GoR provides access to fertilisers for farmers through private distribution with agro-dealers. Farmers are provided with an opportunity to pay 50% cash for the value of their fertilisers needs and get vouchers worth 50% for the remainder that can be redeemed by the distributor. These subsidies were aimed at supporting production of staple foods/crops such as maize, beans, cassava, banana and wheat.

Currently, farmers are paying 50% of the price of their fertilisers to agro-dealers. Farmers receive loans of vouchers for the other half. Over the years, farmers have improved their own perception on the impact of fertilisers on crop yields (MINAGRI 2010). However, the farmers' perception on the subsidy programme has not been established and this study aims to establish the level of farmers' satisfaction with the inputs subsidy program. The findings revealed that generally, farmers are aware of the impact of using inorganic fertilizers. In all the surveyed districts, farmers under CIP reported to using inorganic fertilizers and homemade compost/organic fertilizers. At national level, 87% reported to be using inorganic fertilizers, while 97% reported to be using organic fertilizers, leading to good results from mixing the two (Table 9). More details are here below displayed in the table.

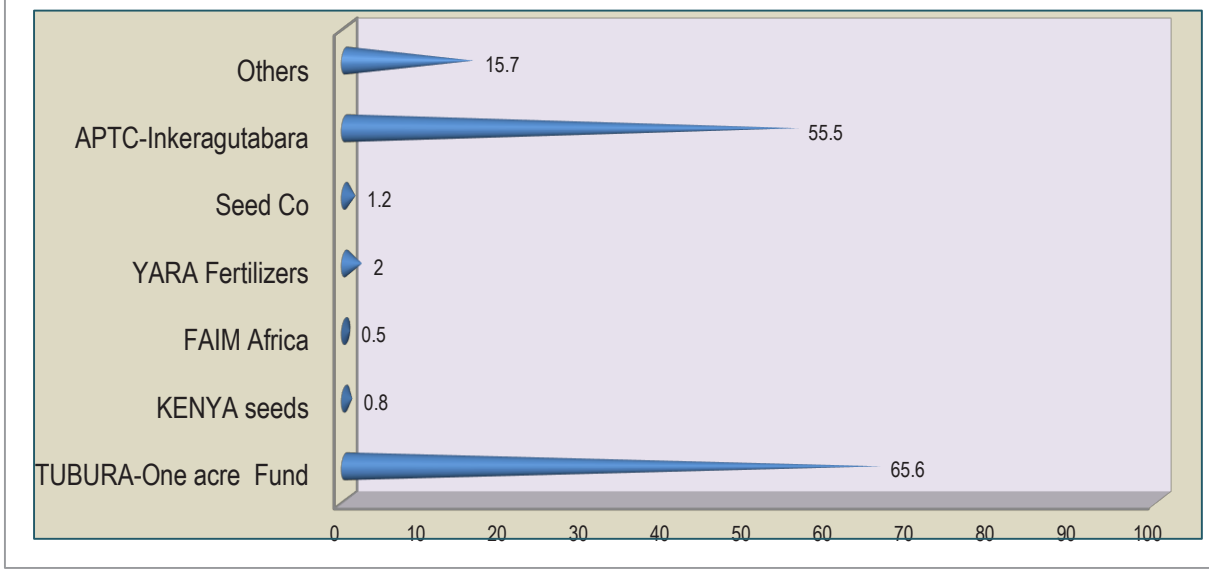
Table 9: Extent of organic and inorganic fertilizer use by district

District (Sector)	*Surveyed farmers*	*Count: User of inorganic fertilizers (Chemical)*	*% Users of inorganic fertilizers (Chemical)*	*Count: Home/Field made compost/Organic fertilizers (traditional)*	*% Home/Field made compost/Organic fertilizers (traditional)*
Nyamasheke(Bushekeri, Kagano)	211	206	97.6	206	97.6
Kirehe (Gatore, Kirehe	180	162	90	165	91.7
Gicumbi (Kageyo, Byumba)	204	148	72.5	194	95.1
Nyamagabe(Buruhukiro, Gatare)	139	139	100	139	100
Burera (Gahunga, Nemba)	148	135	91.2	147	99.3
Kayonza(Nyamirama, Ruramira)	156	129	82.7	156	100

Nyaruguru (Kibeho, Cyahinda)	127	126	99.2	127	100
Gasabo (Nduba, Rutunga)	115	112	97.4	115	100
Rubavu (Nyundo, Rugerero)	126	78	61.9	126	100
Kicukiro (Masaka, Gahanga)	94	71	75.5	82	87.2
Total	**1500**	**1306**	**87.07%**	**1457**	**97.13%**

Source: Primary data, CIP satisfaction Survey; 2017

Figure 20 Certified organs in distributing agriculture inputs



Extent of organic and inorganic fertilizers use by districts

As mentioned in the above paragraphs, 87% of surveyed farmers used chemical fertilizers and 97% used home/field made compost. These findings indicated that the farmer can simultaneously use both types of fertilizer. From these findings it is clear that the targets of CIP in the access of fertilizers is achieved even if some farmers claimed that the fertilizer is very expensive and also reaches them late.

3.7 The access and use of improved seeds

In line with CIP policy, it is expected that in the consolidated lands, farmers must use improved seeds for selected crop to increase the productivity, ensure food security and to increase incomes.

Figure 21 Certified institutions to distribute inputs in the country

Certified organs to multiply improved seeds and to sell fertilizers in the area

The findings revealed the following certified institutions for multiplying improved seeds and distribution of agriculture inputs. TUBURA (One Acre Fund) and APTC-Inkeragutabara were the most popular supplier of improved seeds and fertilizers, with 65.6% and 55.5% of interviewed farmers respectively reported to have received the inputs from them. On the other side, KENYA seed and FAIM-Africa was the least popular supplier reported. If there are no government subsidies, the farmers reported that they would prefer to use the inputs from trusted improved seeds such as TUBURA (One Acre Fund), KENYA seeds, FAIM Africa, YARA fertilizers and seed Co. More information is provided in figure

The extent of using improved seeds by farmers

The findings revealed good results with regard to access and use of improved seeds. 94 % of interviewed farmers reported to using improved seeds in their agricultural activities and 6% do not use improved seeds due to failure of land use consolidation in some sectors. Figure 6 below illustrates the findings.

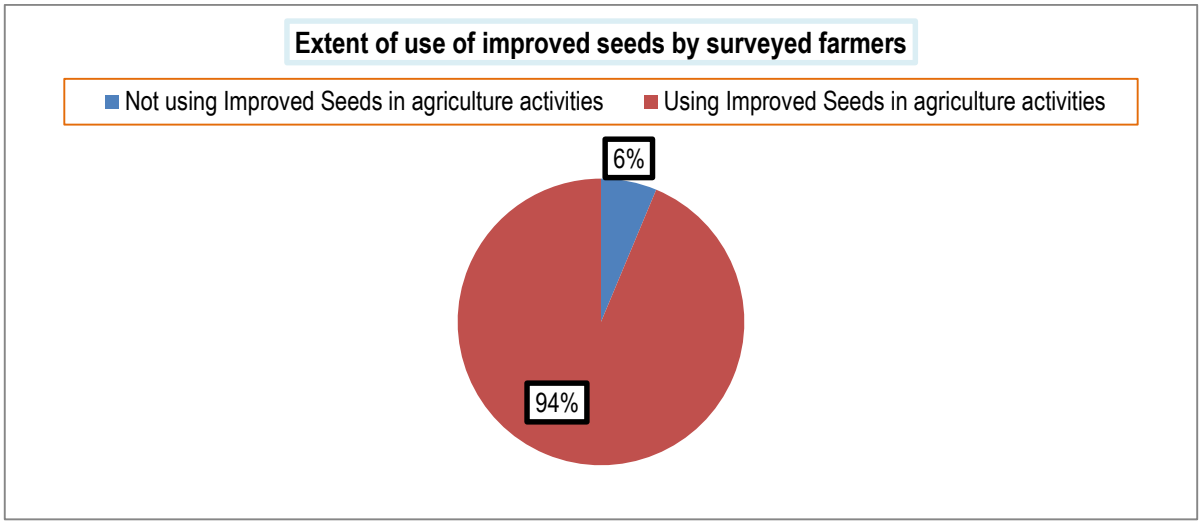


Figure 22: Extent of using improved seeds by the surveyed farmers

Source: Primary data, CIP satisfaction Survey; 2017

The access and use of improved seeds by District

It is important to show extent to which improved seeds are used at district and sector level. The results regarding the use of improved seeds across districts are good in all districts and range

from 83% (Kicukiro district) to 99.4% (Kirehe district). Table 10 below shows the status across districts.

Table 10: Status of use of certified seeds in surveyed districts

District (Sector)	Number of surveyed farmers	Number of farmers by using improved Seeds	Percentage Share
1. **Nyamasheke** (Bushekeri, Kagano)	211	207	98.1
2. **Kirehe** (Gatore, Kirehe)	180	179	99.4
3. **Gicumbi** (Kageyo, Byumba)	204	195	95.6
4. **Nyamagabe** (Buruhukiro, Gatare)	139	117	84.2
5. **Burera** (Gahunga, Nemba)	148	135	91.2
6. **Kayonza** (Nyamirama, Ruramira)	156	149	95.5
7. **Nyaruguru** (Kibeho, Cyahinda)	127	122	96.1
8. **Gasabo** (Nduba, Rutunga)	115	109	94.8
9. **Rubavu** (Nyundo, Rugerero)	126	115	91.3
10. **Kicukiro** (Masaka, Gahanga)	94	78	83
Total	**1500**	**1406**	**93.73%**

Source: Primary data, CIP satisfaction Survey; 2017

Source of agriculture Inputs (Improved seeds and fertilizer)

Interviewed farmers were asked to state their respective providers of improved seeds and fertilizers. Nearly two thirds (65%) reported having obtained inputs from government subsidized sources. 28.9% reported having obtained seeds from agro-dealers shops without subsidies, while 19.1% had purchased them from cooperatives with a seed multiplication certificate. A small proportion (11.2%) reported having received improved seeds from their own produced seeds. The following table provides detailed information.

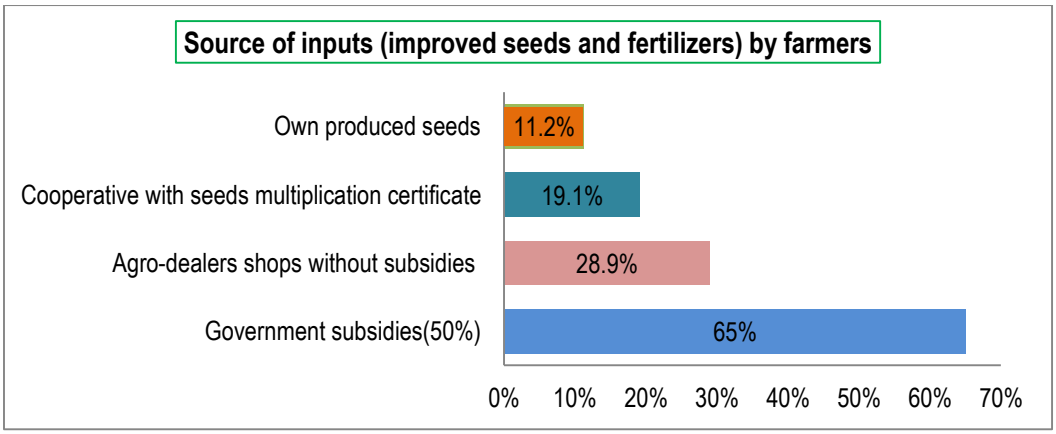


Figure 23Source of seeds among the interviewed farmers

Source: Primary data, CIP satisfaction Survey; 2017

The reasons of not using improved seeds

According to qualitative interviews in the field, the long distance to agro-dealers shops is a constraint to access to improved seeds for some of the farmers.. However, empirical findings reveled that one of the major reasons why farmers do not use improved seeds is reliance on the seeds harvested from previous seasons (34.7%). This is followed by the feeling that improved seeds are very expensive (29.5%), and the lack of agro-dealers shops in the neighborhood (15.8%) as indicated in Table 11.

Table 11: Main reasons for not using improved seeds

Main reasons for not using agriculture inputs (improved seeds)	*Percentage share*
1. There are no Agro-dealers shops in the neighborhood	15.80%
2. Not included in the Government subsidy system through TWIGIREMUHINZI list	14.70%
3. Included in the Government subsidy system through TWIGIREMUHINZI list but did not receive	10.50%
4. Poor quality of the previously received seeds that induced the farmer to refuse the use of improved seeds again	6.30%
5. I have reliance on the seeds harvested from previous season	34.70%
6. Improved seeds are very expensive [due to market speculations]	29.50%
7. Other (haven't reliance on inputs, to prefer the use of their own produced seed and manure fertilizers).	48.40%

Source: Primary data, CIP satisfaction Survey; 2017

3.8 Involvement of farmers in planning and implementation of access to improved seeds

The findings from FGDs revealed poor involvement of farmers in planning for access to improved seeds and fertilizers. The finding revealed that, in some districts, farmers owning large sized lands are the ones who are supplied improved seeds and inorganic fertilizers first. The other farmers are used to relying on the previous season harvest to get seeds for the subsequent season. The government chooses the crop to plant for the farmers instead of being the ones to choose and propose the crop to local authorities. The survey established that the government efforts are mainly oriented towards production of maize crop and that, if there was enough involvement of farmers in planning, they would have chosen to plant different crops other than maize.

Table 12: Involvement of farmers in planning and implementation of access to improved seeds

Modalities	*N*	*Min*	*Max*	*Mean*	*Std. Deviation*	*Interpretation (level of involvement)*
Farmers reported to have been involved in planning and implementation of the distribution of improved seeds	1406	1	10	5.53	2.825	Limited involvement
Farmers reported to have been involved in implementation of the distribution of improved seeds	1406	1	10	3.61	2.736	Moderate involvement

(1.0-3.0=high level of involvement, 3.1-5.0 = moderate level of involvement, 5.1-7.0 = limited involvement on, 7.1-10.0 low level of involvement). ***Source: Primary data, CIP satisfaction Survey; 2017***

A descriptive analysis of the findings revealed that farmers tend to be more involved in the implementation of seed distribution rather than it's planning.

3.9 Challenges faced by farmers to ensure access to and use of fertilizers and improved seeds

Some farmers reported constraints to accessing improved seeds including delays in delivery, delivery of seeds that are not adapted to their respective agro ecological areas, poor knowledge of what improved seeds are, etc. In one of the visited sites, farmers demonstrated surprisingly little knowledge about improved seeds. For example, in Kirehe district, some farmers were not sure whether seeds supplied to them were really improved. Here they used the expressive jargon "Tubona batuyorera" to highlight that there was no indication that the seeds, which they receive, are improved seeds. Some farmers also reported to be afraid of receiving seeds with low germination rate and because of that, they prefer to use the previously harvested crop as seeds. Table 13 provides information on challenges faced by farmers accessing inputs:

Table 13: Challenges faced in accessing inputs

Challenges faced on Access to Inputs (improved seeds and fertilizers)	**Count**	**Rate**
Price of fertilizers is still high	1268	84.5
Price of improved seeds is still high	1067	71.1
Sometimes farmers do not have right to choose crops	459	30.6
Some improved seeds do not adapt to local conditions	567	37.8
Very late supply of fertilizers and improved seeds	1261	84.1
Improved seeds do not adapt to the season	614	40.9
Mix Up of different sort of improved seeds in one package	1012	67.5
Supply of expired improved seeds and fertilizers	432	28.8
Some kind of monopolistic of inputs suppliers	1418	94.5

Source: Primary data, CIP satisfaction Survey; 2017

Reasons for farmers not to implement CIP

- Some farmers indicated that the price of fertilizers and for improved seed is still high; the farmers compared the expense of buying seeds and fertilizers to revenues from crop sales. Sometimes their harvest is not marketed due to poor quality or market glut.
- When the farmers do not have the right to choose crops, coupled with very late supply of inputs, this can lead to misapprehension and can create some resistance to implementing the CIP by farmers.
- Monopolistic approach to input supply, mix up of different varieties of improved seeds in one package (Kirehe), supply of expired improved seeds and fertilizers (Gasabo, Rutunga) is also a cause of low level of interest and trust by farmers in the CIP.
- Lack of testing improved seeds and fertilizers before distribution and soil surveying (inspection of survey) leads to the use of unsuitable seeds.
- Delay in the delivery of improved seeds and fertilizers affects crop yield.

Strategic recommendations about challenges facing the access of improved seeds

- Ministry of Agriculture, Development Partners and other stakeholders that are involved in supporting agriculture activities; should monitor and regularly follow-up in assessing the standards of improved seeds and fertilizers before their distribution to the farmers.
- The improved seeds and fertilizers should be distributed in time to fit with Rwandan seasons and climate.
- Soil surveying or soil inspection should be put in place before deciding the type of crops to be grown in specific region.
- The ideas of citizens should be consulted through local meetings before deciding crops to be grown.
- The supply of improved seeds and fertilizers should be subject to market competition instead of monopolistic supply. Subsidies from government should be distributed to a greater number of agro- dealers providing farmers with greater choice.

3.10 Land use consolidation among individual farmer and within cooperatives

Information retrieved from RAB shows that 174,962 Ha of land were consolidated in year 2015 nationwide. The same information shows that, the main suitable grown crops in consolidated lands are: maize, cassava, beans, Irish potatoes, wheat, vegetables and sorghum. Brief of information on share of consolidated land and the kinds of crops grown in consolidated lands in different districts is summarized in Table 14.

Table 14: Consolidated land in surveyed districts

District	Selected crops	Proportion of consolidated land	Size of consolidated land in hectares
KIREHE	Maize, Cassava	**55**	**32,442**
KAYONZA	Maize, Beans	**49**	**24,664**
BURERA	Beans, irish potatoes,	**49**	**18,337**
GICUMBI	Maize, Beans, wheat, Irish potatoes	**44**	**27,193**
NYARUGURU	Wheat, Maize, Beans	**36**	**22,599**
NYAMAGABE	Wheat, Maize	**29**	**19,511**
RUBAVU	Maize, Beans	**28**	**7815**
NYAMASHEKE	Beans, Maize	**26**	**1,4066**
KICUKIRO	Maize, Vegetables, Sorghum	**24**	**2158**
GASABO	Beans, Maize	**21**	**6177**
TOTAL			**174,962**

Source: Rwanda Agricultural Board, 2017

A cooperative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise. Cooperative members share its benefits and profits. Agricultural cooperatives enable producers to realize economic benefits that they could not otherwise achieve alone. Through agricultural cooperatives, groups of agricultural producers improve their bargaining power in the market place, reduce costs by pooling capital and resources through cooperative enterprises, and make expensive services, such as marketing, more accessible.

Through cooperatives, farmers can also achieve economies of scale, by reducing the unit costs of inputs and services, improve products and service quality and reduce risks. Agricultural cooperatives can allow farmers to address common problems, develop new market opportunities or expand existing markets. Agricultural cooperatives empower farmers and improve their marketing opportunities. The survey findings showed that ffarmers' membership of agricultural cooperatives varies by district.

According to the survey findings, the district with the largest share of farmers operating within cooperatives is Nyamasheke where 90.5% reported having been working within agricultural cooperatives. Gasabo follows with 75.7% and Kirehe with 70.6%. The district with the lowest share of farmers operating in cooperatives was found to be in Kicukiro district where only 7.4% of interviewed farmers reported cooperative membership. Table 15 below provides more information.

Table 15: Proportion of farmers joining LUC as individual or as cooperatives

District	n	Farmers belong in cooperatives	% in cooperatives	Count of Individual farmers	% Individual farmers
Nyamasheke	211	191	90.5	20	9.5
Gicumbi	204	93	45.6	111	54.4
Kirehe	180	127	70.6	53	29.4
Kayonza	156	110	70.5	46	29.5
Burera	148	77	52	71	48
Nyamagabe	139	64	46	75	54
Nyaruguru	127	94	74	33	26
Rubavu	126	83	65.9	43	34.1
Gasabo	115	87	75.7	28	24.3
Kicukiro	94	7	7.4	87	92.6
Average	**1500**	**933**	62.20%	567	**37.80%**

Source: Primary data, CIP satisfaction Survey; 2017

Share of Farmers' land that is under Crop Intensification Programme

As stated earlier, Land Use Consolidation (LUC) is "a procedure of putting together small plots of land in order to manage the land and use it in an efficient manner so that the land may give more productivity" and is a critical component of CIP. The survey investigated whether farmers' lands are under CIP or not and the findings revealed that 86.8% of interviewed farmers land are under CIP while 13.2% are not. One of the challenges hampering farmers' lands from being put under CIP is the misunderstanding of LUC policy by farmers. The findings revealed that farmers do not understand the objectives of land use consolidation and they believe that it can be a way through which the government is using to grab their land. Qualitative information gathered from the field revealed that in some districts, most farmers are consolidating lands, which belong to the government (e.g. marshland land of Gahanga stadium). Farmers also reported existence of inequality in leasing the government land (marshland) whereby rich farmers receive larger acreage than poor farmers. Figure 8 displays the empirical findings on the farmers' land under consolidation.

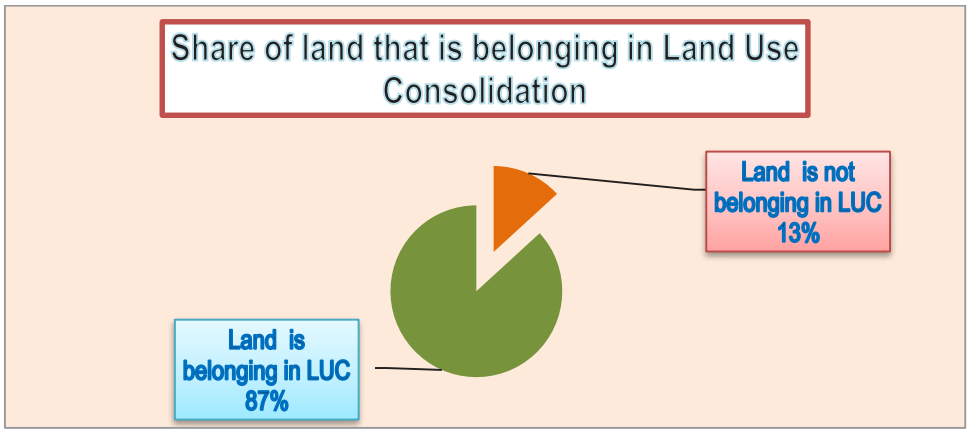


Figure 24:*Share of land under LUC*

Source: Primary data, CIP satisfaction Survey; 2017

Type of crops grown in surveyed districts and sectors

Though qualitative findings revealed a big share of farmers thinking that the government focus is only on production of maize, empirical findings revealed various kinds of crops grown under CIP including maize, Irish potatoes, beans, bananas, rice, cassava, wheat, sorghum, soya beans, sweet potatoes and vegetables.

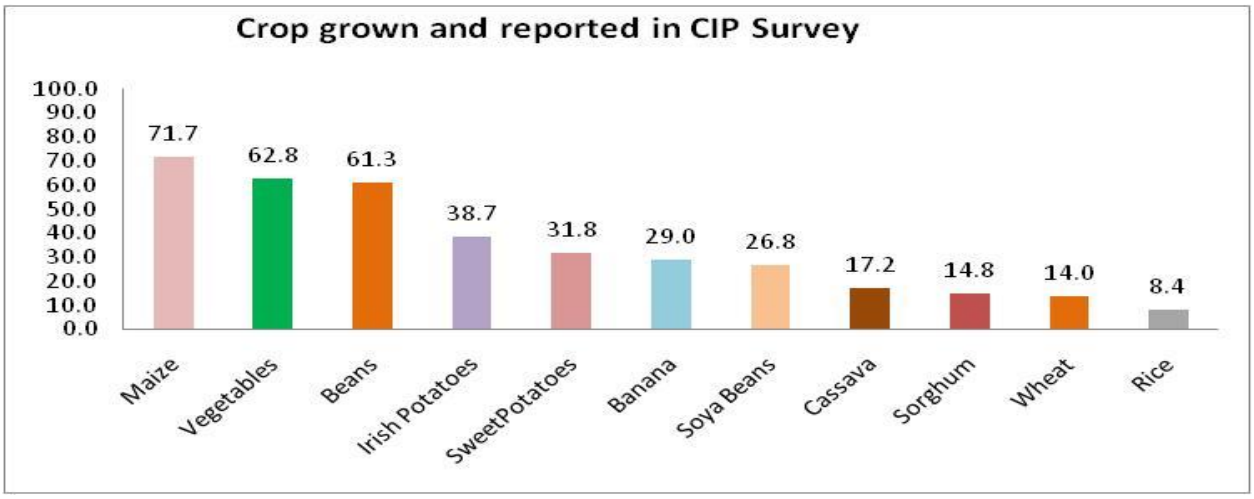


Figure 25: **Types of crops grown under CIP in the surveyed districts**

Source: Primary data, CIP satisfaction Survey; 2017

As observed in Figure 8, maize was reported to be cultivated by the largest share of farmers (71.7%), followed by beans and vegetables (61.3% and 62.8% respectively). This is supported by qualitative information that in the implementation of CIP, more effort was put in maize crop production than for the other crops. Regarding the status within districts, Maize, beans and

vegetables occupied a greater share than other crops. For example, in Nyaruguru and Gasabo districts maize represents 95.3% and 95.7% of the crops grown respectively.

Irish potatoes were reported to be cultivated by a large share of farmers in Nyaruguru district (89.1%). Beans were reported to be cultivated by a large under of farmers in Gasabo district (87%). The cultivation of bananas under CIP was found to be high in Gasabo district (96.5%); rice was reported to be cultivated by a large share of farmers under CIP in Kirehe district (31.6%).

The findings revealed low cultivation of rice by farmers under CIP across almost all districts - in some districts nobody reported growing rice. Qualitative findings revealed that in Kirehe district some farmers have been put off growing rice because of problems in accessing affordable fertilizers and improved seeds. In Nyamasheke district, rice farmers do not have access to improved seeds. They rely to the previous season harvest to get seeds for the subsequent season. It was also reported that there is a lack of rice milling services in Kagano sector. All of these qualitative findings are quite informative to anybody seeking the reasons for poor uptake of rice growing.

Regarding the other CIP priority crops, cassava was reported to be cultivated by a large share of farmers in Nyamasheke district (55.5%); wheat cultivation is high in Nyamagabe district (61.2%), and sorghum cultivation is common in Kayonza district with (41%). In Gasabo district Soy beans (80%), sweet potatoes (90.4%) and vegetables (97.4%) are frequently cultivated. Table 14 provides detailed information.

Table 16: Proportion of farmers growing specific crops

District		Nyamasheke	Kayonza	Nyaruguru	Kirehe	Gasabo	Nyamagabe	Burera	Rubavu	Kicukiro	Gicumbi
Sectors		*Bushekeri, Kagano*	*Nyamirama, Ruramira*	*Kibeho, Cyahinda*	*Gatore, Kirehe*	*Nduba, Rutunga*	*Buruhukiro, Gatare*	*Gahunga, Nemba*	*Nyundo, Rugerero*	*Masaka, Gahanga*	*Kageyo, Byumba*
Grown Crops	**Stat.**	**n=211**	**n=156**	**n=127**	**n=180**	**n=115**	**n=139**	**n=148**	**n=126**	**n=94**	**n=204**
	Nber	161	139	121	121	110	94	93	79	70	53
Maize	%	**76.30%**	**89.10%**	**95.30%**	**67.20%**	**95.70%**	**67.60%**	**62.80%**	**62.70%**	**74.50%**	**26.00%**
	fi	15	67	110	21	89	95	84	7	4	53
Irish potatoes	%	**7.10%**	**42.90%**	**86.60%**	**11.70%**	**77.40%**	**68.30%**	**56.80%**	**5.60%**	**4.30%**	**26.00%**
	fi	161	119	70	56	100	79	112	84	57	55
Beans	%	**76.30%**	**76.30%**	**55.10%**	**31.10%**	**87.00%**	**56.80%**	**75.70%**	**66.70%**	**60.60%**	**27.00%**
	fi	73	105	10	24	111	3	27	23	28	3
Bananas	%	**34.60%**	**67.30%**	**7.90%**	**13.30%**	**96.50%**	**2.20%**	**18.20%**	**18.30%**	**29.80%**	**1.50%**
	fi	55	13	0	65	11	1	0	1	2	0
Rice	%	**26.10%**	**8.30%**	**0.00%**	**36.10%**	**9.60%**	**0.70%**	**0.00%**	**0.80%**	**2.10%**	**0.00%**
	fi	117	67	0	16	53	7	6	1	8	0
Cassava	%	**55.50%**	**42.90%**	**0.00%**	**8.90%**	**46.10%**	**5.00%**	**4.10%**	**0.80%**	**8.50%**	**0.00%**
	fi	7	6	0	3	11	85	66	0	1	30
Wheat	%	**3.30%**	**3.80%**	**0.00%**	**1.70%**	**9.60%**	**61.20%**	**44.60%**	**0.00%**	**1.10%**	**14.70%**
	fi	12	65	0	10	47	2	21	4	31	5
Sorghum	%	**5.70%**	**41.70%**	**0.00%**	**5.60%**	**40.90%**	**1.40%**	**14.20%**	**3.20%**	**33.00%**	**2.50%**
Soya	fi	68	94	1	63	92	1	13	0	47	1
bean	%	**32.20%**	**60.30%**	**0.80%**	**35.00%**	**80.00%**	**0.70%**	**8.80%**	**0.00%**	**50.00%**	**0.50%**
	fi	92	71	1	10	104	5	51	44	47	18
Sweet potatoes	%	**43.60%**	**45.50%**	**0.80%**	**5.60%**	**90.40%**	**3.60%**	**34.50%**	**34.90%**	**50.00%**	**8.80%**
	fi	142	91	26	33	112	56	85	52	68	35
Vegetables	%	**67.30%**	**58.30%**	**20.50%**	**18.30%**	**97.40%**	**40.30%**	**57.40%**	**41.3**	**72.30%**	**17.20%**

3.11 Reasons why some of the farmers' land is not under CIP

The survey investigated the reasons why some farmers' lands are not under CIP. The findings revealed that the most common reason was lack of interest in land use consolidation (32.5%). This is followed by resistance from farmers and mindset of CIP not being beneficial to the farmers (29.4%). Qualitative findings revealed that land use consolidation, a critical component of CIP, is not well perceived by the majority of farmers. The findings revealed that farmers do not understand the land use consolidation, which they believe that it could be a way through which the government can grab their land.

In line with this, farmers recommended that the words used in Kinyarwanda for Land Use Consolidation should be changed to **"Guhuza Igihingwa"** instead of **"Guhuza ubutaka"**. Moreover, they stated that growing one crop can cause hunger. When they were growing many crops in one plot, one crop could fail while another would thrive. Furthermore, farmers refused to consolidate their land claiming that the size of their land is small and therefore, they could not consolidate their lands. Some farmers claimed that CIP is for the government not farmers. They think that the program is beneficial to the government and not farmers. Some farmers also imagine that some selected crops are not adapted to their region and they would like to select the crops to grow on their own without influence from the government officials. The farmers affirm that they are the ones able to identify which crops are most suitable, and not the agronomists. Table 15 displays more findings.

Table 17: Reasons why farmers land is not under CIP

Reasons for which the land of some farmers were not belonging under CIP	Count	%
1. I am not interested in LUC	41	32.5
2. Our leaders didn't mobilize the citizens about the benefits of LUC	17	13.5
3. Resistance from farmers and mind-set of them against CIP	37	29.4
4. To have own profitable projects which is not under CIP	29	23
5. The farm is covered by another agriculture programme outside CIP	32	25.4
6. Farmers benefiting from other programmes (COIKA, TUBURA one acre fund)	37	29.4
Total	**126**	**100**

Source: Primary data, CIP satisfaction Survey; 2017

3.12 Perceptions of farmers on the effect of CIP on production

As earlier stated, CIP was initiated with the aim of increasing the agricultural productivity of high potential food crops and to provide Rwanda with greater food security and self-sufficiency. The survey investigated extent to which CIP increased the farmers' production and the findings revealed perceptions of moderate success.

Table 18: Perception of farmers on effect of CIP on improving production

	N	Min	Max	Mean	Std. Deviation
The extent to which CIP increased your production (1<10)	1336	1	10	**7.92**	1.554

Extent to which CIP increased the production (1-4 decreased, 5-6 do not change, 7-10 increased) the productivity.

The results in table 18 indicates that, even if the farmers are not aware of the benefits of CIP nor interested in CIP, they reported that CIP contributed in increasing the production especially the production of maize, beans, and vegetables. The average reported score is 7.92, which indicates perceptions that the CIP has increased production. The farmers also claimed to have found a market for their harvest.

Challenges facing Land Use Consolidation in surveyed Districts

Table 19: Challenges facing LUC in surveyed districts

Challenges facing Land use Consolidation	Count	rate
1. Hill side is still problem in LUC	456	30.4
2. Low level of awareness for LUC by some farmers	265	17.7
3. Resistance of farmers to perform LUC	187	12.5
4. LUC were not applicable in some sectors due to revised district master plan	246	16.4

Source: Primary data, CIP satisfaction Survey; 2017

The challenges facing land use consolidation are the hilly nature of the land (30.4%), low level of awareness for LUC by some farmers (17.7%), resistance of farmers to undertake LUC (12.5%) and LUC did not applicable in some Sectors due to revised master plan (Gahanga, Masaka in Kigali City) (16.4%).

Strategic recommendations on improving awareness of CIP_LUC

- Study tours in CIP best practice regions (Bushekeri in Nyamasheke, Gatore in Kirehe, Buruhukiro and Gatare in Nyamagabe, Cyahinda, and Kibeho in Nyaruguru) should be organized.
- Agriculture discussions on radio and witness for CIP benefits should be strengthened and organized regularly.

3.13 Provision of Proximity extension services

Farmer' extension services should be strengthened and organized regularly. Nyamagabe, Cyahinda, and Kibeho in Nyaruguru) should be organized, as well as strengthening the inter-

linkages and information sharing between the various actors in the sector. The Government has adopted the TWIGIRE MUHINZI extension system as a way to increase overall access to advisory services by all farmers. This new extension system was introduced in 2014 and the survey established the farmers' satisfaction and their perceptions on TWIGIRE MUHINZI.

Received trainings by farmers under CIP in surveyed districts

Under CIP, various kinds of training are offered to farmers. The survey investigated kinds of training offered to farmers and the proportion of farmers that were trained. Generally, Gasabo district was found to be well positioned in terms of training farmers under CIP while Gicumbi was lagging behind. Of all trainings offered, training on agro processing was found have been given to a low number of farmers across districts compared to other kinds of trainings. Table 20 provides more details.

Table 20: Type of trainings received by farmers under CIP by sector

Received Training		Proximity and Extension services/ District (Sectors)									
		Nyamasheke (Bushekeri, Kagano)	*Kayonza (Nyamirama, Ruramira)*	*Kirehe (Gatore, Kirehe)*	*Burera (Gahunga, Nemba)*	*Gasabo (Nduba, Rutunga)*	*Nyaruguru (Kibeho, Cyahinda)*	*Nyamagabe (Buruhukiro, Gatare)*	*Kicukiro (Masaka, Gahanga)*	*Rubavu (Nyundo, Rugerero)*	*Gicumbi (Kageyo, Byumba)*
1. Early land preparation	n	*211*	*156*	*180*	*148*	*115*	*127*	*139*	*94*	*126*	*204*
	fi	171	138	132	116	113	120	96	65	85	59
	%	**81.0**	**88.5**	**73.3**	**78.4**	**98.3**	**94.5**	**69.1**	**69.1**	**67.5**	**28.9**
2. Compost making	fi	170	138	129	112	110	94	92	66	81	58
	%	**80.6**	**88.5**	**71.7**	**75.7**	**95.7**	**74.0**	**66.2**	**70.2**	**64.3**	**28.4**
3. Timely planting	fi	171	141	132	116	113	121	96	67	78	59
	%	**81.0**	**90.4**	**73.3**	**78.4**	**98.3**	**95.3**	**69.1**	**71.3**	**61.9**	**28.9**
4. Proper spacing, planting on rows	fi	172	141	128	115	112	120	95	69	73	59
	%	**81.5**	**90.4**	**71.1**	**77.7**	**97.4**	**94.5**	**68.3**	**73.4**	**57.9**	**28.9**
5. Application	fi	171	141	119	118	112	121	97	67	61	57
	%	**81.0**	**90.4**	**66.1**	**79.7**	**97.4**	**95.3**	**69.8**	**71.3**	**48.4**	**27.9**
6. Pest and diseases control	fi	164	139	120	114	113	107	94	66	62	57
	%	**77.7**	**89.1**	**66.7**	**77.0**	**98.3**	**84.3**	**67.6**	**70.2**	**49.2**	**27.9**
7. Reduce post-harvest losses	fi	140	137	109	108	108	93	92	55	37	45
	%	**66.4**	**87.8**	**60.6**	**73.0**	**93.9**	**73.2**	**66.2**	**58.5**	**29.4**	**22.1**
8. Linking farmers to market	fi	128	131	91	61	88	92	89	12	15	33
	%	**60.7**	**84.0**	**50.6**	**41.2**	**76.5**	**72.4**	**64.0**	**12.8**	**11.9**	**16.2**
9. Agro-processing	fi	80	66	13	49	49	23	65	3	8	4
	%	**37.9**	**42.3**	**7.2**	**33.1**	**42.6**	**18.1**	**46.8**	**3.2**	**6.3**	**2.0**
10. Climate smart agriculture	fi	117	113	58	74	108	51	92	11	65	24
	%	**55.5**	**72.4**	**32.2**	**50.0**	**93.9**	**40.2**	**66.2**	**11.7**	**51.6**	**11.8**
11. Nutritious food	fi	142	117	73	109	112	23	90	57	67	42
	%	**67.3**	**75.0**	**40.6**	**73.6**	**97.4**	**18.1**	**64.7**	**60.6**	**53.2**	**20.6**

Source: Primary data, CIP satisfaction Survey; 2017

Distribution of percentage share of farmers that received any agriculture training through CIP

The survey investigated if farmers had received training from extension agents. Findings revealed that 74.2% of interviewed farmers got trainings from extension agents, while 25.8% of them did not. Qualitative findings revealed that local farmer promoters provide extension services, but the provision of extension services was not well understood by some farmers. Indeed, some farmers do not receive trainings because they do not attend their village meetings where most of trainings are delivered. In some regions, farmers were not content with how these farmer' promoters operate. For example, in Nyamasheke district, farmers reported that they did not receive extension services because the number of local extension agents is very low. Additionally, local extension services were reported not to be gender sensitive in some areas where farmer promoters comprised of only men. There is a case in Gicumbi district where farmers reported that trainings are only delivered to farmer promoters and the latter do not train farmers. The following figure displays empirical findings.

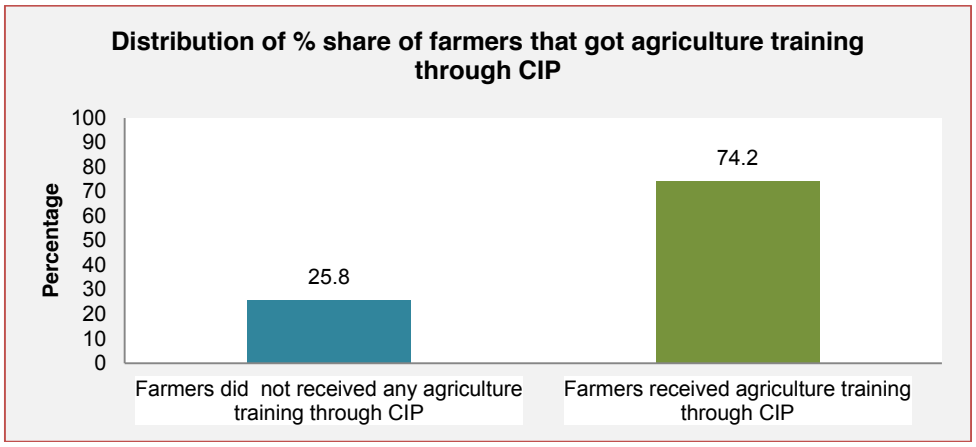


Figure 26 Distribution of farmers who receive training through CIP

Source: Primary data, CIP satisfaction Survey; 2017

Distribution of percentage share of times/frequency that farmers received agriculture training through CIP

Regarding the frequency by which extension agents meet farmers, the findings revealed that 77 % meet them less than four times per month while 23 % work with them in the field as indicated in the figure 11 below.

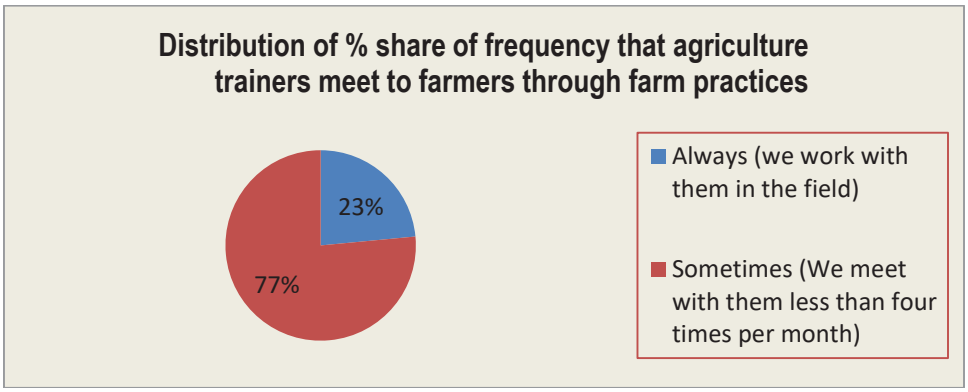


Figure 27: Frequency in which extension agents train farmers

Source: Primary data, CIP satisfaction Survey; 2017

Type of received trainings from extension agents.

Under CIP, local extension agents provide training to farmers in various areas. The survey investigated the kind of trainings received from extension agents. The findings revealed that nearly all farmers had received "training on early land preparation" (98.4%) and "training on timely planting" (98.3%). The kind of training that was offered to the least number of farmers was found to be "training on agro-processing" (32.3%). One of the challenges reported by farmers with regard to trainings was that some extension agents fail to offer training. The following table displays the kinds of training received.

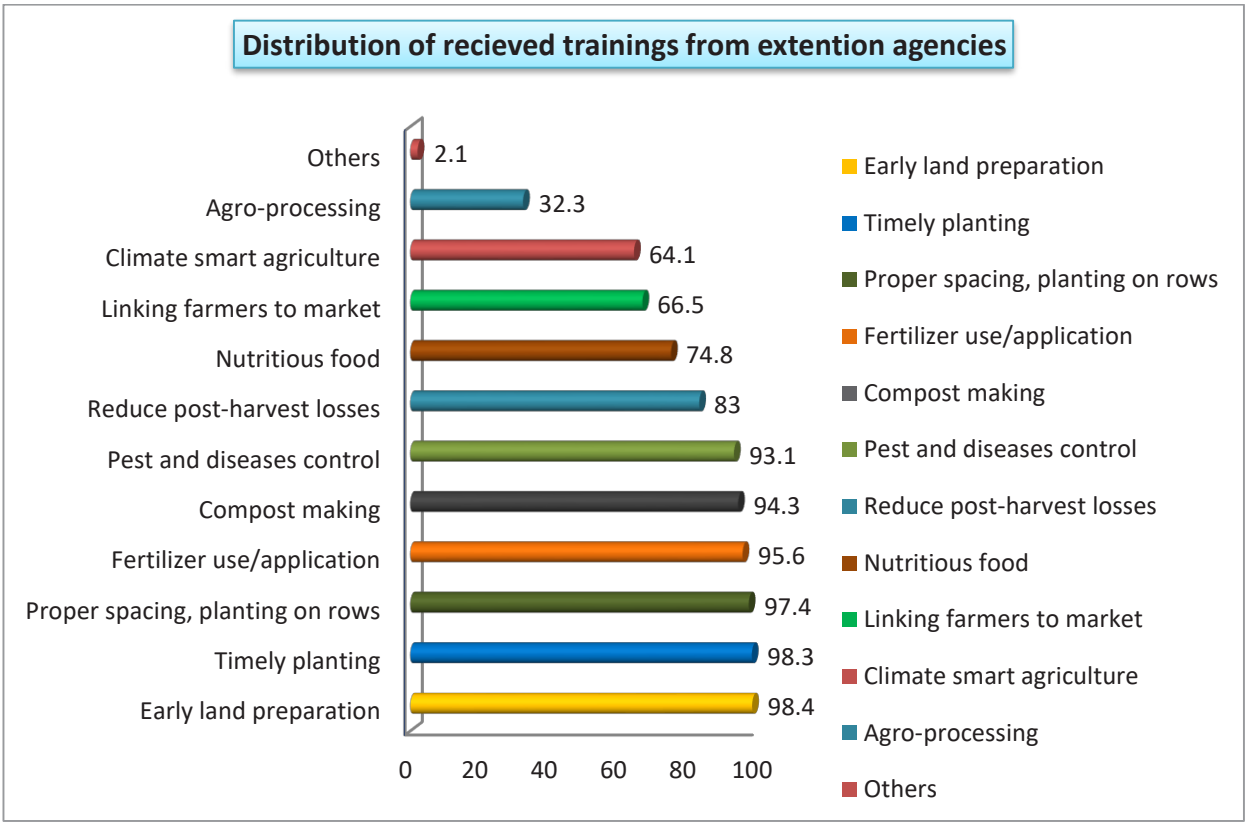


Figure 28: Distribution of received trainings by farmers from extension agents

Training by crop type

Table 21: Type of crop for which farmers received training

Type of crop for which farmers received training	Count	%
Maize	1041	93.5
Irish potatoes	545	49
Beans	893	80.2
Bananas	407	36.6
Rice	148	13.3
Cassava	275	24.7
Wheat	209	18.8
Sorghum	197	17.7
Soya bean	380	34.1
Sweet potatoes	443	39.8
Vegetables	700	62.9
Others	70	6.3

The survey investigated the kind crop farmers were trained on by extension agents and the findings revealed that a large share of trained farmers was trained on maize (93.5%) and beans (80.2%). The findings revealed a gap in training on rice as only 13.3% of trained farmers reported to have been trained on this crop. Table 21 provides more information.

Source: Primary data, CIP satisfaction Survey; 2017

Challenges facing provision of proximity of extension services

Farmers face challenges on post-harvest handling and storage as well as marketing. The farmers need training on how they can add value to their crops through agro-processing, reducing post-harvest losses, pest and diseases control, linking them to market, and climate smart agriculture. Table 22 below indicates the extent to which survey respondents mentioned the lack of training in these areas.

Table 22: Challenges facing provision of proximity extension services

Challenges facing provision of Proximity and extension services	Count	Rate
1. Limited training on reducing postharvest losses (Gicumbi, Rubavu)	234	15.6
2. Limited training on linking farmers to market (Burera, Kicukiro, Rubavu, Gicumbi)	318	21.2
3. Limited training on climate smart agriculture (Kirehe, Kicukiro, Gicumbi)	267	17.8
4. Limited training on giving value added to their yield using agro-processing or crop conservation (all 10 Districts)	1013	67.5
5. Limited training on Pest and diseases control (Rubavu, Gicumbi).	189	12.6

Source: Primary data, CIP satisfaction Survey; 2017

3.14 Postharvest handling, storage and feeder road infrastructure

In order to reduce pre- and post-harvest losses that occur between the field and the first point of aggregation, the Government supports training and coaching of farmers, dissemination of post-harvest tools and equipment, construction of model drying and storage facilities, as well as establishing feeder and access roads across staple crop producing areas. However, post-harvest losses remain a major challenge across most crop value chains due to insufficient post-harvest infrastructure and equipment. This section presents the findings on the farmers' perceptions regarding the post-harvest and storage initiatives under the CIP.

Postharvest and storage handling of CIP priority crops

The implementation of the component of postharvest handling and storage is still low. Moreover, the status of the majority of feeder roads is poor. The shortcomings in this area may be related to budgetary shortages. However, in some area where storage facilities were built, they are not used. Empirical findings revealed that handling of community storage facilities by districts is at 16%. The remaining 84% use individual storage facilities at their respective homes. Some districts

including Burera, Gasabo and Kicukiro were found not to have community storage facilities. Handling of community storage was found to be high in Gicumbi district where 68.1% of interviewed farmers reported to have been using community storage. Table 23 provides more details.

Table 23: Distribution of post-harvest handling and storage facilities in the surveyed districts

District	Surveyed farmers	# farmers by using community storage	% Community storage	Using home storage	% Home storage
1. Nyamasheke	211	36	17.1	175	82.9
2. Kirehe	180	25	13.9	155	86.1
3. Gicumbi	204	139	68.1	65	31.9
4. Nyamagabe	139	1	0.7	138	99.3
5. Burera	148	0	0	148	100
6. Kayonza	156	3	1.9	153	98.1
7. Nyaruguru	127	27	21.3	100	78.7
8. Gasabo	115	0	0	115	100
9. Rubavu	126	9	7.1	117	92.9
10. Kicukiro	94	0	0	94	100
Total	1500	240	**16%**	1260	**84%**

Source: Primary data, CIP satisfaction Survey; 2017

Ownership of post-harvest Handling and storage facilities in surveyed districts

The survey revealed that the majority of farmers (72.2%) handle storage themselves on an individual basis. Only 2.2% reported using community storage facilities built by government. A further 25.6% reported using storage built by private institutions. Qualitative information revealed that postharvest handling and storage facilities are lacking in some districts. Moreover, the status of feeder roads is very poor in many of the sectors. These factors force farmers to sell their produce at lower prices because they fear losing their production or that their produce will deteriorate before it can be sold. Figure 13, provides more information on post-harvest handling.

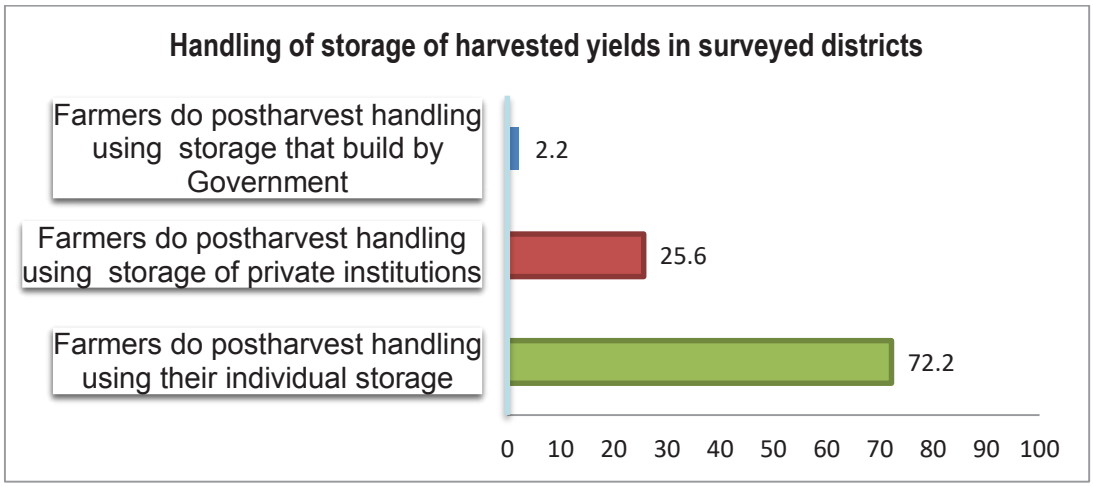


Figure 29 Ownership of post-harvest and storage facilities

Source: Primary data, CIP satisfaction Survey; 2017

Existence and access to community storage

The findings from FGDs showed that farmers in Kageyo sector are not aware of the benefits of common storage and some farmers do not trust the management of the facilities thus fearing theft of their produce while others believe that common storage can worsen post-harvest losses. In some sectors, farmers reported the existence of storage facilities that are not used (case of MUHIRA). However, farmers in Kirehe district reported the existence of fewer storage facilities compared to the yield of maize in the area. One of the challenges reported with regard to the use of common storage facilities are that farmers do not use them because they fear pest damages in storage. Table 25 displays more findings.

Table 24: Access to and usage of community storage by all interested farmers

	Not Interested	Interested	Total
No existence of community storage facilities	52.0%	0.0%	52.0%
Existence of community storage facilities	2.8%	45.2%	48.0%
	54.8%	**45.2%**	**100.0%**

In additional to qualitative information, the survey investigated existence of community storage in visited sites and access to these community storage facilities by interested farmers. 48% of interviewed people reported the existence of community storage facilities while the remaining 52% reported the opposite. Regarding access to community storage by all interested farmers, 45.2% of interviewed people confirmed access by interested farmers while 54.8% did not. Only 2.8% reported existence of community storage but denied access by interested farmers. Qualitative findings revealed that, in some districts, there are no common storage facilities.

Access to material support for post-harvest storage

The survey investigated whether farmers receive material support in post-harvest handling and storage. The findings revealed that only 10% received such support. In some areas, farmers reported a lack of post-harvest handling and storage facilities. However, in some areas where storage facilities are in place, they are not used (e.g., Nyundo, Rugerero, Rubavu)

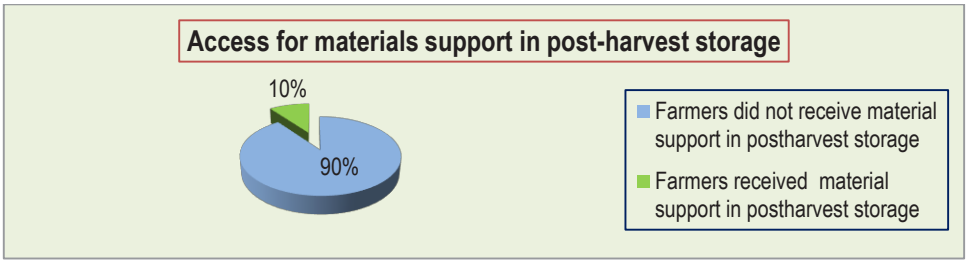


Figure 30: Access to material support for post-harvest handling and storage

Source: Primary data, CIP satisfaction Survey; 2017

Challenges facing Post-harvest handling, storage and feeder road Infrastructure and other related agriculture challenges

In relation to the challenges facing post-harvest storage handling and feeder roads, the survey established that poor feeder road infrastructure was the main challenge across all districts. Table 26 presents a summary of challenges found.

Table 25: **Challenges facing post-harvest handling and storage and other agriculture related challenges**

Challenges facing Post harvest handling, storage and feeder road Infrastructure	Count	rate
Fewer storage facilities compare to yield of maize	789	52.6
Poor feeder road infrastructure in all 10 districts	1012	67.5
Other agriculture related challenges	**Count**	**rate**
Lack of technical inspection of land for crop to be grown	1178	78.5
Insufficient irrigation facilities and rainwater harvesting program	986	65.7
Mindsets of farmer regards to inorganic fertilizers, improved seeds	572	38.1
Insurance for flooding and drought in agriculture activities	1078	71.9

Source: Primary data, CIP satisfaction Survey; 2017

The main challenges identified by the survey are lack of technical inspection of land for suitability of the crop to be grown, poor feeder road infrastructure in all 10 districts, insurance for drought and flood related losses, insufficient irrigation facilities and rainwater harvesting.

3.15 Satisfaction level of surveyed farmers about CIP

The perceptions of the surveyed farmers were rated using a likert scale ranging from 1 to 4 (see below):

Score	*Response*	*Description*	*Range*	*Interpretation*
4	*Strongly Agree*	*You agree with no doubt at all*	*3.26-4.00*	*Very high level*
3	*Agree*	*you agree with some doubt*	*3.25-2.75*	*High level*
2	*Disagree*	*you disagree with some doubt*	*2.76-1.76*	*Moderate*
1	*Strongly Disagree*	*You disagree with no doubt at all*	*1.75-1.00*	*Low level*

Satisfaction level of farmers on access to inputs (Improved seeds and fertilizers)

Previously reported findings indicate that more than 80% of surveyed farmers used agriculture inputs, such as improved seeds and fertilizers. The survey objective is to establish the extent to which the farmers were satisfied with access to inputs. Table 27 indicates the satisfaction scores:

Table 26: **Farmers' satisfaction levels on access to inputs**

Satisfaction level of farmers on the access to inputs (Fertilizers and improved seeds)					
Items	**Mean**	**%**	**Std. Deviation**	**Interpretation**	**Rank**
1.Farmers are appropriately satisfied and involved in distribution of inorganic fertilizers and improved seeds	2.86	71.5	0.795	High level	3
2.Farmers are appropriately satisfied in using inorganic fertilizers and improved seeds	2.93	73.25	0.774	High level	2
3.Farmers are appropriately in setting list used in distributing of inorganic fertilizers and improved seeds	3.13	78.25	0.739	High level	1
The average mean index (1)	**2.9733**	**74.3**		**High level**	

Source: Primary data, CIP satisfaction Survey; 2017

The findings in Table 26 show an average score of 2.97 suggesting that farmers are generally satisfied with their access to fertilisers and improved seeds. There is a need of little improvement so as to attain 100% satisfaction of farmers.

Satisfaction level of farmers with land use consolidation

The satisfaction level of surveyed farmers was rated using Likert scale ranging from 1 to 4. The findings indicate that if land use consolidation is well applied it can promote agriculture productivity. The farmers perceive that: land use consolidation contributes to increasing, land use consolidation can facilitate the access to inputs, and land use consolidation helps optimal utilization of small pieces of land. On the other hand, farmers' satisfaction with the implementation of land use consolidation in the area and the perception that land use consolidation increases income from farming are at moderate level, while there is a low level of agreement with the statements that "land use consolidation improves access to finance" and that "land use consolidation helps farmers to get access to market information systems.". The overall level of satisfaction of farmers with Land Use Consolidation is 2.57 suggesting substantial room for improvement. Table 27 illustrates the details.

Table 27: Farmers satisfaction levels on land use consolidation

Satisfaction level of farmers on land use consolidation					
Items	**Mean**	**%**	**Std. Deviation**	**Interpretation**	**Rank**
1.Satisfied with the implementation of land use consolidation in the area	2.28	57	0.688	Moderate level	6
2.Land use consolidation increase the yields	3.36	84	0.658	Very high level	2
3.Land use consolidation facilitate the access to inputs	3.35	83.8	0.666	Very high level	3
4.Land use consolidation accelerates modernization of agriculture	3.18	79.5	0.659	High level	4
5.Land use consolidation increases income from farming	2.35	58.8	0.688	Moderate level	5
6.Land use consolidation improves access to finances	1.24	31	0.796	Low level	8
7.Land use consolidation helps optimal utilization of small pieces of lands	3.37	84.3	0.668	Very high level	1
8.Land use consolidation helps farmers to get access to market information systems	1.45	36.3	0.778	Low level	7
The average mean index (2)	**2.5725**	**64.3**		**Moderate level**	

Source: Primary data, CIP satisfaction Survey; 2017

Satisfaction level of farmers with proximity and extension services

Of all the components of the CIP, farmers expressed the highest satisfaction levels with proximity and extension services (77.4%). Farmers mainly considered that the provided information and advisory services are adequate, and appreciated the training provided by extension agents. The time taken by the extension agents to train farmers was generally found to be is sufficient, and the frequency of training was considered by most to be sufficient. The overall satisfaction score for proximity and extension services was 3.095 (Table 28).

Table 28: Farmers' satisfaction level on proximity and extension services

Satisfaction level of farmers on proximity and extension services (Training of farmers by agriculture extension agencies					
Items	**Mean**	**%**	**Std. Deviation**	**Interpretation**	**Rank**
1.The time taken by the extension agents to train farmers is sufficient	2.77	69.3	0.7	High level	3
2.The frequency taken by the extension agents to train farmers is enough	2.75	68.8	0.693	High level	4
3.The information and advisory services provided is adequate	3.44	86	0.575	Very high level	1
4.The provided training by extension agent is appreciated by farmers	3.42	85.5	0.596	Very high level	2
Average mean Index (3)	**3.095**	**77.4**		High level	

Source: Primary data, CIP satisfaction Survey; 2017

Satisfaction level of farmers on postharvest, storage handling and feeder road infrastructure

Farmers' perceptions about postharvest and storage handling were assessed using a likert scale ranging from 1 to 4. Farmers reported that some districts have neither a community store nor feeder road infrastructure. In general, satisfaction with elements of postharvest, storage handling and feeder road infrastructures were at a moderate level of 64.3%, with an average score of 2.70.

Table 29: Farmers' satisfaction level on post-harvest handling and storage services

Satisfaction of farmers on postharvest services and storage handling in CIP					
Item	**Mean**	**%**	**Std. Deviation**	**Interpretation**	**Rank**
1.Post-harvest services are well organized and respond farmers needs	2.88	57	0.755	High level	1
2.The training provided on post-harvest services is appreciated	2.74	84	0.799	Moderate level	6
3.The training provided on reduction of post-harvest losses is appreciated	2.69	83.8	0.81	Moderate level	7

4.Satisfied with the size and quality of store for keeping yields	2.46	79.5	0.995	Moderate level	8
5.Feeder road infrastructures are well developed and used	2.8	58.8	0.797	High level	2
6.Road infrastructures in the area	2.79	31	0.804	High level	3
7.It is easy to reach market place on time due to the feeder roads	2.79	84.3	0.814	High level	4
8.It is easy to move inputs, materials for agriculture due to feeder roads in farm	2.77	36.3	0.81	High level	5
Average mean Index (4)	**2.7**	**64.3**		**Moderate**	

Source: Primary data, CIP satisfaction Survey; 2017

3.16 Uptake of best practices promoted by Crops intensification program (CIP) in surveyed Districts

To assess the benefits of CIP based on the uptake of best practices and to justify satisfaction level of farmers to CIP and to verify the reality based on data evidences of productivity from intensified crops, the survey considered the findings from National Seasonal Agriculture Survey, especially season B of 2017. This was conducted by the National Institute of Statistics of Rwanda (NISR, SAS, 2017).

Table 30: Physical cultivated land in the surveyed districts

Physical land for agriculture per district (Ha)		
District	**Intensive crop land on hillsides (Ha)**	**Intensive crop land in marshlands (Ha)**
Nyamasheke	44,064.10	2,371.10
Nyamagabe	50,410.80	3,402.80
Nyaruguru	43,598.20	3,674.00
Gicumbi	61,872.10	1,674.20
Burera	44,013.00	1,459.70
Rubavu	26,886.60	
Kirehe	66,696.00	10,604.40
Kayonza	64,327.70	3,156.70
Kicukiro	7,597.30	2,686.20
Gasabo	25,561.90	3,190.70

Source: NISR, SAS, 2017B

Table 31 indicates cultivated lands in each of the sampled 10 districts. The NISR Seasonal Agriculture Survey 2017B details global information about agriculture activities in the sampled districts as follows:

The main crops grown in 2017 Season B were legumes and pulses (28.2%) followed by tubers and roots (26.8%) then bananas (18.9%) and cereals (18.7%).

For small scale farmers 95.4% used traditional seeds, while 4.6% used with improved seeds. For large-scale farmers, 59.7% used traditional seeds, whereas 40.3% used improved seeds.

For small-scale farmers, 34.7% used organic fertilizers and 15.1% used inorganic fertilizers. For large scale Farmers, the use of organic fertilizers and inorganic fertilizers was 32.7% and 32.5% respectively. 11.7% of small scale farmers and 31.8% of large scale farmers used pesticides (NISR, SAS, 2017B)
In 2017 season B, 4.6% of small scale farmers and 20.7% of large scale farmers practiced irrigation., 64.4% of small scale farmers employed anti-erosion practices, compared to 56.6% for large scale farmers (NISR, SAS, 2017B).

In regards to production, in 2017 Season B, most of the crops underwent increased production. Among others Irish potatoes increased by 29%, Bush beans by 28%, Maize by 16% and Paddy rice by 4% by comparing with 2016 season B production (NISR, SAS, 2017B)

Level of production in metric tons by crop in the sampled Districts

Table 31: **Level of production in metric tons by crop in the sampled districts**

Crop	Gasabo	Kicukiro	Nyaruguru	Nyamagabe	Rubavu	Kayonza	Nyamasheke	Burera	Gicumbi	Kirehe	Total production (MT)	Share %
Maize	1,124	284	273	335	1,518	5,564	338	915	2,775	2,024	15,150	1.7
Sorghum	4,321	640	2,856	4,670	1,181	10,509	17	7,437	9,005	10,688	51,325	5.7
Paddy rice	-	-	-	-	-	165	320	-	-	1,625	2,109	0.2
Wheat	-	-	324	454	64	-	-	1,513	-	-	2,355	0.3
Cassava	5,134	1,217	17,410	26,211	735	14,837	46,956	624	8,443	19,897	141,464	15.7
Sweet potato	4,940	470	31,357	24,814	5,532	9,562	20,556	14,593	27,698	8,233	147,754	16.4
Irish potatoes	1,875	25	7,838	16,477	57,747	2,924	93	54,529	19,724	1,804	163,038	18.1
Yams & Taro	1,238	389	2,393	6,052	508	2,492	3,750	1,710	1,146	1,937	21,614	2.4
Cooking Banana	5,056	3,469	2,664	2,681	4,082	33,555	9,040	5,505	11,524	43,985	121,562	13.5
Dessert banana	4,796	1,227	598	1,885	9	2,275	1,182	902	7,767	602	21,244	2.4
Banana for beer	3,475	1,126	3,459	18,729	828	7,612	12,947	3,118	7,134	13,448	71,875	8
Bush bean	3,528	1,112	346	876	-	10,102	618	458	2,922	10,504	30,465	3.4
Climbing bean	220	44	3,308	3,172	3,589	471	2,995	14,109	8,983	4,217	41,107	4.6
Peas	121	1	214	804	117	309	51	411	887	16	2,931	0.3
Ground nuts	202	22	-	-	-	323	-	-	-	179	726	0.1
Soya beans	273	40	516	518	24	206	1,080	7	323	39	3,026	0.3
Vegetables	4,393	2,208	1,628	6,772	17,631	1,056	5,500	3,462	18,084	1,417	62,152	6.9
Fruits	477	209	5	181	73	339	977	204	299	341	3,106	0.3

Source: NISR, SAS, 2017B,

Production changes in 2016B and 2017B

To assess an increase in crop production, the comparison of same seasons in year 2016 B and 2017 were made; figure 14 indicates the increment level between two seasons of different years.

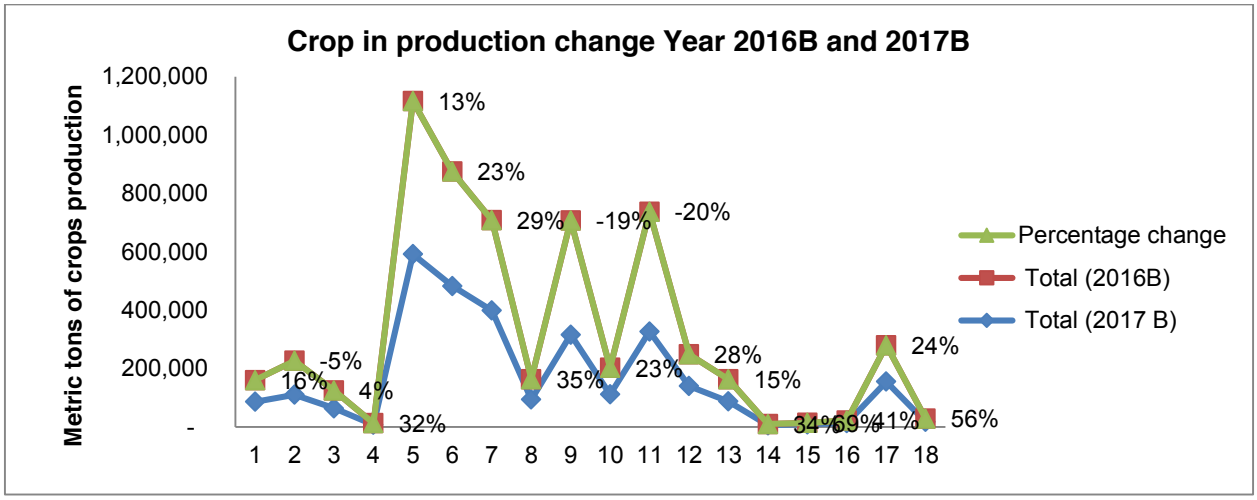


Figure 31: Crop production changes in 2016B and 2017B

Total (2017B)	Total (2016B)	Percentage change
3,015,217	2,784,022	**22%**

Source: NISR, SAS, 2017B,

Data from Seasonal agriculture survey, 2016 B and 2017B as reference, indicates that the crop production have increased by season, the increase of production in sampled districts is 22%. This provides evidence that if CIP is well done at high level should contribute to agriculture growth in Rwanda.

3.17 Benefits from CIP as identified by the surveyed farmers

The reported benefits from CIP varied by district. Results from the survey indicate that in Nyamasheke District (Bushekeri Sector), Kirehe District (Gatore sector), Nyamagabe District (Buruhukiro and Gatare Sectors), Nyaruguru District (Cyahinda and Kibeho Sectors) farmers perceive that the CIP has brought substantial benefits. These locations should therefore be documented as the areas with the best practices with regard to the implementation of CIP. In other visited sectors, such as Gahanga in Kicukiro District, Kirehe sector in Kirehe district farmers did not perceive that the CIP had benefitted them. Figure 16 indicates reported benefits.

Overall benefits from CIP in surveyed districts

Results from the survey revealed that 67% of farmers reported that CIP helps farmers to get government subsidies at 50% the price of fertilizers and improved seeds. 54.2% of farmers reported that CIP helps farmers to get technical assistance and advisory services though agriculture trainings. 27.8% of surveyed farmers also reported that the CIP contributes to the increase of production and CIP contributes in changing mindsets of farmers with regard to land consolidation and monocropping (19.4%) (Figure 16),

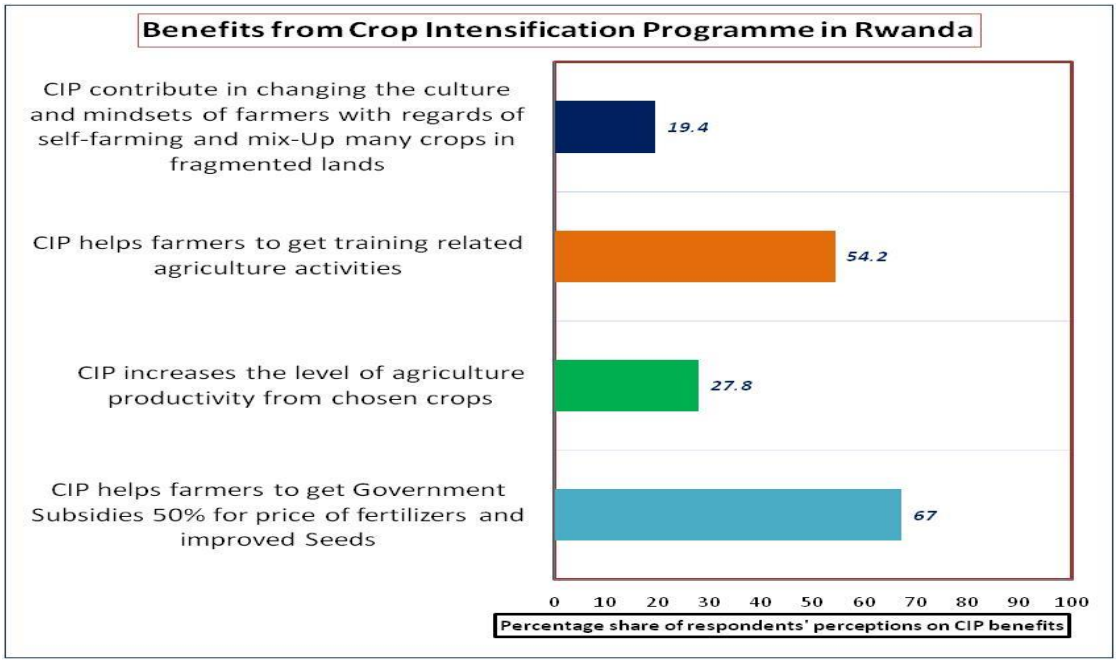


Figure 32: Benefits from CIP in Rwanda

Source: Primary data, CIP satisfaction Survey; 2017

Particular benefits of the CIP for individual farmers

The particular benefits of the CIP for individual farmers were stated by survey respondents as helping farmers to buy agriculture inputs (89.2%), helping farmers to attain household food security and to buy basic needs for the households (75.3%), empowering farmers to construct and rehabilitate houses (67.2%), and buying other land and livestock (79.9%). Figure 17 illustrates the details:

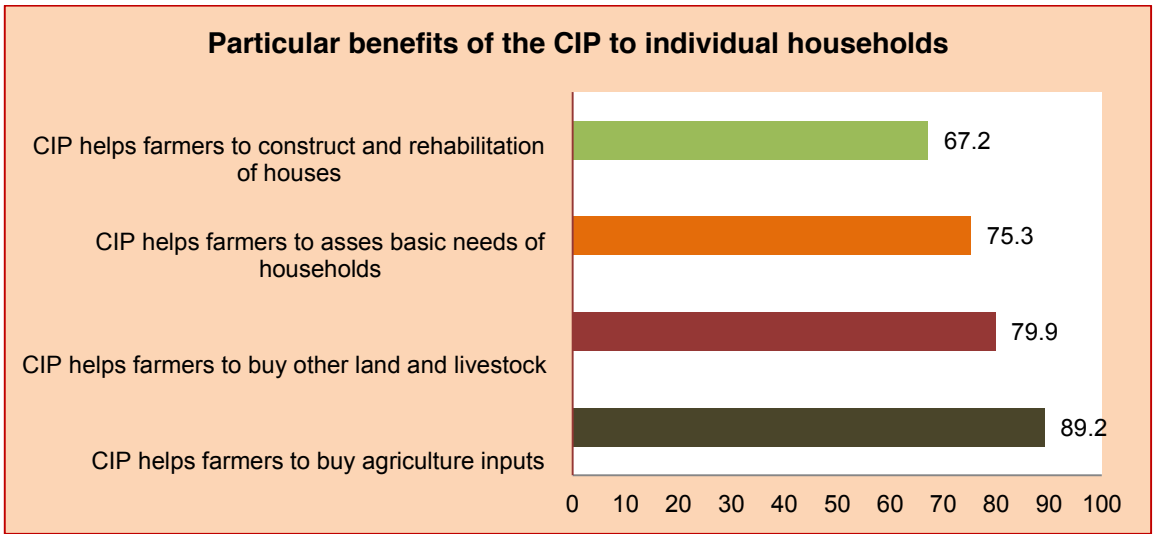


Figure 33: Particular benefits from CIP to farmers' households

Source: Primary data, CIP satisfaction Survey; 2017

3.18 Conclusion and recommendations

The overall objective of the study was to gain farmers perspectives on their experiences and perceptions regarding the Crop Intensification Programme. Based on the survey, the following conclusions can be drawn.

1***. Farmers' perceptions regarding Crop Intensification Programme in as far as access to extension services; access to agricultural inputs and the land use consolidation are concerned.***

i. Around65% of surveyed farmers were satisfied with services provided through the four components of CIP. The highest level of satisfaction is for proximity and extension services and the lowest level for Land Use Consolidation. Majority of the farmers appreciated the government program of land use consolidation because their small plots were consolidated and the farmers were organised into cooperatives which helped them to improve their production.

ii. The usage of improved seeds and fertilizers is at a high level (over 80%). The survey findings revealed that 86.8% of interviewed farmers' land is under LUC. The farmers' perception on CIP varies from sector to sector within the districts. In some sectors, the farmers appreciated CIP benefits and others have misconceptions of the CIP. Some farmers believe that the land use consolidation programme can enable the government to seize their land.

iii. The most frequently stated benefits of the CIP were that the program enables farmers to purchase affordable inputs (89.2%), and to attain household food security and to buy basic needs (75.3%), construct and rehabilitate houses (67.2%) and buy other land and

livestock (79.9%). There are questions as to whether these benefits are sustainable if government removes or reduces its subsidies. Findings are pointing the need for education to give farmers the knowledge to sustain improved practices.

2. The level of understanding and application of different CIP components by beneficiaries and other actors

i. The study established that CIP is not well understood by the farmers. This relates to the lack of awareness of the program by farmers, a fixed mind-set, beliefs and resistance of farmers (particularly in relation to land use consolidation). Some farmers believe that inorganic fertilizers contaminate the land and reduce the fertility of land in subsequent seasons. *(Kugundura Ubutaka*).

ii. While farmers have benefitted improved access to inputs and extension services, many are not aware that these services are provided under the CIP program. Rural communities are not sufficiently sensitized on the concept of CIP.

iv. Some of the farmers do not appreciate land use consolidation because they perceive it, to be an instrument through which the government can grab their land .They also reported that growing one crop on a piece of land (mono-cropping) could increase risks of crop failure and hunger. Farmers indicated that when they used to grow many crops in one plot, one crop could fail while the others could thrive. Some farmers are for the opinion that CIP is beneficial to the government and not to the farmers. The findings showed that in some districts, most farmers are consolidating lands, which belong to the government as opposed to their own land (marshland land of Gahanga stadium). Farmers also reported inequality in leasing government land (marshland) whereby rich farmers get larger acreage than poor farmers.

v. The farmers identified some constraints regarding access to inputs (improved seeds, fertilizers) which are supplied by certified agro-dealers including delay in delivery, high prices, delivery of seeds that are not adapted to the local climatic conditions and poor knowledge of the importance of improved seeds. The findings show that the process starts from farmers and agronomists who assess the need for improved inputs and compile lists of beneficiaries to be sent to agro-dealers and RAB. The return depends on the availability of both seeds and fertilizers. During distribution priority is given to big famers and big cooperatives. Small farmers claim that they are not favored. Advocacy should address these inequality issues.

3. The challenges faced by different actors

The survey identified the following as the key challenges in implementation of CIP, which influences farmers' perception of CIP and therefore need to be addressed so as to improve farmers' level of satisfaction with CIP.

i. Involvement of the farmers in planning of agriculture decisions is still negligible in local area (Sectors); Sector agronomists and certified agro-dealers take decisions and request small-scale farmers to implement without sufficient consultation.
ii. Not having insurance for agriculture crops in case of drought and flooding is a serious challenge to the farmers, which prevents them from making investments on their farms.
iii. Limited knowledge in agro-processing, reducing postharvest losses and marketing are key challenges to the farmers leading to postharvest losses.
iv. Insufficient market for maize, Irish potatoes and tomatoes produce. The feeder road infrastructure is still poor in some sectors (example in Ruramira, Kayonza), thus posing a problem to transport farm produce to market.
v. Some districts do not have community storage facilities (example in Nyaruguru) while other district have community storage, which are underutilised (example in Gicumbi, Rubavu).

4. The proposed avenues for improvement of access to agricultural inputs, proximity service delivery in agriculture and land use consolidation and to better respond to citizens needs and to achieve the CIP objectives in this area

This study proposes the following strategic recommendations to address the challenges identified in implementation of CIP.

i Farmers should be sensitized about the benefits of the CIP with clear information on the four pillars of CIP. Given the benefits of the CIP to the farmers as identified in the survey, the farmers should be informed on their roles in the CIP, as well as the role of all the other actors. This will ensure more take up of the CIP. This should be carried out through community dialogue, which should be held in every village within the country so as to reach all farmers

ii. Farmers should be consulted in the implementation of CIP and their proposals taken into consideration. For instance, the ideas of citizens should be consulted through local meetings before deciding on crops to be grown.

iii. To achieve strategic objectives of CIP specifically in the components of access to inputs, Ministry of Agriculture, development partners and other stakeholders involved in supporting agriculture activities should monitor and regularly follow-up in assessing the standards of improved seeds and fertilizers before their distribution to the farmers.

iv. The improved seeds and fertilizers should be distributed in time and should be certified that they are suitable for Rwandan conditions.

v. Soil surveying or soil inspection should be put in place before deciding the type of crops to be grown in a specific region.
vi. The supply of improved seeds and fertilizers should be subject to greater market competition by increasing the number of agro-dealers included in the subsidy scheme.

Other recommendations;

- To ensure the increase of agriculture productivity, priority should be given to using organic fertilizers (manure and compost) in combination with the inorganic fertilizers especially in acidic soils (RAB should conduct soil pH testing and advise on suitable fertilizer application).
- Given land scarcity agricultural intensification strategies should be followed rather than extending the cultivated area.
- Basing the small size of land per family there is need to create off-farm employment and use modern technology to increasing agricultural productivity.
- There is a need to provide feasibility studies on volume of production and capacity of farming activities before constructing storage facilities in the districts.
- Improved access to finance is needed for farmers and agro-businesses.

Further research

The study findings indicate that the farmers' satisfaction with CIP is generally high. There is a need for additional evidence to establish the economic impact of the CIP. Qualitative data shows that the CIP has impacted positively increasing production in the 20 sectors covered in the study. The next study should be extended to more than 20 sectors and provide information on measurable economic outcomes by household.

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