The Republic of Rwanda

NATIONAL INSTITUTE OF STATISTICS OF RWANDA

SEASONAL AGRICULTURAL SURVEY

2017

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April 2018

The Seasonal Agricultural Survey, 2017 (SAS2017) is produced by the National Institute of Statistics of Rwanda (NISR).

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ISBN: 978-99977-43-28-2

Recommended citation:

National Institute of Statistics of Rwanda (NISR), Seasonal Agricultural Survey, 2017; May 2018

FOREWORD

The National Institute of Statistics of Rwanda (NISR) has been conducting seasonal surveys since November 2012 for the estimation of the national agricultural crop area and production estimates. In 2017 the NISR upgraded the survey using an updated area sampling frame and enhanced questionnaires. The survey covered the three agricultural seasons. The USAS incorporated an expanded area frame and increased sample size to provide more precise estimates at the district level. The USAS allows information for monitoring progress on agriculture programs and policies in Rwanda, including the Second Economic Development and Poverty Reduction Strategy (EDPRS II) and Vision 2020.

The 2017 Upgraded Seasonal Agricultural Survey (USAS) covers three agricultural Seasons (A, B and C). Separate questionnaires were prepared to collect information from respondents grouped into two categories: Agricultural operators (or Small Scale Farmers and Large Scale Farmers). The enhanced version of the survey provides data on, farm production characteristics (crop area, yield and production), agricultural practices, and agricultural inputs at the district level for the first time. The 2017 U SAS was implemented by the National Institute of Statistics of Rwanda (NISR) in partnership with the Ministry of Agriculture and Animal Resources (MINAGRI), National Agriculture Export Board (NAEB), and the Rwanda Agricultural Board (RAB). Special recognition must be given to the delegation of the European Union to Rwanda for their continuous interest, steadfast support and additional funding that enabled the upgrading of the seasonal agricultural survey.

The 2017 crop growing season began under normal conditions but drought conditions developed midway through the year in the eastern part of the country resulting in lower crop production and reduction in livestock herds. There was also army worm infestation also occurred under stress conditions that further effected and lowered the maize production in affected areas. Results of the 2017 USAS indicated that in terms of area the main crops grown in 2017 Season A were banana followed by beans, cassava and maize. In Season B, the main crops grown were beans followed by Bananas, cassava and sorghum. Season C was quite different as the main crops were Irish potatoes followed by sweet potatoes, vegetables and beans.
This published report has likewise been enhanced to reflect the importance of the USAS information for use as a tool to assist addressing the key agricultural issues and information needs that will inform policy makers and other stakeholders and allow more effective identification of priority intervention needs.

We are grateful to the NISR staff and other partners who worked tirelessly to ensure the survey was successfully implemented.
We hope this report will be of value to users.

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Director General, NISR

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ACRONYMS

CAPI	:Computer Assisted Personnel Interviewing
CCE	:Crop Cutting Experiment
EDPRS	:Economic Development And Poverty Reduction Strategy
GDP	:Gross Domestic Product
GIS	:Geographic Information System
GPS	:Global Positioning System
Ha	:Hectare
Kg	:Kilogram
Kg/Ha	:Kilogram per Hectare
LSF	:Large Scale Farmers
MFS	:Multiple Frame Survey
MINAGRI	:Ministry of Agriculture and Animal Resources
MINECOFIN	:Ministry of Finance and Economic Planning
MT	:Metric Ton
NAEB	:National Agricultural Export Development Board
NGO	:Non-governmental organization
NISR	:National Institute of Statistics of Rwanda
PPS	:Probability Proportional to Size
PSU	:Primary Sampling Units
RNRA	:Rwanda Natural Resources Authority
SAS	:Seasonal Agricultural Survey
Sq.m.	:Square meter
SSF	:Small Scale farmer
SSU	:Secondary Sampling Units
RAB	:Rwanda Agriculture Board
REMA	:Rwanda Environmental Management Authority
RNRA	:Rwanda Natural Resources Authority
SD	:Standard deviations
SE	:Standard error
USAS	:Upgraded Seasonal Agricultural Survey
USDA	:United States Department of Agriculture

EXECUTIVE SUMMARY

The National Institute of Statistics of Rwanda (NISR) conducted the 2017 annual agricultural survey in enhanced form, as the Upgraded Seasonal Agricultural Surveys (USAS) covering all three agricultural seasons of Rwanda:

- Season A began in September 2016 and ended in February 2017 of the current reporting year
- Season B began in March 2017 and ended in June of this same year; and
- Season C began in July 2017 and ended in September of this same year.

Sampling methodology and sample size

The traditional SAS sample is composed of two categories of respondents: small scale farmers (SSF) in the segments and large-scale farmers (LSF). For the 2017 USAS, the NISR spent considerable resources to construct a new area sampling frame that provides more complete coverage of the farming population. The 2017 survey continued to use as the sampling method a dual frame sampling design approach which utilizes sampling the traditional area sampling frame with an increased number of sample segments and supplemented with a total enumeration from a list of large-scale farmers.

For construction of the enhanced 2017 area sampling frame NISR used imagery with very high resolution of 25 cm obtained from the Rwanda Land Management and Use Authority, along with satellite imagery (world view) from Digital Globe (2010-2016). A combination of two helped to divide the total land of the country into ten overall land use strata. For more statistically efficient sampling the USAS utilized three land use strata: Intensively cultivated agricultural land, cultivated agricultural land, and rangeland. A fourth land use stratum was created for enhanced coverage of farm household located in villages and rural urban areas with associated agricultural land to provide for more accurate estimation of livestock.

A total number of 960 segments were selected using systematic sampling across the four land use strata with the sample allocation made by district to ensure a representative sample for district estimation. An additional enhancement to USAS survey methodology is the incorporation of an innovative point-sampling approach for estimation of crop area by random selection across the country within the 960 segments with the distribution of 51,390 grid point samples (each of which fall within and identify a farm plot for enumeration). The initial point-samples were screened and mapped by NISR field enumerator teams during the survey first phase and from the initial sample, a sub-sample was selected of those point-samples falling within agricultural plots (or fields) during a second phase of the survey data collection which included farmer interviews. The supplemental list sample consisted of a total of 201 large-scale farmers enumerated in 2017.

Fieldwork

For the 2017 USAS the NISR employed around 180 field workers in the form of two-person teams to conduct the fieldwork. The fieldwork consisted of a Phase 1 for segment screening and a Phase 2 for plot data collection. Training was provided to all fieldwork personnel to on the new data collection methodologies associated with the use of GPS for point-sampling and computer tablet questionnaires used for plot data collection and farmer interviews. The tablet computer assisted data collection and interview allowed for very fast and efficient uploading and transfer of the enumerated data from the field to NISR headquarters for processing. The tablet software instruments (electronic version of the paper questionnaires) allowed for instantaneous checking of the respondent data and automatically directed the enumerator questioning to reduce non-sampling error within the data collection. The computer assisted personal interview (CAPI) data collection methodology was used based on three different software applications: “Collector” which is GIS based and is used to help identify and navigate the enumerator team to the exact GPS point-sample location and for mapping the plot boundary for GIS area

determination, "survey 123" which is an electronic instrument or questionnaire for farmer interview data collection, and "Cs Entry" which is a CS Pro data entry application used for computer assisted personal interviewing (CAPI) on Android tablets and suite of data processing tools.
During Phase 1 segment data collection the field enumerator teams will screen each of the segment point samples and map the plot land boundary areas using the "collector" software application and classifying every plot which has a sample grid point falling inside as either agricultural (cultivated land, pastures, and fallow land) or non- agricultural land (water, forests, roads, rocky and bare soils and buildings) using "Cs Entry" software. During Phase 2 segment data collection the field enumerator teams will use the "collector" software to locate the point-sample within the segment and uses "Cs Entry" software to collect data at plot level such data as agricultural crop inputs, agricultural practices and crop production.
The fieldwork was conducted as follows:

- In Season A, the fieldwork commenced on 8th December 2016 and concluded on 15th February 2017
- In Season B, the fieldwork started on 24th April 2017 and ended on 2nd July 2017
- In Season C, the fieldwork started on 21st September and ended on 30th October 2017.

Data analysis

The main focuses of data analysis are the farm cropping characteristics (area, yield and production), the agricultural inputs and farmer agricultural practices.

Results from the 2017 USAS

Crop area

The results of the 2017 USAS indicate that the four Season A main cultivated crops are bananas at 237,849 ha is the largest planted crop but this estimate is a 26% decrease in cultivated area compared with the 2016 crop estimates, the second largest crop is Beans at 268,095 ha but this is a 2% decrease in cultivated area from 2016A, Cassava at 219,845 ha is the third largest crop and a 24% increase in cultivated area from 2016A, while Maize are the fourth largest cultivated crop at 210,609 ha which is a 23% increase from 2016 estimates. The district with the largest overall Season A crop cultivated area was Nyagatare at 98,375 ha, the second largest was Kirehe at 73,691 ha, and the third largest was Gatsibo at 70,296 ha.

For 2017 Season B the four largest main cultivated crops are beans at 276,435 ha are the largest planted crops and this estimate is a 18% increase from the 2016 estimates, Bananas at 226,472 ha are the second largest crops and it is a 27% decrease from 2016 B estimates, cassava at 164,529 ha is the third largest but a 41% decrease in area from 2016 B estimates, and the sorghum is the fourth largest cultivated crop at 112,694 ha which is a 13% decrease from 2016. The district with the largest overall Season B crop cultivated area was Nyagatare at 78,232 ha, the second largest was Kirehe at 71,047 ha, and the third largest was Gatsibo at 67,927 ha.

Season C is a small crop season in Rwanda focused on cooler season crops. The crop with the largest cultivated area is Irish potatoes estimated at 8,526 ha which is a 1% increase from the 2016 crop year estimate, sweet potatoes at 7,609 ha is the second largest cultivated area and this is a 4% decrease from 2016, and vegetables are the third largest crop at 3,525 ha which is 45% decrease in cultivated area from 2016 estimates. The district with the largest overall Season C crop cultivated area was Musanze at 4,044 ha, the second largest was Gisagara at 2,952 ha, and the third largest was Nyabihu at 2,927 ha.

Production

Results of the 2017 USAS indicate that in terms of production grown in Season A, Paddy rice was 55,215 MT, a 12% increase from the 2016 production estimates, sweet potatoes were 574,500 MT, a 14% increase from the 2016 production estimate and cassava was 451,362 MT, a 11% increase from 2016 estimates and cooking banana was 415,868 MT which is a 10% increase from the 2016 Season A estimates while maize production of 324,368 MT was increased 8% from the 2016 estimates of Season A production.

During 2017 Season B in terms of production grown, cassava was 590,481 MT, a 13% increase from the 2016 production estimates, sweet potatoes were 483,898 MT, a 23% increase from 2016 estimates, and Irish potatoes were 398,934 MT, a 29% increase from 2016 estimates.
Season C in Rwanda is quite different as to the crops grown and in 2017 Season C, many crops undergo a decrease of production where vegetables decreased by 60%, legumes and pulses by 21%, and tubers and roots by 2 % but it should be noted that bush bean and sweet potato individually increased respectively by 6% and 3 % by comparing with 2016 season C production estimates.

Agricultural inputs

Use of Seeds

During the 2017 crop year the USAS found that the type of seed used for Season A crop plantings by small scale farmers (SSF) were overall 94% traditional seeds versus 6% improved variety seeds. However, the data indicates that in the marshland stratum those SSF farmers used 20% improved seed. The SSF percentage contrasts greatly with the large scale farmers (LSF) who utilized improved seed for 52% of their planted area. For SSF on a district basis there were three districts which used improved seed on over 10% of their planted area. The largest percentage was in Rutsiro at 15%, followed by Nyaruguru at 12% and Gakenke at 11%.
The SSF during Season A overall primarily relies on traditional seeds for their planting but this does vary considerably where paddy rice is sowed with 57% use of improved seed, wheat is 30% and 24% of maize are sowed with improved seed. Vegetables at 12% and other minor crops at 26% are sowed with improved varieties. The SSF for Season A relies primarily on three main sources for their improved seed: government agencies (referred to as RAB/SECTOR) contribute 42%, suppliers/NGOs provide 19%, and dealer/shops supply 30% of the improved seed. A minor amount, 8.5%, comes from other sources. Districts can vary substantially as to the availability and access to improved seed by sources. The RAB/Sector provides 94% of the improved seed in Musanze and 91% in Burera but a low of 9% in Nyabihu and 5% in Muhanga. Suppliers/NGOs contributed a high of 54% of the improved seed for Karongi farmers, 49% in Rutsiro and 43% in Rusizi. Data from both Rulindo and Nyabihu indicate that farmers do not obtain their improved seed for this source category. The survey data indicates that a number of districts utilize the dealer/shops to obtain a majority their improved seed in Nyabihu at 90% and to a lesser degree in Gicumbi at 67%, Rulindo 65.5%, Muhanga 60%, and three additional districts over 50%.
The SSF for Season A will vary their purchases of improved seed considerably for the different crops they plant. The survey data indicates that RAB/SECTOR provides 100% of sorghum planted and 85% of wheat, 80% of sweet potato and 50% of both soybeans and cassava planted. Suppliers/NGOs provide 63% of the Irish potato “eyes” for planting and 61.5% of cassava seedlings. Dealers/shops provide 84% of the vegetable seeds and supply 46% of paddy rice improved seed while other sources are the primary source for fruit tree seedlings at 50%, 36.5% of paddy rice improved seed, and 30% of dessert and 28% of beer banana seedlings.

The Season A source of improved seed for the LSF for most crops comes from the RAB/SECTOR with the survey data indicating 100% of cassava, 78% of soybeans, 75% of both climbing beans and Irish potatoes,

64% of dessert banana seedlings, and 56% of maize improved seed. The LSF obtain a majority of their improved paddy rice seed (69%) from suppliers/NGOs and nearly all (85%) of their vegetable seed from dealers/shops.

Use of Fertilizers

The survey data indicates for Season A that half of the SSFs utilize organic fertilizer. This percentage is representative of all cropland stratum SSF usage but drops to only 26% of those in rangeland. LSF are remarkably close in organic fertilizer usage at 44%. By district the SSF usage of organic fertilizer varies widely with the highest level of usage in Gakenke at 83%, Nyaruguru at 79%, and Nyamagabe at 72.5% and several others around 70%. The lowest organic usage by SSF is in Nyagatare at 77%, Rubavu at 76% and Kayonza at 74%.

The Season A usage of inorganic fertilizers by SSF is considerably less 19%, however the SSF usage by marshland stratum farmers rises to 49% (presumably with its application on paddy rice). The use of inorganic fertilizers by LSF is virtually the same that of organic fertilizers. Inorganic fertilizer usage varies by districts to a lesser degree because of its overall lower usage. Its highest usage is reported in Rusizi at 43.5%, Nyaruguru at 43%, and in Gakenke at 42%. Its lowest usage is in both Kamonyi and Nyarugenge at 3%, Muhango at 4% and Ruhango at 4.5%.

In Season A the overall usage of inorganic fertilizer by types is almost equally divided by SSF at 27% using NPK 17-17-17 -17 , 33% using Urea, and 35% using DAP. The SSF use of NPK 17-17-17 is nearly the same across all land use stratum but urea usage is 41% in marshland strata versus 29% on hillside strata and 32% on rangelands. DAP is more often used on hillsides at 42% and rangeland at 40% while marshland usage is lowest at 23%. LSF usage is similarly divided between NPK 17-17-17 at 29.5%, urea at 38% and DAP at 24%.

The Season A usage of NPK 17-17-17 is highest in the districts of Rubavu at 71%, and both Nyabihu and Bugesera at 59.5% with several others at a little over 50%. The usage of urea is fairly uniform across districts with the highest usage in Nyarugenge at 57%. DAP usage is more variable across districts with its highest usage in Muhanga and Ngororero with both at 68%.

Use of Pesticides

The survey data indicates for Season A that only 10% of the SSFs used pesticides overall. This percentage is representative of all cropland hillside stratum SSF usage at 8% but drops to 3% in rangeland but has a high usage reported in the crop marshland stratum. LSF are more inclined to pesticide usage at 38%. By district the SSF usage of pesticides fluctuates somewhat with its lower usage with the highest level of usage in Rubavu at 34% and only three next highest around 20%.

The SSF usage during Season A of pesticide by type finds that 42% of crop plots reporting application of pesticides used Cypermethrin was the highest application rate, followed by Dithane at 22% and other types accounted for 18% of the usage application. Dithane is equally used in crop hillside and rangeland stratum at 29% and 31% respectively but only at 8% from crop marshland strata. Cypermethrin has its highest usage in the crop marshland strata at 49%, slightly lower in crop hillside strata at 39.5% and its lowest usage is in rangeland strata at 27%. This differed for the LSF with 31% reporting the use of Cypermethrin and 45% other types of pesticides. District pesticide usage reported for Dithane varies widely but is generally below 50% across all districts with only Musanze at 55% and Gicumbi at 54% above that level of application. Cypermethrin usage reported across districts is higher because of its wider usage in general with twelve districts reports levels above 60% but the highest is Ngororero at 78%. Other pesticide usage also varies widely with twelve districts reporting usage at zero or less than 10% with the highest reported usage in Bugesera at 69%, Nyarugenge at 64%, and Kicukiro at 61%.

Agricultural practices

Irrigation practices

In Rwanda during Season A the SSF only irrigates overall 4% of all cultivated plots, however, this is heavily influenced by virtually no usage of irrigation on the crop hillside and rangeland stratum cropland while the marshland strata farmers practice irrigation on 26% of their cultivated plots. The LSF practice nearly the same amount of irrigation as the marshland strata SSF's with 28% of their cultivated plots reported to have been irrigation. The highest occurrence of irrigation usage during Season A was in districts Huye at 19% and Rusizi at 18% of cultivated plots.
During Season A the SSF overall used surface irrigation on three-quarters of their irrigated cropland versus 90% of the LSF irrigated cropland. The LSF use sprinkler irrigation on 8% of their irrigated cropland versus 5% of the SSF in the hillside strata. The remaining portion of SSF irrigation utilizes traditional methods on 57% of the hillside, 13% of the marshland, and 100% of the rangeland stratum while LSF have reported use of the traditional methods on only 1% of their irrigated cropland. Where irrigation is practiced at the district level a majority of the cropland is irrigated using surface irrigation methods. The main exception is sprinkler irrigation usage of 100% in Rutsiro, 29% in Gakenke, 25% in Rulindo, and 14% in Gasabo, with 22 districts reporting zero sprinkler usage and the remaining four districts reporting minor amounts of usage. The traditional method of irrigation is predominately used in six districts with over half or more of their cropland irrigation using this method with the highest being 100% usage in seven districts and 93% in Nyanza, It should be noted that these percentages on techniques used for irrigation are calculated out of those who reported to irrigate their plots.

During Season A the small amount of irrigation practiced by SSF is applied using surface irrigation primary on paddy rice at 100% and at lesser rates of 50% on fruit and other crops, while drip irrigation is only 4% of the irrigation type reported used to irrigate sweet potatoes, with sprinklers used to for 15% of the maize, 4% of sweet potato, 12.5% of fruit irrigation, and the traditional is the predominate type of irrigation used on crops except paddy rice at 0%, , fruit at 38%, and other crops at 50%. The LSF primarily use surface irrigation as their preferred method for maize at 71%, fruit at 83%, vegetables at 96% and cassava, cooking and beer banana at 100% for each. LSF also use drip irrigation on 14% of the other crops being irrigated, and sprinkler irrigation is utilized totally when wheat, bush beans, and cassava are reported being irrigated with maize on 21% and fruit 17% by this method of irrigation.

The source of water during Season A used for irrigation by the SSF is 43% stream fed followed closely by underground water at 41% as the two main sources of irrigation water. The LSF primarily use an underground water source for 42% of their irrigation, followed by lake water for 28% and WASAC at 23% as their main sources of crop irrigation. At the district level the primary sources of irrigation water considerately with rainfall the main source in Ruhango with lesser application in five other districts, rain-harvesting has its highest usage in Rusizi at 32% and Ruhango at 22% as the source of their irrigation water, WASAC is reported as a source in five districts with Kicukiro at 31% and Rulindo at 20% the highest percentage usage, underground water is the primary source in nine district and not reported used in ten districts, lake water is the total source in Burera and Bugesera districts, while stream water is the primary source in twelve districts. Recycled water is reported used in three districts to a lesser extent and other sources of water are reported being used in eight district with Nyarugenge reporting this as 57% of their source of irrigation water.

Anti-erosion activities

During the 2017 Season A the SSF reported to have practiced erosion control on two-thirds of their cropland which is only slightly less than the 69% of cropland that erosion control practices are utilized by the LSF. However, erosion control is practiced at a lesser extent by the SSF in the rangeland strata at only 23% of the cropland having reported a control applied. Twenty-one districts are estimated to have

erosion controls applied to 60% or more their cropland. Only Nyagatare and Kirehe at 48% report erosion controls used on less than half their cropland land. The methods of erosion control vary widely but cover plants/grasses are the major erosion control method practiced by SSF at 54% of the cropland reported utilizing a control method. The LSF are more diversified with implementation of water drainage and ditching each at 28% usage as their preferred method of erosion control followed by cover plants/grasses at 18%.

Looking across districts the methods used by SSF of erosion control vary widely based on which method is most applicable to local conditions. For example ditches are in common usage in all districts but one and only in Bugesera at 48% is it the preferred method of the district's cropland erosion control. The same can be said for the trees/wind breaks/shelterbelts method which is applied in all districts but one and only in Rubavu at 22% is it main erosion control measure. Bench terraces are being utilized to a lesser extent in Nyabihu at 16%, Nyamasheke at 11% and Gicumbi at 10.5% as protection for cropland where erosion control is practiced in each of these districts. Progressive terraces are utilized in all but one district but are not a preferred method with its usage the highest in Ngororero at 29%, Kamonyi at 26%, and Karongi at 24%. Cover plants/grasses are the predominate method of erosion control in 26 of the 30 districts with its lowest usage in Rubavu at 14% and Musanze at 26% as those district's form of erosion control. Water drainage is in use in all districts to some lesser degree but three but its highest usage is in Rusizi at 31% and Huye at 23%. Likewise mulching is used to a lesser extent in all districts but two and its highest usage is in Kayonza at 20%. Beds/ridges are used to some lesser degree in most districts but is the predominant form of erosion control in Musanze at 52%, in Rubavu at 44%, and in Burera at 42.5%. There are other forms of erosion control used in 17 of the 30 districts but mostly account for only a fraction of the total area cropland protected by erosion controls in those districts.

The 2017 USAS also accessed the degree erosion and Season A observations estimate that 91% of SSF cultivated land had minimal to low degree of "splash" erosion, 8.5% has a moderate degree, and 1% severe erosion. This compares to LSF cultivated land which was observed to have 86.5% of its cultivated land minimally to lowly eroded, 8.5% moderately eroded, and 5% severely eroded. The SSF land at the district level with the most severely eroded land is Nyabihu at 11% and Burera at 5%. The degree of SSF land across districts with moderate erosion varies considerably with the highest observed moderate erosion in Karongi at 35%, Rutsiro at 29%, and Ngororero at 24.5%.

Chapter 1: Introduction

During the recent decades, agriculture has had a lot of transformations. It contributed around 30% of the GDP and employed over 70% of the Rwandan population. Over the course of Economic Development And Poverty Reduction Strategy I (EDPRS I), agriculture contributed significantly to poverty reduction. In recognition of its potential in economic development, food security and poverty reduction, the government has set a very ambitious agricultural agenda aiming at an annual average growth of 8.5% over the course of EDPRS II (2012-2017). Therefore, to provide timely and reliable statistics for the agricultural sector, the NISR in collaboration with the MINAGRI, introduced a new program of agricultural surveys that uses a duel sampling frame approach, based on probability sampling and estimation methods combining an area frame and a list frame. Since the 2013 agricultural year the NISR has been conducting the Seasonal Agricultural Surveys (SAS) to regularly and accurately provide the needed statistics on the agricultural economy of Rwanda.

The National Institute of Statistics of Rwanda (NISR) has worked on an upgraded1 Seasonal Agriculture Survey since November 2016 in order to provide more comprehensive data on Rwandan agriculture and also to enable disaggregation of the survey data to the district level. To accommodate the need for the additional statistical inference at the district level the area sampling was redesigned with new stratification to provide more efficient estimation of both crops and livestock. To ensure more precise estimates at the district level the number of secondary sampling units or segments were increased from 540 up to 960 segments. Additional statistical sampling methodology enhancements were included in the survey design utilizing point-sampling for crop area estimation in order to minimize non-sampling error. Also the field data collection technology has been improved by replacement of paper based questionnaires data collection with state-of-the-art tablet computers which enable the use of Computer Assisted Personnel Interviewing (CAPI) methodology which is expected to improve the interview process and provide more accurate data and facilitate quick uploading of the reported data in the field to NISR headquarters for processing

1.1 Objectives of the Survey

The main objective of the Seasonal Agricultural Survey is to provide timely, accurate, reliable and comprehensive agricultural statistics that describe the structure of agriculture in Rwanda in terms of land use, crop production and livestock to monitor current agricultural and food supply conditions and to facilitate evidence based decision making for the development of the agricultural sector.

1.2 Time frame

Data collection for three agricultural seasons in Rwanda cover the approximate monthly periods as follows:

- Season A that starts in September and ends with February of the following year
- Season B that starts in March and ends with June of the same year; and
- Season C that starts in July and ends in September of the same year.

The SAS is divided into three seasons for data collection purposes. Field enumerator and their supervisors are in the field for each season utilizing specific enumeration procedures for each phase of the survey based on the survey sample design for crop area estimation, yield and production.
The following contents of this report will help explain details of the methodology used for the USAS and will provide extensive data on the Rwandan agricultural crops and livestock and key findings on farm characteristics, agricultural inputs and agricultural practices obtained from the 2017 USAS.

[1] From 2012 to 2016, a total number of 540 segments were spread throughout the country as coverage of the survey and results were at National level. The field work consisted of screening land are as on maps by classifying every plot inside each

Chapter 2: Methodology of the survey

For the design of the survey a multiple or duel sampling frame was used which requires means that the NISR combines more than one frame for summary of the data: an area frame based on digital satellite imagery (uploaded from Digital Globe) for enumeration of small scale farmers (SSF) and a List frame for enumeration of large scale farmers (LSF).

The survey design of the USAS utilizing the classic area sampling frame supplemented by a list of large farms which is an adaptation of the traditional area sampling frame design as developed by the Iowa State University statistical lab and in use by the United States Department of Agriculture's (USDA) National Agricultural Statistical Service (NASS). This area sampling frame design combines a probability sample of land use stratified area sampling units or segments which were selected from the newly constructed NISR A*rea Sampling Frame* and is supplemented with a list of *Large Scale Farmers (LSF)* to be totally enumerated during the USAS data collection period.

Construction of the new NISR area sampling frame began with land stratification where the total country land was delineated into 10 land use strata. The strata definitions are based on land cover and/or land use characteristics and agriculture presence or livestock activity and their intensity. With a focus on district estimation the NISR reduced the 10 down to 4 strata for the Agriculture Survey which are:

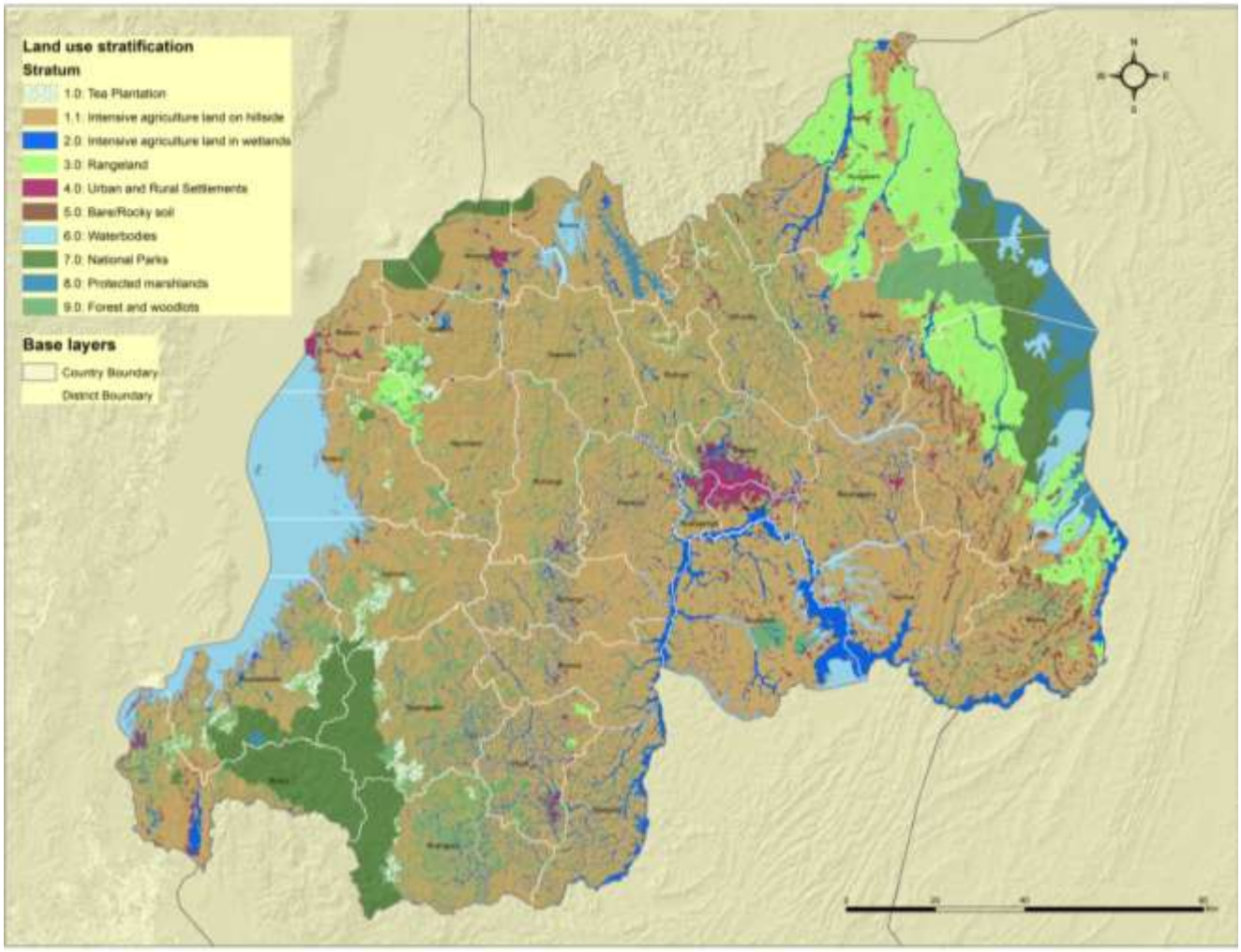
- 1.1 Intensive agriculture land on Hillsides
- 2.0 Intensive agriculture land in wetlands
- 3.0 Rangelands area
- 4.0 Urban area and rural settlements[2]

The remaining land use strata are essentially representative of all the non-agricultural land in Rwanda. These additional land use strata are:

- 1.0 Tea plantations
- 5.0. Non crop land
- 6.0. Water bodies
- 7.0 National Parks
- 8.0 Uncultivated "protected" marshlands
- 9.0 Forest and woodlands

[2] Stratum 4.0 is used in the Household and Livestock Survey Module

Figure 1. Land use stratification



The picture above shows how strata are distributed across the country.

The GIS team at NISR headquarters used satellite imagery of the whole country for stratification and identification of the ten land use strata with special attention being made to crop intensity and other land-use characteristics as follows:

Table 1. Stratified physical land for agriculture per district (Ha)

District Name	Tea plantation	Intensive cropland on hillsides	Intensive cropland in marshlands	Rangelands	Total
Nyarugenge	-	5,894.6	1,698.0	-	7,592.6
Gasabo	-	25,561.9	3,190.7	-	28,752.7
Kicukiro	-	7,597.3	2,686.2	-	10,283.5
Nyanza	-	53,698.6	6,302.5		60,001.1
Gisagara	-	48,939.5	11,095.9	-	60,035.4
Nyaruguru	3,531.7	43,598.2	3,674.0	-	50,803.9
Huye	-	39,249.1	6,358.0	1,051.5	46,658.6
Nyamagabe	6,217.8	50,410.8	3,402.8	-	60,031.4
Ruhango	-	52,253.8	4,985.6	-	57,239.4
Muhanga	-	49,946.6	1,955.5	-	51,902.1
Kamonyi	-	52,483.8	5,816.4	-	58,300.2
Karongi	6,682.8	55,904.7	799.4	-	63,386.8
Rutsiro	1,652.2	50,755.4	505.1	3,613.3	56,526.0
Rubavu	411.7	26,886.6	-	822.2	28,120.5
Nyabihu	1,780.3	37,199.4	801.9	2,691.3	42,473.0
Ngororero	1,472.3	51,198.6	914.3	3,910.9	57,496.1
Rusizi	953.5	38,535.1	3,069.1	-	42,557.7
Nyamasheke	7,549.0	44,064.1	2,371.1	-	53,984.2
Rulindo	1,528.5	41,718.2	1,861.0	-	45,107.7
Gakenke	-	56,044.5	1,489.5	-	57,534.0
Musanze	7.5	33,596.6	1,096.9	-	34,701.0
Burera	-	44,013.0	1,459.7	-	45,472.7
Gicumbi	2,475.5	61,872.1	1,674.2	-	66,021.8
Rwamagana	-	55,324.6	3,235.5	-	58,560.2
Nyagatare	-	62,330.9	8,108.5	91,762.0	162,201.3
Gatsibo	-	71,583.4	4,786.9	12,813.8	89,184.1
Kayonza	-	64,327.7	3,156.7	46,806.1	114,290.4
Kirehe	-	66,696.0	10,604.4	15,350.6	92,650.9
Ngoma	-	68,594.0	8,088.6	-	76,682.6
Bugesera	-	87,766.1	21,253.1	-	109,019.2
Total Agricultural land	34,263	1,448,046	126,441	178,822	1,787,571

2017 Seasonal Agricultural Survey

Table 2: Share (in percentage) of area occupied by strata within districts

District	Tea plantation	Intensive cropland on hillsides	Intensive cropland in marshlands	Rangeland	Total
Nyarugenge	-	77.6	22.4	-	100
Gasabo	-	88.9	11.1	-	100
Kicukiro	-	73.9	26.1	-	100
Nyanza	-	89.5	10.5	-	100
Gisagara	-	81.5	18.5	-	100
Nyaruguru	7.0	85.8	7.2	-	100
Huye	-	84.1	13.6	2.3	100
Nyamagabe	10.4	84.0	5.7	-	100
Ruhango	-	91.3	8.7	-	100
Muhanga	-	96.2	3.8	-	100
Kamonyi	-	90.0	10.0	-	100
Karongi	10.5	88.2	1.3	-	100
Rutsiro	2.9	89.8	0.9	6.4	100
Rubavu	1.5	95.6	-	2.9	100
Nyabihu	4.2	87.6	1.9	6.3	100
Ngororero	2.6	89.0	1.6	6.8	100
Rusizi	2.2	90.5	7.2	-	100
Nyamasheke	14.0	81.6	4.4	-	100
Rulindo	3.4	92.5	4.1	-	100
Gakenke	-	97.4	2.6	-	100
Musanze	-	96.8	3.2	-	100
Burera	-	96.8	3.2	-	100
Gicumbi	3.7	93.7	2.5	-	100
Rwamagana	-	94.5	5.5	-	100
Nyagatare	-	38.4	5.0	56.6	100
Gatsibo	-	80.3	5.4	14.4	100
Kayonza	-	56.3	2.8	41.0	100
Kirehe	-	72.0	11.4	16.6	100
Ngoma	-	89.5	10.5	-	100
Bugesera	-	80.5	19.5	-	100
Total	1.9	81.0	7.1	10.0	100

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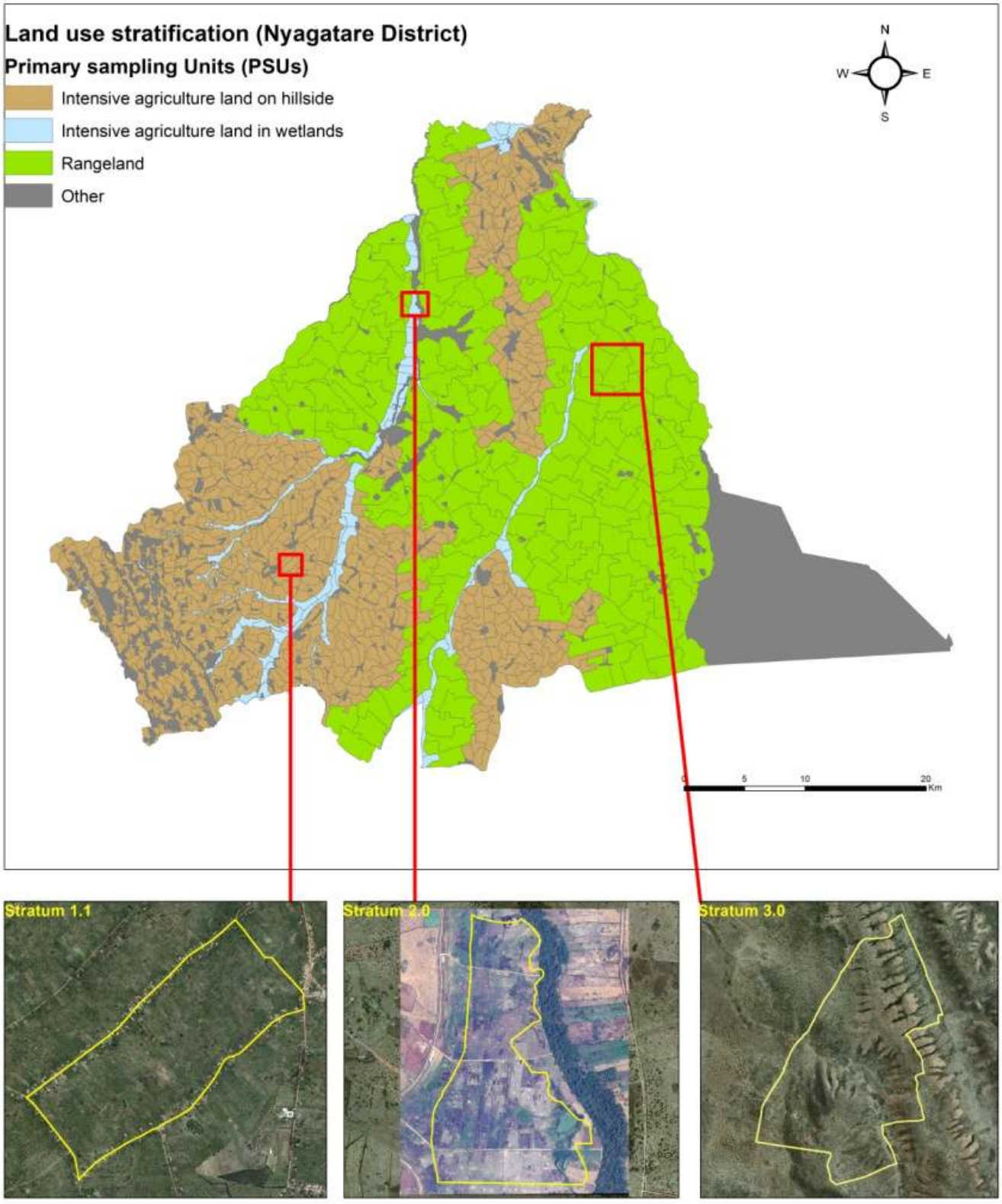
Countrywide the land classified as intensive cropland on hillsides dominate all other strata with 81% of the total potential arable land. Table 2 shows clearly the distribution share of strata area within each district and in every district intensive cropland on hillsides dominates except in Nyagatare district where rangelands dominate with 56.6% of the total potential arable land of the district.

The GIS team performed the stratification based on “eye” examination and interpretation of digital imagery. Those images are orthophotos imagery obtained in collaboration with the Rwanda Land Management and Use Authority and satellite imagery (world view) from Digital Globe (2010-2016). A new methodology utilizing Arcsoft was used to automatically divide each district land use stratum into a number of equal size primary sampling units (PSUs). A sample size allocation by district was made based on the PSU population size in each strata with emphasis made to ensure sufficient samples were allocated to each stratum to ensure equally precise estimates.

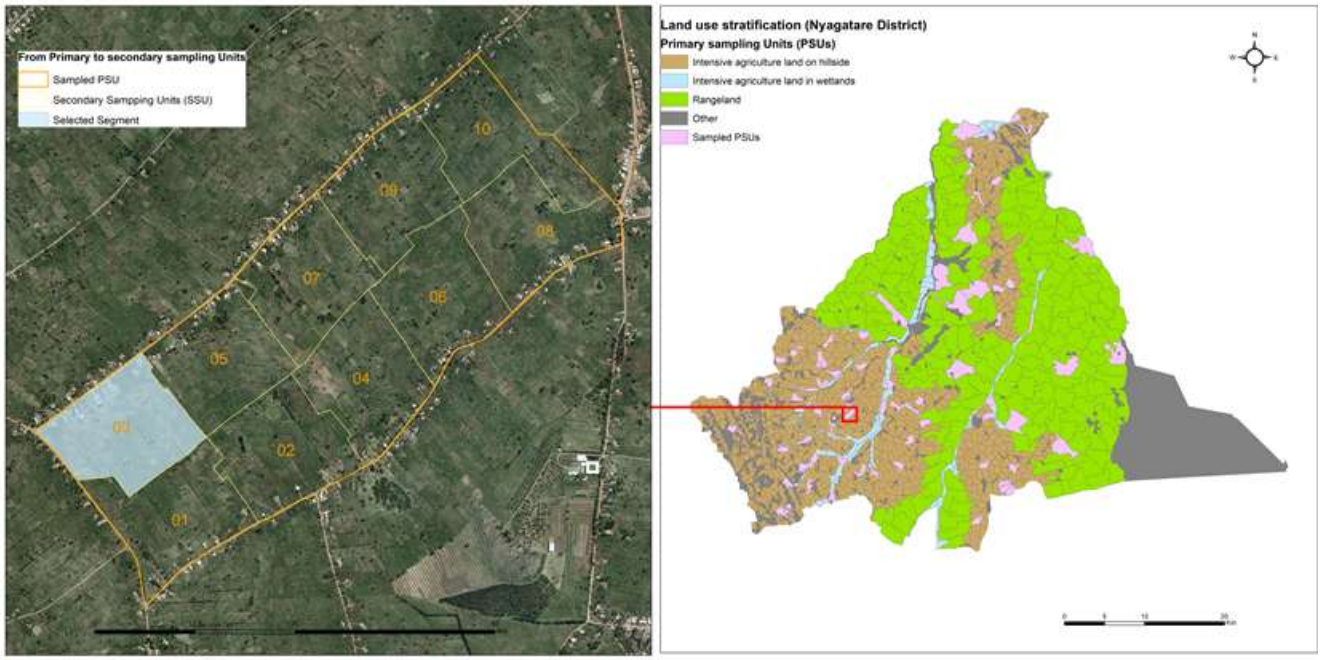
More precisely the selection process is a two-stage process which begins with the first stage at the district level with every agriculture stratum (1.1, 2.0 and 3.0) divided into PSUs of 100 Ha (in strata1.1 and 2.0) and 500 ha (in stratum 3.0). The strata are broken into PSUs following visible boundaries and each PSU is given a unique PSU identity number (PSUID).

Figure 2. Construction of PSUs (Example of Nyagatare District)



Based on the sample allocation to each district stratum the second-stage of the sample selection process uses a systematic sampling method to select the number of PSUs equal to each stratum's sample allocation. Then each of the selected PSUs is divided into secondary sampling units (SSUs) of approximately 10 ha for strata 1.1 and 2.0 and approximately 50 ha for stratum 3.0, and then randomly one SSU is selected from within each sampled PSU and each are called a sample segment.

Figure 3. Construction of SSUs (Example of Nyagatare District)

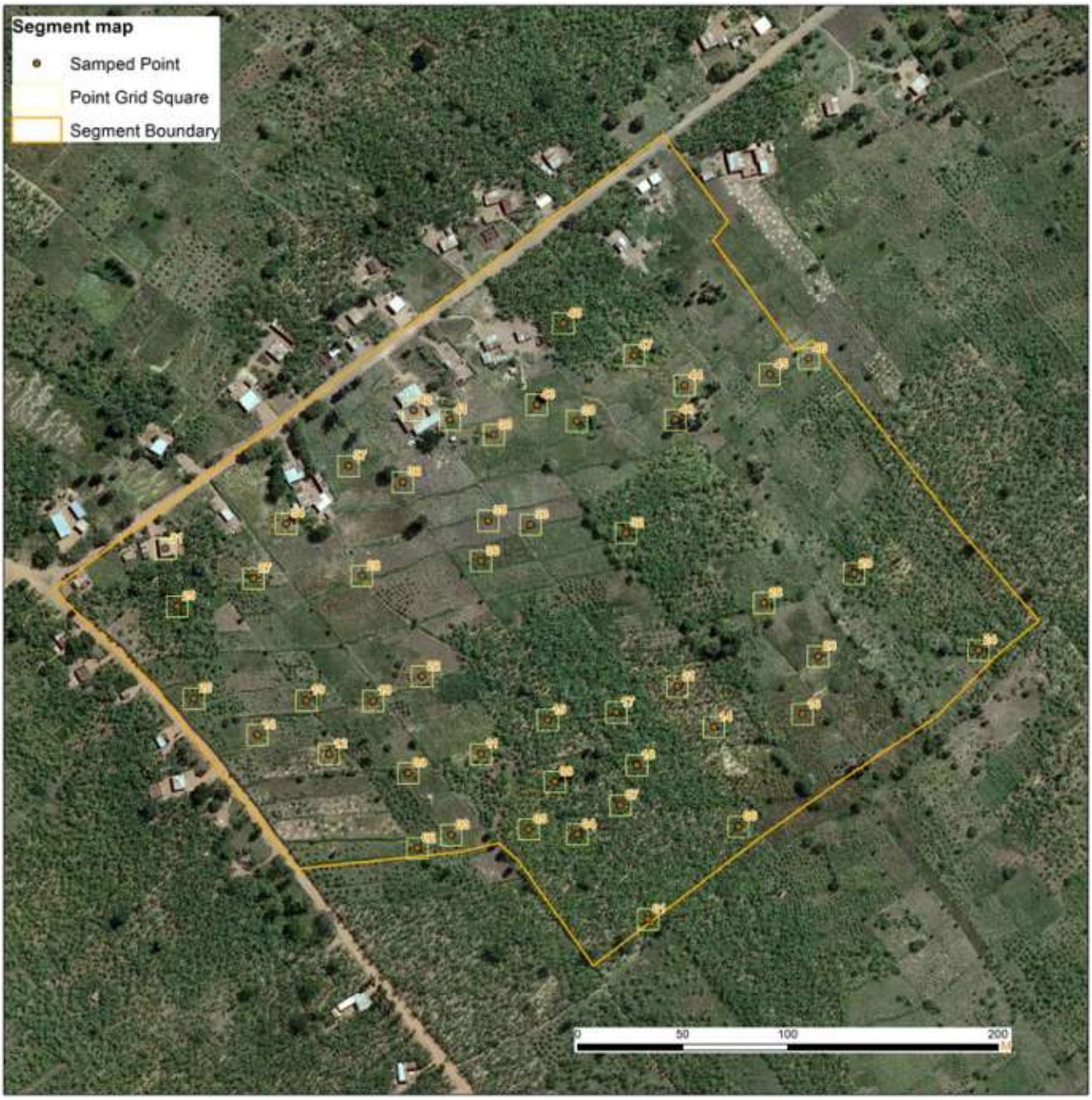


New for the USAS is the use of point-sampling to identify the plots within the segment for the field enumerator to use for data collection purposes. The concept of point-sampling used for the USAS is based on the average strata 1.1 and 2.0 sample segment which average 10 ha in size can be subdivided into 100,000 sq. meter equal size areas. These are then consolidated and grouped into areas equal to 1,000 grid squares of 100 square meters each and these 1,000 grid squares represent a complete sampling population for the segment. (A grid is a geographical located landmark in the segment having a distance of 10 meters square in association with adjacent grids).

A random sample of 5% of the total grid squares was selected for screening in each sample segment resulting in a nationwide point-sample total of 51,390 grid squares.

The actual point-sample is located in the center of every sampled grid square. The field enumerator team used their tablet GPS to locate each point-sample the sample segment. The field enumerator then identifies which farmer plot the point falls in, the enumerator team then measures the plot using the tablet software mapping application and records the plot land use and crops with a tablet data collection software.

Figure 4. Segment map with a distribution of 50 point-sample grid squares



2.1 Sampling Plan for the Seasonal Agricultural Survey 2017

Development of the sampling plan began with a consideration of three main factors: 1. Provide district level estimates, 2. Construct the new area sampling to ensure accurate estimation of livestock which required construction of a fourth stratum for household enumeration, and 3. Collect a more comprehensive set of indicator data for monitoring the agricultural community requiring data collected at the household level. In Rwanda the three seasons complicate the survey design and data collection. The Seasons A and B are primarily intended for estimation of crop area and production and the USAS is incorporating a point-sampling scheme to subsample within segments to reduce enumeration time and non-sampling errors. When the new area sampling was finished construction the GIS team was able to provide the population counts of the SSUs by stratum.

This information was used for allocation of the 960 total segments across districts. The segments within each stratum are uniform respect to size and agricultural intensity at the district level so a proportionate allocation of segments were made across districts along with a minimum allocation to ensure a

representative could be selected in every district and also to ensure a reliable precision of the estimates. Analysis of the segment population counts provided by the GIS team a means for allocation of 702 segments to strata 1, 174 segments to strata 2, and 84 segments to strata 3.

Likewise the 5% point-sampling within segments was deemed appropriate with pilot survey work that indicated that the roughly 50-points per segment provided a representative sample of field plots for accurate estimation of the various crop areas growing within the segment.

In order to more accurately estimate livestock and household indicator data it was necessary in Rwanda to create a fourth stratum that allowed a more comprehensive survey of agricultural households residing in villages and urban areas adjacent to agricultural pasture land. This was earlier referred to as strata 4.0 Urban area and rural settlements. Analysis of the segment population counts provided by the GIS team a means for allocation of 89 segments to strata 4.1, 511 segments to strata 4.2. This stratum would be enumerated in Season C along with all 950 segments allocated to stratum 1, 2, and 3.

2.1.1 Sample Data for Districts

The 2017 USAS survey design specifically focused on the need to provide accurate district level estimates which required a change in the stratification definitions from the previous SAS sampling frames and a change in the sample allocation to districts. The sample segments were previously selected for national estimates of crop and production and the samples were allocated across land use stratum for all the 30 districts within the five provinces of Rwanda during the SAS surveys up to 2016. The strata were reduced to three for the USAS and the sampling of segments took into consideration three strata; namely Stratum 1, Stratum 2 and Stratum 3.3 For these three strata, the segments were constructed as uniformly as possible taking into consideration the data on the total cultivated area of crops, which were obtained by the NISR GIS staff in the screening process (Phase 1) of the SAS survey.

2.1.2 Sample Size Determination

The 2017 USAS found it necessary to allocate a sample across stratum by district for the first time without any normal data on the agricultural content of the segment except the GIS determination of the crop area content per segment. Previous SAS sample size determination considers that there are L districts in the stratum concerned, for which we seek to determine the numbers of sample segments to allocate within districts, such that the stratified sample mean has variance no larger than a pre-specified value, V_S, for the given stratum:[4]

$$Var(\bar{y}_{st}) \leq V_S \quad \textbf{(1)}$$

where the stratified sample mean of hectares of cultivated land per segment is defined by:

$$\bar{y}_{st} = \sum_{i=1}^{L} W_i \bar{y}_i \quad \textbf{(2)}$$

where $W_i = (N_i / N)$ denotes the population weight for the *i*-th district, which is the ratio of the total number of population segments (N_i) in the *i*-th district (*i=1,2,...,L*, where *L* is the number of districts in given stratum) to the number of segments in the population (N), as specified in the area frame for the specific type of agriculture involved (classified as Strata 1, 2 and 3 by the NISR); and $\bar{y}_i$ is the sample mean of hectares of cultivated land in the n_i sample segments in the *i*-th district.

The variance of the stratified sample mean is given by:

[3] For Strata 1 and 2, the segments were constructed in the area frame to be approximately 10 hectares but, for Stratum 3, the segments were approximately 50 hectares.

[4] For Stratum 1, *L*=30, but in Stratum 3, *L*=4, as noted above.

$$Var(\bar{y}_{st}) = \sum_{i=1}^{L} W_i^2 (1 - f_i) \left\{ \frac{S_i^2}{n_i} \right\} \quad \textbf{(3)}$$

where $f_i = (n_i / N_i)$ is the sampling fraction of the number of sample segments for the *i*-th district; and S_i^2 is the mean square of hectares of cultivated land per segment in all segments of the *i*-th district, as defined by:

$$S_i^2 = \frac{1}{N_i - 1} \sum_{j=1}^{N_i} (Y_{ij} - \bar{Y}_i)^2 \quad \textbf{(4)}$$

where Y_{ij} denotes the number of hectares of cultivated land in the *j*-th population segment of the *i*-th district; and $\bar{Y}_i = N_i^{-1} \sum_{j=1}^{N_i} Y_{ij}$ is the population mean hectares of cultivated land per segment in the *i*-th district.

It can be shown that the total sample size, *n*, which satisfies the variance constraint in equation (1), will be such that:

$$n \geq \frac{(\sum_{i=1}^{L} W_i S_i)^2}{V_S + N^{-1} \sum_{i=1}^{L} W_i S_i^2} \quad \textbf{(5)}$$

and that the sample sizes in the individual districts in the stratum involved must satisfy:

$$n_i \geq W_i S_i \times \frac{\sum_{j=1}^{L} W_j S_j}{V_S + N^{-1} \sum_{j=1}^{L} W_j S_j^2}, \; i = 1, 2, \ldots, L, \quad \textbf{(6)}$$

[cf. Fuller (2009: 21); and Schaeffer, Mendenhall & Ott (1996: equations (5.6)–(5.10)].

This sample size determination methodology will now be more accurately calculated at the district level based on the results of the 2017 USAS which will allow for adjustments in the sample allocation to be made if appropriate.

2.1.3 Distribution of sampled Primary Sampling Units (PSUs)

For the 2017 USAS the sample size was increased for the entire country by selection of 960 PSUs which then made it possible to randomly select a corresponding 960 SSUs or segments for allocation across the three main agricultural strata and selection was made using systematic random sampling for segment data collection in Season A and B. For previous SAS the season Utilized a proportion of the total segments based on whether or not which segment were identified for field enumeration depending on where cultivation was taking place during Season C in the country. Tables 3 and 4 show the distribution of the selected PSUs in each district.

Table 3. Season A&B , Selected Segments per district

District	Number of segments	Total area in Ha	Share (%)
Nyarugenge	24	242.3	1.9
Gasabo	24	238.3	1.8
Kicukiro	24	239.6	1.8
Nyanza	29	289.2	2.2
Gisagara	37	370.4	2.9
Nyaruguru	24	238.4	1.8
Huye	28	360.7	2.8
Nyamagabe	24	242.7	1.9
Ruhango	24	241.1	1.9
Muhanga	24	239.4	1.8
Kamonyi	24	244.4	1.9
Karongi	24	240.0	1.8
Rutsiro	32	474.3	3.6
Rubavu	22	302.6	2.3
Nyabihu	28	439.0	3.4
Ngororero	28	445.7	3.4
Rusizi	26	260.9	2.0
Nyamasheke	24	242.0	1.9
Rulindo	24	241.0	1.9
Gakenke	24	238.1	1.8
Musanze	24	238.1	1.8
Burera	24	237.9	1.8
Gicumbi	24	240.5	1.9
Rwamagana	34	339.5	2.6
Nyagatare	72	1,210.0	9.3
Gatsibo	55	1,198.8	9.2
Kayonza	63	1,598.2	12.3
Kirehe	63	1,272.9	9.8
Ngoma	24	241.6	1.9
Bugesera	59	589.3	4.5
Total	960	12,997.2	100.0

2017 Seasonal Agricultural Survey - Season A&B

Table 4. Season C, Selected Segments per district

District	Number of segments	Total area in Ha	Share (%)
Nyarugenge	3	29.9	1.5
Gasabo	3	29.3	1.5
Kicukiro	1	9.8	0.5
Nyanza	9	87.8	4.5
Gisagara	12	121.1	6.2
Nyaruguru	4	40.3	2.1
Huye	5	49.0	2.5
Nyamagabe	4	39.9	2.1
Ruhango	4	40.2	2.1
Muhanga	4	39.1	2.0
Kamonyi	4	40.4	2.1
Karongi	4	40.1	2.1
Rutsiro	3	30.3	1.6
Rubavu	16	159.3	8.2
Nyabihu	17	172.0	8.9
Ngororero	4	40.2	2.1
Rusizi	4	40.1	2.1
Nyamasheke	3	30.3	1.6
Rulindo	3	30.1	1.6
Gakenke	4	40.0	2.1
Musanze	22	218.6	11.3
Burera	17	167.2	8.6
Gicumbi	4	39.8	2.1
Rwamagana	3	30.5	1.6
Nyagatare	9	88.6	4.6
Gatsibo	7	74.5	3.8
Kayonza	1	9.8	0.5
Kirehe	6	59.8	3.1
Bugesera	14	139.7	7.2
Total	194	1,937.9	100

2017 Seasonal Agricultural Survey - Season C

2.2 Estimation Methodology[5]

This section discusses the statistical formulation that NISR uses for each level of the USAS summarization. The prior SAS required complete measurement of all fields in the segment to obtain the total hectares in the segment for summarization purposes. The first section below has been added to correct previous formulation reported in the 2015 SAS publication. For the 2017 USAS the initial level of summation for relates to estimation of the area segment crop land based on enumerates using a point-sampling of field plots for crop area enumeration within the area sample segment.

2.2.1 Estimation formulas

i. Estimation of the Mean

The overall mean area of cultivated land per segment is $\bar{Y}$ and is written as follows:

$\bar{Y} = \sum_{k=1}^{K} W_k \bar{Y}_k$, where K denotes the number of strata;

The unbiased estimator of $\bar{Y}$ is $\bar{y}_{st} = \sum_{i=1}^{K} W_i \bar{y}_i$

ii. Estimation of the total cultivated area

For stratum *i,* the total of Y is estimated by $N_i \bar{y}_i$, the unbiased estimate of the total cultivated land Y of the universe is: $\hat{T}(Y) = \sum_{i=1}^{K} N_i \bar{y}_i$

The term "W" used for data weighting of the sample is called "extrapolation coefficient" or "expansion factor".

The estimators $\hat{T}(Y)$ and $\bar{y}_{st}$ are unbiased estimators of the total and the mean because they satisfy the following conditions: $E[\hat{T}(Y)] = T(Y)$ and $E[\bar{y}_{st}] = \bar{Y}$

iii. Variance of the Estimators

$$Var[\bar{y}_{st}] = \sum_{i=1}^{K} W_i^2 (1 - f_i) \frac{S_i^2}{n_i} \text{ and } Var[\hat{T}(Y)] = \sum_{i=1}^{K} N_i^2 (1 - f_i) \frac{S_i^2}{n_i}$$

Estimation of Variances of Estimators

$$\hat{Var}[\bar{y}_{st}] = \sum_{i=1}^{K} W_i^2 (1 - f_i) \frac{s_i^2}{n_i} \text{ and } \hat{Var}[\hat{T}(Y)] = \sum_{i=1}^{K} N_i^2 (1 - f_i) \frac{s_i^2}{n_i}$$

Estimates of variance estimators of the mean and the total cultivated area are used to calculate the standard deviations of the estimators, defined by the square roots of the variance estimators and, thus, to obtain confidence intervals for the appropriate parameters.

2.2.2 Segment-Level Estimation used with the USAS

i. Point-sampling plot crop estimation (segment level)

Segments are enumerated using point-sampling for seasonal crop area estimation and the survey design specifies a 5% sampling rate of points. The GIS team in headquarters will determine the area of each sample segment and the number of grid squares which are multiplied by 5% to determine the number of sampled grid squares. By using a random number generator, random point-sample grid-point locations

[5]This section corrects some of the errors in formulae in Section 3.1.6 of the *Seasonal Agricultural Survey 2015*.

will be generated in each digitized sample segment, each representing the area of the 10m-by-10m grid square or 100 square meters or one-hundredth hectare (.01 ha).

The GIS team for each jth sample segment in the ith stratum that will be point-sampled will need to have determined its point-sample- (or grid square) population size (N_{ij}) which is approximately equal to the segment size total hectares divided by .01 ha/point. The total point-samples in the jth segment of the ith stratum will approximately be equal to (N_{ij}) times 5%. The actual point-sample is the center-point of each randomly selected grid square in the sample segment.

For USAS crop area estimation the field enumerator team will visit each sampled point-sample location and screen the point and determine what crops are being cultivated within the plot that the point-sample is located. The segment level estimator of area for each crop requires the count or number of point-samples within the sample segment indicating the presence of each crop being cultivated in the plot at each point-sample GPS location coordinate, and the count for each kth crop in the n_{ij} segment point-samples in the ith stratum and jth segment can be represented as: c_{ijk}= $\sum_{k=1}^{n_{ij}}(count\ of\ point)$. The kth crop area estimate at the segment level becomes: X_{ijk}= $\left(\frac{N_{ij}}{n_{ij}}\right)(.01\text{ha per point} - \text{sample})(c_{ijk})$ = in the ith stratum and the jth sample.

Example: The following is a simplified example supposing the entire segment is planted to rice just for illustration purposes of the estimation process at segment-level. Suppose we have a 10-hectare segment and the GIS team determines the sample segment has 1000 grid squares or point-samples which is equivalent to a population size N_{ij}= 1000 that are 10m-by-10m or 100sq. m. each or .01 ha each. A 5% sample of 1000 = (1000 times .05) = 50 point-samples (n_{ij}). The area estimator X_{ijk} becomes = $\left(\frac{1000}{50}\right)(.01\text{ ha per point} - \text{sample})(c_{ijk})$. If all point-samples fall in rice plots, then $X_{ij(k=rice)}$ becomes = $\left(\frac{1000}{50}\right)(.01\text{ha per point} - \text{sample})(50\ )$ = 10 hectares of rice.

iv. Stratum- Level Estimation

The USAS sample sizes at the stratum level are relatively small and uses a systematic sample to ensure uniform distribution of the sample and provide a representative sample at the district level. The sampling in each stratum used a replicated design of two segments per replicate. A replicated sample is a useful statistical sampling method to allow making adjustments to the sample allocation. Replication will allow for an adjustment in stratum sample sizes for future SAS.

The selection of additional replicates was accomplished to allow rotation of a portion of the replicates in each stratum each survey year to reduce respondent burden. A minimum of two segments per replicate are required and a minimum of two replicates per stratum are necessary for variance calculation. The replicated design also simplifies the calculation of crop area totals and their variance estimation as follows:

Stratum-level estimator of the population mean μ for each crop area estimate using n_s = number of replicated systematic samples in the stratum, $\hat{\mu}$ = $\sum_{i=1}^{n_s}\frac{\bar{y}_i}{n_s}$, where $\bar{y}_i$ is the ith replicate mean of the two segments per replicate for each crop area estimate, or variable (*X)* in the stratum. Thus, each crop stratum mean estimate is simply an average of the replicate averages.	Stratum-level estimator of the population total τ crop area estimate using n_s = number of replicated systematic samples in the stratum, $\hat{\tau}$ = N$\hat{\mu}$ = N$\sum_{i=1}^{n_s}\frac{\bar{y}_i}{n_s}$, where $\bar{y}_i$ is the ith replicate mean of the two segments per replicate for each crop area estimate, or variable (*X)* in the stratum, and *N* = total number of segments in the stratum. Thus, for Stratums I thru IV each crop stratum total area estimate is simply the stratum mean crop area estimate per segment times the number of segments (N) in the stratum.

Stratum-level variance estimator of $\hat{\mu}$ for each crop area estimate using n_s = number of replicated systematic samples in the stratum, $\hat{V}(\hat{\mu}) = \left(\frac{N-n}{N}\right)\left(\frac{\sum_{i=1}^{n_s}(\bar{y}_i-\hat{\mu})^2}{n_s(n_s-1)}\right)$, where $\bar{y}_i$ is the ith replicate mean of the two segments per replicate for each crop area estimate, or crop area variable (*X)* in the stratum, and *N* = total number of segments in the stratum, and *n* = number of sample segments in the stratum.	Stratum-level variance estimator of $\hat{\tau}$ for each crop area estimate using n_s = number of replicated systematic samples in the stratum, $\hat{V}(\hat{\tau}) = N^2\hat{V}(\hat{\mu}) = N^2\left(\frac{N-n}{N}\right)\left(\frac{\sum_{i=1}^{n_s}(\bar{y}_i-\hat{\mu})^2}{n_s(n_s-1)}\right)$, where $\bar{y}_i$ is the ith replicate mean of the two segments per replicate for each crop area estimate, or crop area variable (*X)* in the stratum, and *N* = total number of segments in the stratum, and *n* = number of sample segments in the stratum.

v. District-Level Estimation

The district level estimates are simply the summation of all stratum level totals for each crop area ($\hat{\tau}$) and their variance [$\hat{V}(\hat{\tau})$] estimates. For clarification purposes the district level crop total estimate is simply the addition of all three-stratum crop total estimates. There is no district level expansion involved because the district sampling is conducted within each stratum and the crop data is expanded at the stratum level for a district estimate, and thus, the district total is simply the summation of all stratum totals within each district.

This is the primary level of estimation used for publication of questionnaire data including most indicators. It is also the level at which any ratio estimates will be made for publication such as crop yield which is a derived value from the division of crop district total production by the total area for example. It should be noted that specifically for crop yield based on two different surveys that the ratio estimator variance calculation in inappropriate.

vi. National-Level Estimation

The national level estimates are simply the summation of all district level totals for each crop area ($\hat{\tau}$) and their variance [$\hat{V}(\hat{\tau})$] estimates. This is also a primary level of estimation used for publication of questionnaire data including indicators.

Also at the national level the ratio estimates will be made for publication such as crop yield which is a derived value from the division of the summation of all district crop total production estimates by the total summation of area for example. It should be noted that specifically for crop yield based on two different surveys that the ratio estimator variance calculation in inappropriate.

2.3. Crop Cutting Experiment (CCE) Yield Methodology

2.3.1 Crops of interest

Many statistical organizations around the world incorporate crop cutting techniques into their survey design methodology for more accurate estimation of production. The NISR is particularly aware that individual farmers are error prone when it relates to determination of their production for specific crops in their field plots especially under mixed planting and cultivation practices. Most commonly crop cutting is applied to basic grain and small grain crops such as maize, rice, wheat, etc. In Rwanda this methodology has been tested and it was expected that crop cutting can reduce non-sampling errors associated with the respondent's subjective opinion of sample plot production and crops such as maize, rice, sorghum, wheat, Irish potato, sweet potato, soybean and cassava have been taken into consideration. The refers to crop cutting samples as the sample "units" and the strata level use of systematic sample selection provides a crop cutting sample for summarization that is referred to as "self-weighting" and the average yield estimate becomes simply the straight average of the sample unit yields for each crop at the stratum level and is multiplied times the area estimate to derive the estimate of production. District level area and production is simply derived by summation of each stratum area and production estimate to

obtain the district total estimate for each crop area and production. The yield estimate at the district level is a derived number calculated from the total production divided by the total area. Likewise, the national level area and production estimates are simply derived by summation of each district total area and production estimate to obtain the national total estimate for each crop area and production. The yield estimate at the national level is a derived number calculated from the total production divided by the total area.

2.3.2 Sample Size and Sample Selection for the USAS

After the crop survey first phase is accomplished by the screening activity of each point-sample with the plot questionnaire, point-sample area estimates are grouped by stratum for each crop requiring a CCE sample. The 2017 USAS allocated for sampling each crop only 30 plots by district. The sample was selected systematically but with probability proportional to size for CCE purposes. This sample size is generally adequate for accurate estimation of yield with a high degree of sampling error precision especially if supplemented with farmer reported subjective plot yield data from the plot questionnaire farmer interview for comparison purposes. Systematic sample selection ensures that the correct proportion of plots of each planting intensity (i.e. pure stands, mixed, and plantation pure/mixed plots) are used for the calculation of the average yield for the district.

The CCE objective yield estimate follows a specific sampling method that allows both a representative sample and ease of computation of the average yield across each stratum at the district. The basic USAS survey sample design allows selection of CCE sample plots within each of the three land use strata. There are also to consider that crops planted/growing conditions (a degree of planting intensity) are present and described as pure stands, mixed, and plantation pure/mixed plots across the three strata and the objective yield estimates between the different degrees of planting intensity will produce different levels of yield.

2.3.3 Crop Cutting Sample Unit Location and Construction

The crop cutting sample unit is located in the plot using Crop cutting experiment setting methodology developed by Man Singh[6]. The sampled plot was first located using GPS coordinates. For every sampled plot the measurement of length and breadth are taken from south west corner of the plot. Using the random number generation two pair numbers from length and breadth are randomly selected and by intersection of these numbers form the first corner of the sample unit and is the marking point of the starting corner for the first peg of the crop cut. This technique allows the enumerator to identify the reference point for locating the crop cut. It is important the data collected inside of the sample unit is reflective of the actual intended random location of the unit within the sample plot, otherwise the data will be biased.

Various crop cutting experiment sizes are utilized as follows: For maize, rice, sorghum, wheat, Irish potato the crop cutting sample size is 5 x 5 meters. For sweet potato the size is 2 x 2 meters while for the specified size is cassava 10 x 10 meters.

Since the crop cutting sample unit size was specified it was important that the crop cut falls completely within the boundaries of the sampled plot for crop cutting experiment setting. To ensure that, the GIS team identifies plots with a size that does not meet the minimum measurements to correspond with those of the crop cutting experiment unit size such that plots will generally not be smaller than the crop cut size.

Once the field enumerator has located the crop cutting unit starting corner and is oriented due-North, a short-colored garden stake will be placed in the ground to mark the starting corner. The enumerator will then proceed by measuring 5 meters due-East of the starting corner and place in the ground a second garden stake. The field enumerator will turn North (by turning 90^{o}) at the second stake and then measure

[6] Demonstration of crop cutting experiment by Man Singh, Indian Agricultural Statistics Research Institute, New Delhi-110012

again 5 meters in the northerly direction and place in the ground a third garden stake. The fourth garden stake will be placed in the ground at 5 meters perpendicularly (by turning 90 degrees and measuring five meters in a westerly direction) from the third stake this process should complete the formation of a perfectly square crop cutting unit. After that a well stretch string is tied around pegs and finally the experimental plot is constructed.

2.3.4 Crop Cutting Unit Crop Data Collection as used by the USAS

The crop cutting methodology has the advantage of making an accurate measurement of the farmer's production, but this requires that the field enumerator conduct the actual crop cutting as close as possible to same time that the farm producer would be harvesting the field. This requires some close coordination between the field enumerators and the farmers in each area of the districts. Once the crop cutting unit is constructed the field enumerator will carefully determine which plants are growing within the confines of the constructed crop cutting sample unit boundaries. Once the farmer is ready to harvest, the farmer contacts the enumerator and they harvest together but avoids that the farmer mixes the harvest from the CCE plot and the harvest from other plots from the whole farm. After harvesting the crop the enumerator will dry the crop to a standard moisture if applicable, followed by threshing and then weighing the sample unit crop production.
Thereafter the analysis of this Crop cutting experiment test was done and the results are found in appendix.

2.4 Data Collection

2.4.1 Data Collection Tools

i. Screening Questionnaire

A Screening questionnaire was used to collect information that enabled identification of a plot and its land use using the plot questionnaire as well as households within the segment for use of the household questionnaire.

ii. Plot Questionnaire

For point-sampling the plot questionnaire is concerned with the collection of data on characteristics of crop identification, inputs (seeds, fertilizers, labor …), agricultural practices, crop production and use of production.

2.4.2 Data Collection activity

i. Teams and Supervision

The 2017 USAS used 180 fieldworkers grouped in 33 field teams and 30 team leaders. All fieldwork staff in 2017 held a degree in Agronomy Science and were trained by NISR headquarter staff before starting data collection. Higher level supervision staff from NISR visited the field teams during each phase of data collection to ensure data quality control.

ii. Fieldwork Materials

Each enumerator and team leader had adequate materials composed of enumerator's instruction manual, android tablet, charger, Power banks, measuring tapes, pens, notebooks, pencils, calculator, weighing scales, Global Positioning System (GPS), boots, first aid equipment, etc. Each field enumeration team was assigned a vehicle.

iii. Field Procedures

Before proceeding to the field, enumerators and their team leaders checked if they had all needed materials for their fieldwork. All field enumeration team members and staff are required to arrive early in the field for both segment and interviews with the LSF.
At each segment the field enumerator team will familiarize themselves with the segment boundaries and using their tablet GPS to guide the team to each of the point-samples and automatically record the geographical coordinates and the time/date stamp at each point-sample within the segment during the enumeration process to know the actual time of the fieldwork.

iv. Screening Activity of the Segment

After locating and identification of the segment boundaries, the team proceeds to let their tablet GPS guide them to locate accurately each of the sampled grid points inside the segment. The enumerator identifies which plot that each sample point falls within and will identify the boundaries of each of these plots. Guidelines of identification and delineation of a plot using the tablet software follow instructions learned from their training and set forth in the survey instructions manual.
The screening of LSF plots does not have grid points as segments. Instead, the screening is done all over the whole compound of LSF following guidelines defining a plot in Seasonal Agriculture Survey.

v. Farm Interview and Data Quality Assurance

A plot questionnaire was used to conduct an interview with each farmer associated with cultivation of the sampled plot and each farm of the LSF for each season (mainly for agricultural practices, inputs estimation and production).

2.5 Data processing and analysis

The CAPI method of data collection allows the enumerators in the field to collect and enter data with their tablets and then synchronize to the server at headquarters where data are received by NISR staff, checked for consistency at NISR and thereafter transmitted to analysts for tabulation and reporting using STATA and Excel software.

Chapter 3: Results of the 2017 Season A

3.1. Farm characteristics

3.1.1. Areas

3.1.1.1. Agricultural land use area for potential arable land

Table 5. Season A, Agricultural land use for potential arable land per stratum (Ha)

Stratum	Cultivated land	Pasture	Fallow	Non-agricultural land	Total
Intensive cropland on hillsides	836,802	34,797	189,507	379,522	1,440,627
Intensive cropland in marshlands	29,725	4,257	20,406	39,316	93,704
Rangelands	23,257	126,297	5,941	21,112	176,607
SSF	**889,784**	**165,352**	**215,853**	**439,950**	**1,710,938**
LSF	16,749	3,401	2,440	960	23,551
Total	**906,533**	**168,753**	**218,294**	**440,910**	**1,734,489**

2017 Seasonal Agricultural Survey - Season A

The new USAS area sampling frame attempts to provide complete coverage of all potential arable land. Table 5 illustrates the Season A types of arable land for the three main stratum and large scale farmers (LSF) list, Cultivated land was 906,533 hectares out of a total of 1,734,489 hectares.

Figure 5. Agricultural land use for potential arable land (Ha)

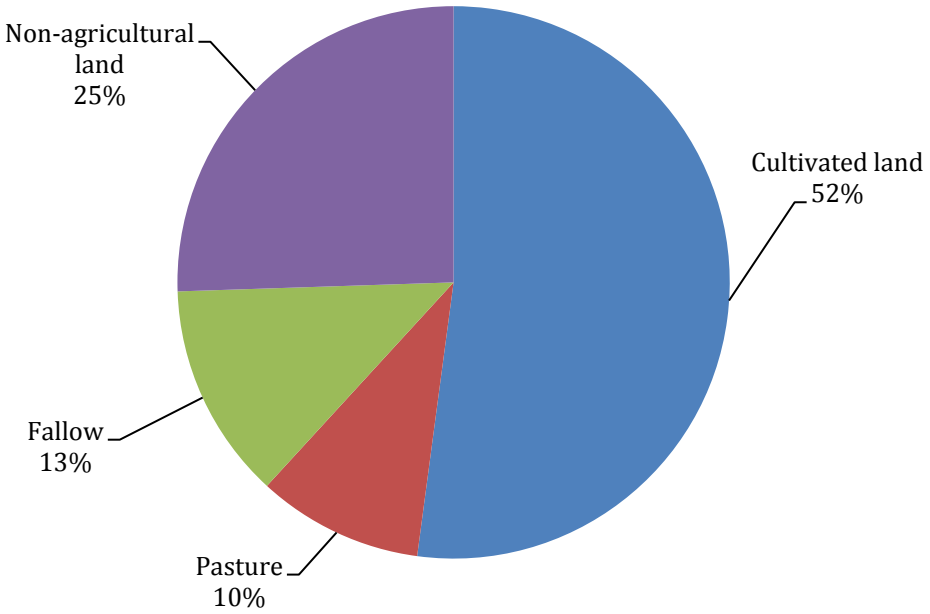


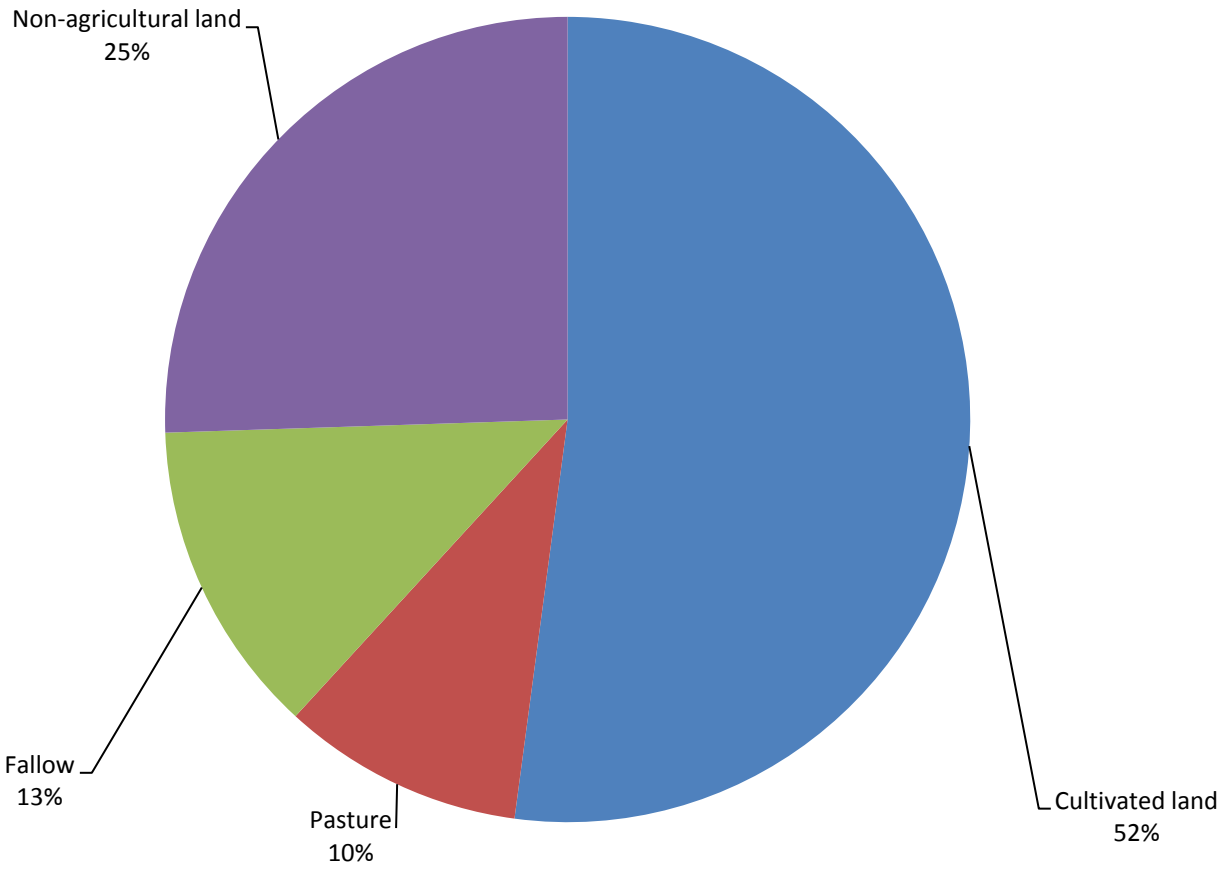
Table 6. Season A, Agricultural land use area for potential arable land per district (Ha)

Districts	Cultivated land	Pasture	Fallow	Non-agricultural land	Total
Nyarugenge	4,064	226	763	2,498	7,552
Gasabo	17,141	353	3,208	7,397	28,099
Kicukiro	4,152	341	2,403	3,188	10,084
Nyanza	26,731	232	14,950	15,765	57,679
Gisagara	28,867	386	9,976	14,121	53,351
Nyaruguru	13,548	3,012	9,984	20,594	47,138
Huye	15,507	992	8,866	18,504	43,869
Nyamagabe	19,786		9,292	24,373	53,451
Ruhango	28,113	633	13,053	13,989	55,789
Muhanga	30,565	142	9,052	11,508	51,267
Kamonyi	36,120		9,737	11,309	57,166
Karongi	21,361	3	9,128	26,192	56,684
Rutsiro	22,830	6,088	4,988	20,968	54,874
Rubavu	17,153	1,464	1,863	7,161	27,640
Nyabihu	24,420	3,624	5,028	7,621	40,693
Ngororero	28,966	3,411	4,485	18,895	55,757
Rusizi	27,094	1,023	2,264	9,080	39,462
yamasheke	24,025	276	3,836	17,174	45,310
Rulindo	25,146		3,137	15,208	43,491
Gakenke	38,001		4,487	14,769	57,256
Musanze	23,164	929	2,528	8,055	34,675
Burera	28,100	46	3,697	13,629	45,473
Gicumbi	39,338	701	12,328	11,078	63,445
Rwamagana	34,692	4,736	4,565	12,961	56,955
Nyagatare	66,920	77,225	3,247	9,601	156,993
Gatsibo	52,860	18,059	3,333	12,081	86,334
Kayonza	48,857	31,301	10,040	21,569	111,768
Kirehe	52,722	5,872	8,063	23,986	90,643
Ngoma	42,138	3,856	6,281	22,767	75,042
Bugesera	47,400	420	31,271	23,909	102,999
SSF	**889,784**	**165,352**	**215,853**	**439,950**	**1,710,938**
LSF	16,749	3,401	2,440	960	23,551
Total	**906,533**	**168,753**	**218,294**	**440,910**	**1,734,489**

2017 Seasonal Agricultural Survey - Season A

Table 6 shows the distribution of land use area within districts whereby in Season A cultivated land is largest in Nyagatare district with 66,920 hectares followed by Kirehe and then by Gatsibo and Large scale farmers have cultivated land of 16,749 hectares. Nyagatare has the largest amount of pasture land at 77,225 ha followed by Kayonza at 31,301 ha. Bugesera has the largest amount of fallow land at 31,271 ha with its cultivated land estimate of 47,400 ha.

Figure 6. Season A, Agricultural land use area for potential arable land (Ha)



3.1.1.2. Crop area

Table 7. Season A, Cultivated area by crop type by stratum (Ha)

	Stratum						
	Intensive cropland on hillsides	Intensive cropland Marshland	Rangelands	SSF Total	LSF Total	TOTAL	Percent
Cereals	**217,409**	**14,654**	**20,665**	**252,729**	***15,133***	***267,862***	**21.2**
Maize	184,913	9,861	13,190	207,964	2,645	210,609	16.7
Sorghum	21,053	1,561	7,019	29,633	69	29,702	2.3
Paddy rice	1,375	3,158		4,533	12,389	16,922	1.3
Wheat	3,226	15	42	3,283	30	3,313	0.3
Other Cereals	6,843	59	414	7,315	0	7,316	0.6
Tubers and Roots	**362,284**	**11,093**	**7,707**	**381,084**	***159***	***381,243***	**30.2**
Cassava	210,440	2,596	6,750	219,786	59	219,845	17.4
Sweet potatoes	81,806	5,543	366	87,716	10	87,725	6.9
Irish potatoes	37,006	766	489	38,261	90	38,351	3.0
Yams & Taro	33,030	2,188	103	35,321	0	35,321	2.8

	Stratum						
	Intensive cropland on hillsides	**Intensive cropland Marshland**	**Rangelands**	**SSF Total**	**LSF Total**	**TOTAL**	**Percent**
Bananas	**230,161**	**1,644**	**5,917**	**237,722**	***127***	**237,849**	**18.8**
Cooking Banana	91,200	430	4,853	96,483	89	96,571	7.6
Dessert banana	34,717	395	301	35,413	17	35,430	2.8
Banana for beer	104,244	819	763	105,826	21	105,847	8.4
Legumes and Pulses	**309,754**	**4,556**	**9,958**	**324,267**	***473***	**324,740**	**25.7**
Beans	256,278	3,410	8,112	267,799	296	268,095	21.2
Bush bean	176,274	2,904	7,797	186,975	281	187,257	14.8
Climbing bean	80,004	505	314	80,824	15	80,838	6.4
Peas	9,221	46	105	9,372	1	9,373	0.7
Ground nuts	23,162	260	1,568	24,990	14	25,004	2.0
Soya beans	21,094	840	173	22,107	161	22,268	1.8
Vegetables and Fruits	**23,660**	**2,411**	**109**	**26,180**	***340***	**26,520**	**2.1**
Vegetables	17,962	1,839	92	19,894	75	19,969	1.6
Fruits	5,698	571	17	6,286	265	6,551	0.5
Other crops	24,082	978	109	25,169	673	25,842	2.0
Developed land	**1,167,349**	**35,336**	**44,466**	**1,247,151**	**16,905**	**1,264,055**	**100.00**
Agricultural Physical land	836,802	29,725	23,257	889,784	16,749	906,533	
Fallow land	189,507	20,406	5,941	215,853	2,440	218,294	

2017 Seasonal Agricultural Survey - Season A

In general, a majority of the cropland is found in the highly cultivated "hillside" stratum of intensive cropland. As one would expect based on the design of the new USAS area sampling frame, paddy rice is predominately found in the stratum of Marshlands. Large scale farmers also account for a large portion of paddy rice area.

Note that the reported area of Large scale farmers are accounted for separately and is not included in the stratum area numbers although the actual LSF list farmland has a probability of falling within a sample segment within one of the three stratum but is administrative removed from duplication from the segment data if the LSF is identified within a sample segment.

The total "developed land" is defined simply as the cultivated cropland associated with perennial crop cultivation standard practices that typically find them planted and being sometimes mixed with seasonal crops while the "agricultural physical land" refers to the amount of cropland in terms of total cultivated plot area. Table 7 illustrates the results of the 2017 USAS indicate that the four Season A main cultivated crops are beans at 268,095 ha is the largest planted crop but this estimate is a 2% decrease in cultivated area compared with the 2016 crop year estimates, the second largest crop is cassava at 219,845 ha but this is a 24% decrease in cultivated area from 2016 , maize at 210,609 ha is the third largest crop and a 24% increase in cultivated area from 2016, while banana for beer are the fourth largest cultivated crop at 105,847 ha which is a 38% decrease from 2016A.

Table 8. Season A, Cultivated area by crop type by province (ha)

Crop/Crop category	Kigali City	Southern Province	Western Province	Northern Province	Eastern Province	SSF Total	LSF Total	Overall Total (2017 A)	Overall Total (2016 A)	Percentage change
Cereals	**5,264**	**34,139**	**33,622**	**38,495**	**141,209**	**252,729**	**15,133**	**267,862**	**230,806**	**16%**
Maize	5,192	28,232	30,078	31,564	112,898	207,964	2,645	210,609	170,815	23%
Sorghum	-	1,125	1,682	4,705	22,121	29,633	69	29,702	35,928	-17%
Paddy rice	25	2,196	624	-	1,688	4,533	12,389	16,922	17,042	-1%
Wheat	-	44	1,096	1,941	201	3,283	30	3,313	5,137	-35%
Other cereals	47	2,540	141	286	4,301	7,315	0	7,316	1,885	288%
Tubers and Roots	**9,068**	**103,665**	**100,850**	**58,393**	**109,108**	**381,084**	**159**	**381,243**	**424,819**	**-10%**
Cassava	6,326	59,575	49,358	20,585	83,942	219,786	59	219,845	288,049	-24%
Sweet potato	1,592	26,666	25,086	20,351	14,021	87,715	10	87,725	65,044	35%
Irish potato	335	4,361	15,767	12,788	5,011	38,261	90	38,351	54,051	-29%
Yams & Taro	816	13,063	10,639	4,669	6,135	35,321	0	35,321	17,674	100%
Bananas	**6,820**	**61,499**	**32,782**	**31,070**	**105,550**	**237,722**	**127**	**237,849**	**322,009**	**-26%**
Cooking banana	2,830	9,618	5,501	8,040	70,494	96,483	89	96,571	114,452	-16%
Dessert banana	1,804	11,908	4,315	7,685	9,700	35,413	17	35,430	35,647	-1%
Banana for beer	2,186	39,974	22,966	15,345	25,356	105,826	21	105,847	171,910	-38%
Legumes and Pulses	**9,641**	**88,652**	**46,328**	**58,364**	**121,281**	**324,267**	**473**	**324,740**	**323,316**	**0%**
Beans	8,612	70,464	37,596	52,383	98,744	267,799	296	268,095	274,568	-2%
Bush bean	8,387	55,048	11,255	17,751	94,534	186,975	281	187,257	181,656	3%
Climbing bean	224	15,417	26,341	34,632	4,209	80,824	15	80,838	92,912	-13%
Pea	80	2,194	2,408	3,617	1,074	9,372	1	9,373	16,012	-41%
Groundnut	526	4,524	836	879	18,225	24,990	14	25,004	11,922	110%
Soybean	424	11,470	5,489	1,485	3,238	22,107	161	22,268	20,815	7%
Vegetables and Fruits	**1,607**	**5,139**	**7,011**	**5,672**	**6,534**	**25,962**	**340**	**26,302**	**24,109**	**9%**

Crop/Crop category	Kigali City	Southern Province	Western Province	Northern Province	Eastern Province	SSF Total	LSF Total	Overall Total (2017 A)	Overall Total (2016 A)	Percentage change
vegetables	1,040	4,642	4,728	4,435	5,050	19,894	75	19,969	15,811	26%
Fruits	567	497	2,283	1,237	1,484	6,068	265	6,333	8,298	-24%
Other crops	**2,765**	**5,375**	**8,615**	**5,544**	**3,088**	**25,387**	**673**	**26,060**	**62,801**	**-59%**
Developed land	**35,165**	**298,469**	**229,208**	**197,538**	**486,771**	**1,247,151**	**16,905**	**1,264,055**	**1,387,860**	**-9%**
Agricultural physical land	**25,358**	**199,238**	**165,848**	**153,750**	**345,590**	**889,784**	**16,749**	**906,533**	**1,247,799**	**-27%**
Fallow land	**6,375**	**84,911**	**31,592**	**26,177**	**66,799**	**215,853**	**2,440**	**218,294**	**191,349**	**14%**

2017 Seasonal Agricultural Survey - Season A

In Table 8 the province with the largest overall Season A crop cultivated area was Eastern province at 345,590 ha, the second largest was Southern Province at 199,238 ha, and the third largest was western province 165,848 ha. District level estimates are found in appendix.

3.1.1.3. Plot Size

Table 9. Season A, Average plot size per crop type by stratum (Ha/100)

Crop Name	Intensive cropland on hillsides	Intensive cropland in marshlands	Rangelands	Overall	LSF
Fruits	3.3	34.4	3.2	5.5	2.5
vegetables	2.8	2.7	4.1	2.8	0.7
Other crops	7.6	25.9	18.4	9.5	4.4
Other cereals	2	2.5	5	2.3	0.1
Maize	6.2	8.9	31.3	8.1	7.6
Paddy rice	7.1	9.9	-	9.1	11.4
Sorghum	11.3	10.4	46.9	18	2.6
Wheat	7.3	53.6	7	8.7	3.8
Bush bean	5.5	4.6	28.4	6.9	3.1
Climbing bean	4.1	3.2	59.2	5.7	1.1
Pea	1.7	4.8	3.6	1.9	0.3
Irish potato	3.4	2.2	8.2	3.4	4.3
Sweet potato	2.8	3.4	3.4	2.9	0.4
Soybean	2.7	2.2	3.1	2.6	6.4
Groundnut	4.8	4.1	11.8	5.3	1
Taro	1.9	1.8	2.5	1.9	0
Yams	0.9	0.5	1.2	0.9	-
Cassava	4.5	2.3	7.4	4.4	1.4
Cooking banana	4.1	3	29.5	5.5	1.3
Dessert banana	2.5	2.4	5.1	2.6	0.5
Banana for beer	4.9	4.5	10.3	5.1	1
Overall average plot size/ crop	4.2	6	19.9	5.1	7.7

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In Season A 2017, the survey results showed that the average size of plots for cultivated land in Rwanda was 5.1 Ares for segments, while expectedly for large scale farmers the average plot size is 7.7 Ares. The stratum of rangelands is the one with overall average plot size bigger compared to other strata (19.9 Ares) but this is associated with considerably less cultivated land.

Concerning crops, plots with sorghum average the largest at 18 Ares in segments while on LSF farms paddy rice is the largest at11.4 Ares. (See table 9)

Table 10. Season A, Average plot size per crop type by district (Ha/100)

District	Maize	Paddy rice	Sorghum	Wheat	Other cereals	Cassava	Irish potato	Sweet potato	Taro	Yarms	Bush bean	Climbing bean	Pea	Groundnut	Soybean
Nyarugenge	2.3	-	-	-	-	4.8	1.4	3.4	1.1	0.5	6.2	3.3	0.6	1.7	1.5
Gasabo	7.3	5.0	-	-	0.6	4.2	1.3	5.9	3.4	-	9.0	3.4	0.8	2.5	3.1
Kicukiro	4.7	-	-	-	0.3	4.2	4.1	2.9	2.0	1.7	6.5	3.5	0.3	5.1	3.1
Nyanza	1.6	6.0	6.4	-	1.9	10.4	1.1	2.3	0.9	1.7	2.7	2.9	1.0	5.6	2.6
Gisagara	3.3	13.9	16.8	-	1.6	2.3	1.8	2.3	0.8	0.2	2.5	3.1	0.6	3.0	2.4
Nyaruguru	2.1	-	2.2	2.3	1.4	2.2	1.0	3.5	1.6	-	1.5	4.2	0.7	3.1	1.7
Huye	0.9	4.1	-	-	2.4	2.4	1.1	2.1	0.9	-	5.1	12.3	0.6	2.2	2.4
Nyamagabe	1.5	-	1.6	-	1.4	2.6	1.4	2.2	0.8	0.9	2.4	2.4	0.8	-	1.3
Ruhango	1.5	6.6	5.5	-	1.3	4.7	1.2	2.4	1.8	0.2	3.6	4.8	0.9	4.2	2.1
Muhanga	2.0	0.8	0.6	-	1.7	2.1	1.6	1.6	2.2	0.2	1.7	2.4	0.8	-	2.1
Kamonyi	1.6	2.1	0.5	-	1.6	4.3	1.1	2.0	2.0	1.0	4.3	4.3	0.6	2.9	2.3
Karongi	3.0	-	4.4	-	1.9	3.1	1.3	2.3	1.4	-	1.5	3.1	0.5	-	2.3
Rutsiro	7.8	-	4.0	16.5	1.5	1.9	3.8	2.9	4.8	-	2.6	2.6	4.5	-	2.8
Rubavu	16.8	-	3.2	10.0	-	3.3	21.7	4.2	2.8	-	3.4	11.7	13.3	-	16.8
Nyabihu	2.6	-	4.8	11.2	-	1.3	5.0	3.3	2.2	-	1.4	3.5	1.3	-	1.4
Ngororero	1.6	2.6	3.8	2.5	-	1.7	1.5	2.8	2.1	-	1.4	3.1	0.7	-	1.9
Rusizi	3.5	11.8	7.2	-	0.6	8.8	0.4	2.6	2.1	0.8	6.0	2.8	0.3	6.5	4.7
Nyamasheke	1.6	4.6	1.9	-	0.2	3.2	0.7	4.4	0.9	0.8	2.3	2.4	0.2	3.1	3.2
Rulindo	3.1	-	-	16.5	-	3.6	2.0	2.2	1.3	-	4.9	7.3	2.3	3.5	1.7
Gakenke	4.2	-	0.7	2.9	2.7	1.9	1.8	1.9	1.9	-	1.4	5.2	1.9	1.3	1.3
Musanze	3.3	-	5.4	8.4	-	0.8	11.0	2.7	0.5	-	1.3	2.3	2.2	-	1.8
Burera	3.0	-	7.4	7.4	1.5	1.2	4.1	1.9	0.8	-	1.5	5.2	3.2	-	1.1
Gicumbi	8.8	-	4.5	3.7	0.3	4.2	3.2	3.0	1.2	-	4.5	5.1	1.7	2.1	1.7
Rwamagana	4.5	4.8	0.3	-	2.3	2.8	2.3	3.1	2.8	-	8.7	9.8	0.9	4.2	1.8
Nyagatare	35.1	12.6	18.6	-	4.2	7.5	2.9	3.9	2.2	-	15.6	6.2	2.4	8.6	4.4
Gatsibo	21.4	21.9	39.3	2.5	2.8	4.7	3.9	2.5	3.8	0.2	14.1	29.9	1.6	7.8	3.9
Kayonza	8.8	28.4	25.9	-	2.6	4.7	3.7	3.4	2.9	1.3	14.2	4.7	2.7	5.2	2.3
Kirehe	9.1	3.9	6.7	-	1.2	6.6	2.4	2.9	2.2	-	8.2	6.5	3.8	5.5	2.0
Ngoma	5.0	2.9	34.7	-	1.0	4.3	1.6	1.6	1.3	1.0	3.9	5.3	-	4.1	3.4
Bugesera	5.6	3.5	17.3	-	1.6	6.4	-	4.8	1.1	1.5	7.9	1.5	-	5.3	2.7
Total	8.1	9.1	18.0	8.7	2.3	4.4	3.4	2.9	1.9	0.9	6.9	5.7	1.9	5.3	2.6

2017 Seasonal Agricultural Survey - Season A

Table 10. Season A, Average plot size per crop type by district (Ha/100) *(Cont.)*

District	Cooking banana	Dessert banana	Banana for beer	vegetables	Fruits	Other crops	Total
Nyarugenge	3.7	2.8	15.7	4.3	41.3	37.2	10.6
Gasabo	4.9	4.4	3.8	3.0	5.3	25.4	6.6
Kicukiro	4.5	3.9	4.8	5.4	7.5	30.5	6.4
Nyanza	1.2	3.0	5.7	1.7	1.9	29.6	4.6
Gisagara	2.3	2.1	4.9	1.2	1.1	6.9	3.0
Nyaruguru	1.6	1.4	2.0	1.0	4.0	2.9	2.1
Huye	3.5	2.4	2.8	1.3	0.3	5.7	2.8
Nyamagabe	1.0	1.2	4.8	1.4	2.0	6.0	2.2
Ruhango	2.2	2.7	4.3	2.3	17.1	3.4	3.4
Muhanga	1.4	1.4	4.5	0.9	1.7	3.2	2.0
Kamonyi	1.6	2.6	7.2	3.3	5.7	3.8	3.1
Karongi	1.8	1.3	7.2	0.8	1.4	5.2	2.5
Rutsiro	2.2	2.1	2.1	2.0	2.7	7.6	4.2
Rubavu	9.9	4.2	2.7	7.8	3.2	5.8	10.2
Nyabihu	1.6	1.3	2.5	2.5	3.6	11.1	3.9
Ngororero	1.6	2.6	5.1	1.0	1.3	16.3	2.8
Rusizi	1.3	1.2	3.4	3.5	2.5	7.5	4.0
Nyamasheke	1.3	1.0	2.9	1.7	1.7	6.1	2.5
Rulindo	2.2	2.4	6.1	1.9	1.0	2.4	3.0
Gakenke	2.4	2.0	2.6	1.1	1.7	3.7	2.4
Musanze	1.2	0.7	1.2	2.4	2.5	7.1	3.3
Burera	1.2	1.8	1.9	2.1	11.5	5.3	3.2
Gicumbi	2.9	3.2	3.4	2.5	3.2	4.9	3.7
Rwamagana	6.5	2.2	2.6	3.4	4.8	7.7	4.2
Nyagatare	13.4	3.8	5.7	8.8	5.0	3.5	11.2
Gatsibo	10.7	2.6	6.2	4.2	3.2	9.7	10.7
Kayonza	11.7	2.7	5.1	3.1	3.2	6.1	6.7
Kirehe	10.6	2.0	6.6	2.8	1.7	8.1	5.5
Ngoma	4.8	1.6	2.3	1.8	1.7	2.9	3.1
Bugesera	7.4	6.4	10.1	2.7	7.2	8.2	6.4
Total	5.5	2.6	5.1	2.8	5.5	9.5	5.1

2017 Seasonal Agricultural Survey - Season A

In season A 2017, the survey results indicate that Nyagatare district has the largest plots with the average plot size of 11.2 which is followed by Gatsibo at 10.7 and the smallest average plot size is in Muhanga district at 2.0 Ares (See Table 10).

3.1.2. Crop Yield

Crop yield refers to the measure of production of a crop per unit area of land cultivation of that crop and is calculated and presented at province and district levels. District level estimates are found in appendix.

Table 11. Season A, Yield of main crops by province (Kg/Ha), Season A

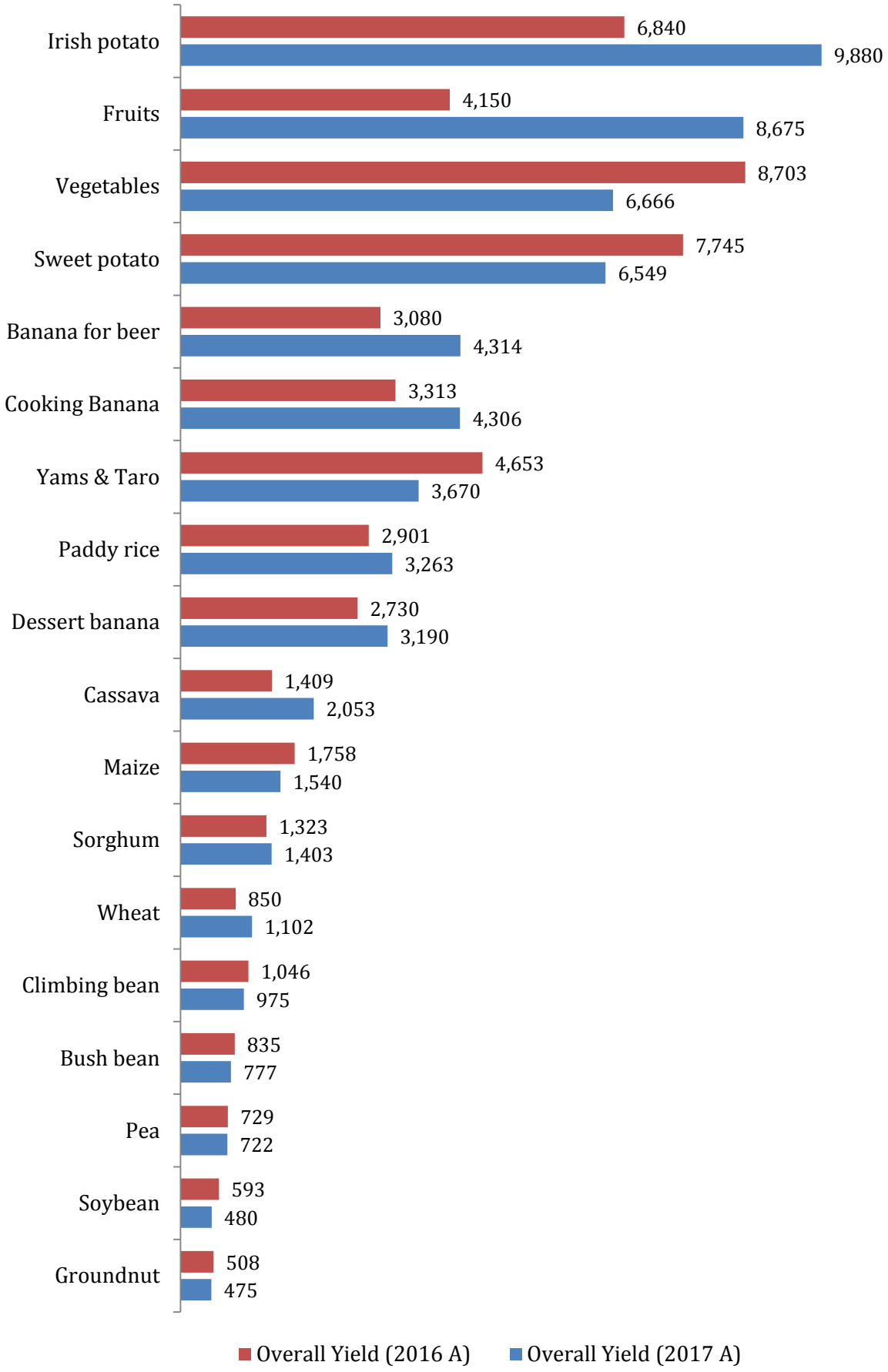
Crop	Maize	Sorghum	Paddy rice	Wheat	Cassava	Sweet potato	Irish potato	Yams & Taro	Cooking Banana
Kigali City	1,177	-	3,981	-	2,457	6,572	7,612	2,083	2,289
Southern Province	1,235	824	3,431	1,074	2,498	7,756	5,238	3,158	2,842
Western Province	1,358	1,207	3,860	740	1,760	5,617	14,064	5,326	3,410
Northern Province	1,451	2,241	-	1,283	1,476	7,087	8,364	3,465	3,218
Eastern Province	1,673	1,267	3,642	1,305	2,021	5,137	4,729	2,256	4,784
SSF Total	1,522	1,401	3,572	1,100	2,053	6,549	9,874	3,670	4,308
LSF Total	2,983	1,948	3,150	1,280	1,277	4,997	12,268	5,924	2,403
Overall Yield (2017 A)	1,540	1,403	3,263	1,102	2,053	6,549	9,880	3,670	4,306
Overall Yield (2016 A)	1,758	1,323	2,901	850	1,409	7,745	6,840	4,653	3,313

Table 11. Season A, Yield of main crops by province (Kg/Ha), Season A (cont'd)

Crop	Dessert banana	Banana for beer	Bush bean	Climbing bean	Pea	Groundnut	Soybean	Vegetables	Fruits
Kigali City	4,196	3,395	940	848	718	332	603	5,758	5,240
Southern Province	2,469	4,238	730	856	715	353	368	6,569	4,844
Western Province	4,384	3,315	689	951	796	741	590	7,849	6,453
Northern Province	3,774	4,179	906	1,036	725	878	632	5,203	7,713
Eastern Province	2,895	5,495	776	1,059	559	478	557	7,100	16,615
SSF Total	3,190	4,313	777	975	722	475	473	6,661	8,951
LSF Total	3,072	9,097	639	1,061	158	487	1,423	8,019	2,367
Overall Yield (2017 A)	3,190	4,314	777	975	722	475	480	6,666	8,675
Overall Yield (2016 A)	2,730	3,080	835	1,046	729	508	593	8,703	4,150

2017 Seasonal Agricultural Survey - Season A

Figure 7. Season A, Comparison of Yields 2016 and 2017 of main crops (Kg/Ha) at national level



3.1.3. Crop Production

Crop production is calculated by using the summation of production estimated for each crop at each province level.

Results of the 2017 USAS indicate that in terms of production grown in Season A, Paddy rice was 55,217 MT, a 12% increase from the 2016 production estimates, sweet potatoes were 574,500 MT, a 14% increase from the 2016 production estimates and cassava was 451,362 MT, a 11% increase from 2016 estimates and cooking banana was 415,868 MT which is 10% increase from the 2016 Season A production estimates. While maize production of 324,368 MT was increased by 8% from the 2016 estimates of Season A production. District level estimates are found in appendix.

Table 12. Season A, Production of main crops by province (MT)

Crop	Maize	Sorghum	Paddy rice	Wheat	Cassava	Sweet potato	Irish potato	Yams & Taro	Cooking Banana
Kigali City	6,110	-	101	-	15,541	10,461	2,547	1,700	6,479
Southern Province	34,880	927	7,535	48	148,798	206,820	22,844	41,250	27,331
Western Province	40,847	2,030	2,408	811	86,877	140,917	221,753	56,664	18,758
Northern Province	45,801	10,545	-	2,491	30,383	144,233	106,964	16,179	25,870
Eastern Province	188,840	28,026	6,146	262	169,688	72,020	23,697	13,837	337,217
SSF Total	316,477	41,528	16,191	3,612	451,287	574,451	377,805	129,630	415,655
LSF Total	7,891	135	39,026	39	76	50	1,100	0	213
Overall Total (2017 A)	324,368	41,662	55,217	3,651	451,362	574,500	378,906	129,630	415,868
Overall Total (2016 A)	300,330	47,522	49,430	4,365	405,961	503,760	369,691	82,244	379,196
Percentage change	8%	-12%	12%	-16%	11%	14%	2%	58%	10%

2017 Seasonal Agricultural Survey - Season A

Table 12. Season A, Production of main crops by province (MT) (Cont'd)

Crop	Dessert banana	Banana for beer	Bush bean	Climbing bean	Pea	Groundnut	Soybean	Vegetables	Fruits
Kigali City	7,571	7,420	7,881	190	57	174	255	5,988	2,970
Southern Province	29,406	169,399	40,211	13,198	1,570	1,596	4,221	30,494	2,406
Western Province	18,916	76,124	7,758	25,059	1,917	619	3,238	37,110	14,733
Northern Province	29,002	64,121	16,082	35,867	2,623	772	938	23,074	9,538
Eastern Province	28,084	139,331	73,334	4,456	600	8,705	1,805	35,853	24,664
SSF Total	112,979	456,396	145,266	78,772	6,768	11,866	10,457	132,519	54,312
LSF Total	53	189	180	16	0	7	229	599	628
Overall Total (2017 A)	113,032	456,585	145,446	78,787	6,768	11,873	10,686	133,118	54,940
Overall Total (2016 A)	97,304	529,434	151,715	97,230	11,673	6,054	12,346	137,608	34,438
Percentage change	16%	-14%	-4%	-19%	-42%	96%	-13%	-3%	60%

2017 Seasonal Agricultural Survey - Season A

3.1.4. Sowing Date

For small scale operators, sowing dates for some crops started before September 2016. The starting dates of sowing per crop and per districts in segments and LSF are summarized in the Tables 13, 14 and 15. Sowing dates for crops such as dessert banana, cooking banana, cassava and other crops were not applicable due to the fact that these crops may have been sown in the previous season especially for perennial crops.

Table 13. Season A, Sowing dates per crop (Percentage) in Segments

Crop	Before 01/09	Between 01-15 /09	Between 16- 30/09	Between 01-15/10	Between16- 31/10	After 31/10	Not applicable	Total
Maize	4.3	20.3	28.4	34.2	8.7	4.0	0.1	100
Paddy rice	100.0	-	-	-	-	-	-	100
Sorghum	20.2	29.4	23.1	12.9	2.9	3.2	8.3	100
Wheat	11.1	21.1	14.4	23.3	17.8	10.0	2.2	100
Bush bean	0.8	15.2	26.7	43.4	10.2	3.1	0.6	100
Climbing bean	5.3	31.1	31.5	26.3	4.5	1.0	0.5	100
Pea	4.3	24.4	26.2	33.7	6.2	4.7	0.6	100
Irish potato	8.9	14.9	15.4	17.5	7.4	12.6	23.3	100
Sweet potato	17.8	13.5	11.2	17.4	10.0	26.7	3.4	100
Soybean	0.8	18.0	26.1	38.0	10.8	6.1	0.3	100
Groundnut	1.4	17.8	32.0	38.6	7.1	0.7	2.4	100
Taro	21.3	17.8	13.7	15.7	3.6	5.4	22.5	100
Yam	7.1	16.7	21.4	28.6	7.1	16.7	2.4	100
Cassava	11.9	18.0	17.0	19.5	4.7	5.3	23.6	100
Cooking banana	12.2	1.0	0.4	0.8	0.2	0.3	85.1	100
Dessert banana	10.1	0.8	0.4	0.8	0.3	0.4	87.3	100
Banana for beer	7.5	0.9	0.4	0.7	0.2	0.5	89.8	100
Fruits	16	3	2	1	1	4	73	100
vegetables	19.7	17.8	11.0	16.6	7.7	18.4	8.7	100
Other crops	7.9	0.6	0.8	1.5	0.8	1.3	87.3	100
Other cereals	0.8	11.9	20.4	47.7	11.5	2.7	5.0	100
Overall	9.9	14.0	16.5	21.1	5.7	5.2	27.7	100

2017 Seasonal Agricultural Survey - Season A

In season A 2017, For the majority of crops, sowing of crops in segments started before and in September 2016. However, the season for paddy is such that 100 % of paddy rice is sown before September while the largest portion of perennial crops such as bananas, cassava and other crops are indicated as not applicable due to the fact that they have been planted in the previous seasons and it can be noted that a majority of crops were planted between mid-September at 16.5% and the start of October at 21.1% (See Table 13).

Table 14. Season A, Sowing dates per crop (Percentage) for Large Scale farmers

Crop	Before 01/09	Between 01-15 /09	Between 16- 30/09	Between 01-15/10	Between16- 31/10	After 31/10	Not applicable	Total
Maize	3.0	30.1	28.3	32.5	4.2	1.2	0.6	100
Paddy rice	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100
Sorghum	0.0	52.2	26.1	4.4	8.7	0.0	8.7	100
Wheat	0.0	14.3	28.6	42.9	14.3	0.0	0.0	100
Bush bean	0.0	18.5	28.4	44.4	7.4	1.2	0.0	100
Climbing bean	0.0	71.4	14.3	14.3	0.0	0.0	0.0	100
Pea	0.0	0.0	66.7	33.3	0.0	0.0	0.0	100
Irish potato	43.8	6.3	25.0	6.3	18.8	0.0	0.0	100
Sweet potato	29.4	0.0	17.7	17.7	0.0	23.5	11.8	100
Soybean	0.0	11.8	41.2	5.9	35.3	0.0	5.9	100
Groundnut	0.0	7.1	14.3	71.4	7.1	0.0	0.0	100
Taro	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100
Cassava	11.1	0.0	0.0	0.0	0.0	11.1	77.8	100
Cooking banana	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100
Dessert banana	4.8	0.0	0.0	0.0	0.0	0.0	95.2	100
Banana for beer	0.0	10.0	0.0	0.0	0.0	0.0	90.0	100
Fruits	17.1	2.9	8.6	0.0	5.7	0.0	65.7	100
vegetables	13.0	2.6	14.3	9.1	5.2	55.8	0.0	100
Other crops	41.0	1.0	11.4	9.5	3.8	1.0	32.4	100
Other cereals	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100
Overall	22.9	12.4	16.5	17.5	4.8	7.0	19.0	100

2017 Seasonal Agricultural Survey - Season A

In Season A 2017, all LSF (100%) indicated that they sowed paddy rice before September 2017 and the majority of main crops were sown before and in September with the exception of perennial crops which were planted by the majority of LSF in the previous seasons and the reason why these crops are indicated as "Not applicable" as the date of planting. The LSF list farmers contrary to the SSF in the segments on average sow 22.9 % of their crops before September (See Table 14).

Table 15. Season A, Sowing dates per district (Percentage)

District	Before 01/09	Between 01-15 /09	Between 16- 30/09	Between 01-15/10	Between1 6- 31/10	After 31/10	Not applicable	Total
Nyarugenge	8.7	9.7	19.0	19.8	2.2	3.5	37.1	100
Gasabo	8.1	13.8	15.1	22.8	2.9	4.7	32.7	100
Kicukiro	12.4	11.2	14.5	28.2	3.4	3.9	26.3	100
Nyanza	4.0	9.2	6.6	25.3	15.5	9.8	29.7	100
Gisagara	8.4	8.8	7.6	36.2	9.9	4.3	24.8	100
Nyaruguru	13.7	8.6	8.1	20.3	7.2	12.7	29.4	100
Huye	10.6	3.8	7.4	37.2	8.5	6.8	25.7	100
Nyamagabe	14.2	19.4	16.8	15.3	2.7	7.8	23.8	100
Ruhango	3.8	9.8	15.0	22.5	11.7	12.0	25.3	100
Muhanga	3.9	16.3	15.0	11.1	2.4	8.2	43.3	100
Kamonyi	8.2	7.6	18.1	28.5	4.8	4.4	28.4	100
Karongi	11.4	18.6	21.5	10.6	5.1	4.1	28.7	100
Rutsiro	18.7	21.2	16.1	8.0	4.5	9.5	22.0	100
Rubavu	32.9	28.6	13.0	6.0	3.1	3.6	12.7	100
Nyabihu	22.0	18.7	16.9	19.1	3.7	5.9	13.7	100
Ngororero	12.3	22.3	13.1	8.9	5.0	7.7	30.6	100
Rusizi	8.8	6.9	14.5	29.2	6.7	4.0	29.8	100
Nyamasheke	5.3	22.1	23.1	15.6	4.0	4.7	25.3	100
Rulindo	3.8	10.1	29.7	7.9	2.0	1.7	44.8	100
Gakenke	11.6	15.3	18.8	13.5	3.2	4.7	32.8	100
Musanze	19.7	23.2	10.8	10.4	4.0	8.5	23.4	100
Burera	17.7	22.7	11.3	12.6	4.7	10.8	20.3	100
Gicumbi	11.1	12.1	19.9	17.3	5.3	4.7	29.7	100
Rwamagana	8.3	9.8	15.1	26.9	7.1	4.1	28.7	100
Nyagatare	13.6	25.0	25.8	14.2	2.4	1.2	17.9	100
Gatsibo	5.7	7.7	20.6	30.5	3.8	2.2	29.6	100
Kayonza	4.6	13.6	17.6	21.5	5.6	5.0	32.2	100
Kirehe	8.9	11.2	10.9	22.9	11.8	5.2	29.2	100
Ngoma	4.0	7.2	24.4	21.1	4.8	2.6	35.9	100
Bugesera	15.0	19.7	14.4	26.1	6.9	7.2	10.7	100
Overall	9.9	14.0	16.5	21.1	5.7	5.2	27.7	100

2017 Seasonal Agricultural Survey - Season A

In season A 2017, the survey results indicate that dates of sowing vary widely district to district but it can be observed from this data that all district have a large portion of their cultivated land reported with a sowing date that is categorized as “not applicable” because all of the perennial crops area that is included in the calculation have been planted in the previous seasons (See Table 15).

3.1.5. Cropping system

Table 16. Season A, Percentage of plots with number of crops per plot

District	1 crop	2 crops	3 crops	4 crops	5 crops and above	Total	Average number of crops per plot
Nyarugenge	26.7	27.5	25.4	12.0	8.4	100	2.5
Gasabo	22.1	22.1	22.7	18.8	14.4	100	2.9
Kicukiro	26.3	23.0	22.6	14.0	14.0	100	2.7
Nyanza	30.0	27.5	23.6	12.0	6.9	100	2.4
Gisagara	31.9	16.8	18.7	16.5	16.0	100	2.8
Nyaruguru	44.8	25.2	14.3	9.3	6.5	100	2.1
Huye	40.4	17.2	15.9	13.9	12.6	100	2.5
Nyamagabe	41.0	27.2	15.8	11.2	4.7	100	2.1
Ruhango	36.2	29.9	20.0	9.9	4.0	100	2.2
Muhanga	34.0	24.1	18.4	13.6	9.8	100	2.5
Kamonyi	32.1	22.4	24.4	12.1	9.0	100	2.5
Karongi	39.5	24.6	17.2	10.7	7.9	100	2.3
Rutsiro	49.3	25.6	14.7	5.6	4.9	100	1.9
Rubavu	62.3	26.4	9.8	1.5	0.0	100	1.5
Nyabihu	51.9	30.7	14.0	2.6	0.9	100	1.7
Ngororero	40.3	25.9	21.0	8.2	4.5	100	2.1
Rusizi	37.3	16.0	20.2	14.7	11.8	100	2.5
Nyamasheke	34.3	19.0	21.4	13.9	11.3	100	2.5
Rulindo	27.9	27.2	19.9	13.1	12.0	100	2.6
Gakenke	27.9	27.3	23.6	11.9	9.2	100	2.5
Musanze	50.3	30.2	11.0	4.6	3.9	100	1.8
Burera	48.0	33.0	12.3	4.8	2.0	100	1.8
Gicumbi	36.7	25.8	19.4	11.6	6.5	100	2.3
Rwamagana	17.9	15.6	24.6	16.2	25.6	100	3.3
Nyagatare	22.3	24.6	31.2	14.5	7.4	100	2.6
Gatsibo	24.0	23.6	24.9	13.2	14.4	100	2.8
Kayonza	21.9	23.8	22.1	15.2	16.9	100	2.9
Kirehe	24.7	21.3	25.1	16.5	12.4	100	2.8
Ngoma	16.0	19.2	20.9	18.3	25.7	100	3.4
Bugesera	28.9	26.7	23.8	14.8	5.8	100	2.4
Overall	32.5	24.0	21.0	12.4	10.1	100	2.5
LSF	90.2	6.0	2.1	1.7	0.0	100	1.2

2017 Seasonal Agricultural Survey - Season A

In general, agricultural operators in many districts used most of their agricultural land to cultivate mixed crops in segments as it is found that only 32.5% of cultivated plots are in pure stand. LSF devoted most of their agricultural land to cultivate crops in pure stand with 90.2 % of all cultivated plots and this is confirmed by the average number of crops per plots (See Table 16).

Table 17. Season A, Share of pure and mixed crop agricultural land per stratum (in percentage)

Stratum	Pure cropping	Mixed cropping	Total
Intensive cropland on hillsides	25.7	74.3	100
Intensive cropland in marshlands	56.2	43.8	100
Rangelands	22.8	77.2	100
Total	26.6	73.4	100
LSF	95.7	4.3	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017 the share of agricultural land used to grow crops in pure stand and mixed stand in Rwanda was respectively 26.6% and 73.4% of total cultivated area. For LSF, the share between pure stand and mixed stand is completely opposite from that of the SSF at respectively 95.7% and 4.3% of total cultivated area (See table 17).

Table 18. Season A, Share of pure and mixed crop agricultural land per district (in percentage)

District	Pure cropping	Mixed cropping	Total
Nyarugenge	41.6	58.4	100
Gasabo	22.7	77.3	100
Kicukiro	29.2	70.8	100
Nyanza	26.7	73.3	100
Gisagara	17.2	82.8	100
Nyaruguru	39.3	60.7	100
Huye	24.8	75.2	100
Nyamagabe	41.8	58.2	100
Ruhango	31.3	68.7	100
Muhanga	27.1	72.9	100
Kamonyi	28.1	71.9	100
Karongi	39.5	60.5	100
Rutsiro	47.1	52.9	100
Rubavu	63.2	36.8	100
Nyabihu	52.0	48.0	100
Ngororero	34.9	65.1	100
Rusizi	21.6	78.4	100
Nyamasheke	31.4	68.6	100
Rulindo	16.6	83.4	100
Gakenke	15.1	84.9	100
Musanze	51.2	48.8	100
Burera	41.4	58.6	100
Gicumbi	32.8	67.2	100
Rwamagana	12.7	87.3	100
Nyagatare	20.1	79.9	100
Gatsibo	14.7	85.3	100
Kayonza	16.3	83.7	100
Kirehe	19.0	81.0	100
Ngoma	12.0	88.0	100
Bugesera	25.5	74.5	100
Total	26.6	73.4	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017 Ngoma and Rwamagana districts had the highest rate of mixing crop with respectively 88 % and 87.3 % of their total cultivated area and Rubavu was the lowest at 36.8 % (See table 18).

3.2. Agricultural inputs

3.2.1. Use of Seeds

Table 19. Season A, Type of seeds used by stratum (Percentage)

Stratum	Traditional seeds	Improved seeds	Total
Intensive cropland on hillsides	95.0	5.0	100
Intensive cropland in marshlands	80.4	19.6	100
Rangelands	96.0	4.0	100
Total	93.8	6.2	100
LSF	48.0	52.0	100

2017 Seasonal Agricultural Survey - Season A

During the 2017 crop year the USAS found that the type of seed used for Season A crop plantings by small scale farmers (SSF) were overall 94% traditional seeds versus 6% improved variety seeds. However, the data indicates that in the marshland stratum those SSF farmers used 20% improved seed. The SSF percentage contrasts greatly with the large scale farmers (LSF) who utilized improved seed for 52% of their planted area.

Table 20. Season A, Type of seeds used by district (Percentage)

District	Traditional seeds	Improved seeds	Total
Nyarugenge	97.5	2.5	100
Gasabo	96.4	3.6	100
Kicukiro	93.7	6.3	100
Nyanza	93.4	6.6	100
Gisagara	91.5	8.5	100
Nyaruguru	88.2	11.8	100
Huye	96.9	3.1	100
Nyamagabe	96.0	4.0	100
Ruhango	97.4	2.6	100
Muhanga	98.4	1.6	100
Kamonyi	93.1	6.9	100
Karongi	92.1	7.9	100
Rutsiro	85.3	14.7	100
Rubavu	91.1	8.9	100
Nyabihu	90.9	9.1	100
Ngororero	96.5	3.5	100
Rusizi	91.4	8.6	100
Nyamasheke	98.1	1.9	100
Rulindo	95.9	4.1	100
Gakenke	89.3	10.7	100
Musanze	92.6	7.4	100
Burera	92.7	7.3	100
Gicumbi	95.6	4.4	100
Rwamagana	93.2	6.9	100
Nyagatare	94.2	5.8	100
Gatsibo	95.0	5.0	100
Kayonza	94.2	5.8	100
Kirehe	93.6	6.4	100
Ngoma	93.3	6.7	100
Bugesera	93.8	6.2	100
Overall	93.8	6.2	100

2017 Seasonal Agricultural Survey - Season A

For SSF on a district basis there were three districts which used improved seed on over 10% of their planted area: The largest percentage was in Rutsiro at 15%, followed by Nyaruguru at 12% and Gakenke at 11%.

Table 21. Season A, Type of seeds used by crop (Percentage)

Crop	Traditional seeds	Improved seeds	Total
Maize	76.4	23.6	100
Paddy rice	42.6	57.4	100
Sorghum	99.8	0.3	100
Wheat	70.0	30.0	100
Bush bean	98.7	1.3	100
Climbing bean	98.1	1.9	100
Pea	100.0	-	100
Irish potato	98.0	2.0	100
Sweet potato	99.8	0.2	100
Soybean	98.3	1.7	100
Groundnut	100.0	-	100
Taro	100.0		100
Yam	100.0		100
Cassava	99.3	0.7	100
Cooking banana	99.2	0.8	100
Dessert banana	97.5	2.5	100
Banana for beer	99.2	0.8	100
Fruits	97.1	2.9	100
Vegetables	88.1	11.9	100
Other crops	74.4	25.6	100
Other cereals	100.0	-	100
Overall	93.8	6.2	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in season A 2017, improved seeds that are used most are for paddy rice (57.4%) followed by wheat (30%) and Maize with 23.6% and other crops which are combination of many crops which have 25.6% while sweet potato are the less used with 0.2 % (see Table 21).

Table 22. Season A, Source of improved seeds by district (Percentage)

District	RAB/ SECTOR	Recognize seed multipliers/NGO	Shops of improved seeds	Other sources	Total
Nyarugenge	47.8	13.0	34.8	4.4	100
Gasabo	23.7	21.1	52.6	2.6	100
Kicukiro	56.9	17.2	13.8	12.1	100
Nyanza	75.8	16.1	8.1	-	100
Gisagara	30.6	26.2	29.5	13.7	100
Nyaruguru	63.5	10.4	20.8	5.2	100
Huye	36.1	22.2	33.3	8.3	100
Nyamagabe	59.0	15.4	20.5	5.1	100
Ruhango	39.1	8.7	52.2	-	100
Muhanga	5.0	25.0	60.0	10.0	100
Kamonyi	46.2	9.0	29.5	15.4	100
Karongi	24.3	54.1	20.3	1.4	100
Rutsiro	30.8	49.3	11.0	8.9	100
Rubavu	43.2	24.3	32.4	-	100
Nyabihu	9.4	-	90.6	-	100
Ngororero	59.5	29.7	10.8	-	100
Rusizi	43.4	43.4	4.4	8.9	100
Nyamasheke	50.0	29.2	8.3	12.5	100
Rulindo	34.5	-	65.5	-	100
Gakenke	51.1	6.8	39.1	3.0	100
Musanze	93.9	1.5	4.6	-	100
Burera	90.8	1.5	6.2	1.5	100
Gicumbi	28.6	4.1	67.4	-	100
Rwamagana	70.2	7.8	22.0	-	100
Nyagatare	35.8	7.4	51.1	5.8	100
Gatsibo	30.6	26.1	27.6	15.7	100
Kayonza	47.3	12.7	38.2	1.8	100
Kirehe	12.0	13.3	28.0	46.7	100
Ngoma	18.4	39.1	37.9	4.6	100
Bugesera	35.9	24.5	28.3	11.3	100
Overall	42.2	19.3	30.0	8.5	100

2017 Seasonal Agricultural Survey - Season A

The SSF for Season A relies primarily on three main sources for their improved seed: government agencies (referred to as RAB/SECTOR) contribute 42%, suppliers/NGOs provide 19%, and dealer/shops supply 30% of the improved seed. A minor amount, 8.5%, comes from other sources. Districts can vary substantially as to the availability and access to improved seed by sources. The RAB/SECTOR provides 94% of the improved seed in Musanze and 91% in Burera but a low of 9% in Nyabihu and 5% in Muhanga. Suppliers/NGOs contribute a high of 54% of the improved seed for Karongi farmers, 49% in Rutsiro and 43% in Rusizi. Data from both Rulindo and Nyabihu indicate that farmers do not obtain their improved seed for this source category. The survey data indicates that a number of districts utilize the dealer/shops to obtain a majority their improved seed in Nyabihu at 90% and to a lesser degree in Gicumbi at 67%, Rulindo 65.5%, Muhanga 60%, and three additional districts over 50%.

Table 23. Season A, Source of improved seeds by crop (Percentage) in segments

Crop	RAB/ SECTOR	Recognize seed multipliers / NGO	Shops of improved seeds	Other sources	Total
Maize	49.2	17.4	30.9	2.5	100
Paddy rice	9.9	7.9	45.6	36.5	100
Sorghum	100.0	-	-	-	100
Wheat	85.2	-	14.8	-	100
Bush bean	25.8	45.2	25.8	3.2	100
Climbing bean	45.2	41.9	6.5	6.5	100
Irish potato	13.3	63.3	23.3	-	100
Sweet potato	80.0	20.0	-	-	100
Soybean	50.0	27.8	16.7	5.6	100
Cassava	50.0	25.0	17.5	7.5	100
Cooking banana	30.8	61.5	-	7.7	100
Dessert banana	24.1	46.3	-	29.6	100
Banana for beer	12.0	48.0	12.0	28.0	100
Fruits	25.0	-	25.0	50.0	100
Vegetables	6.6	6.6	83.6	3.3	100
Other crops	49.6	22.1	4.6	23.7	100
Overall	42.2	19.3	30.0	8.5	100

2017 Seasonal Agricultural Survey - Season A

The SSF for Season A will vary their purchases of improved seed considerably for the different crops they plant. The survey data indicates that RAB/SECTOR provides 100% of sorghum planted and 85% of wheat, 80% of sweet potato and 50% of both soybeans and cassava planted. Suppliers/NGOs provide 63% of the Irish potato "eyes" for planting and 61.5% of cassava seedlings. Dealers/shops provide 84% of the vegetable seeds and supply 46% of paddy rice improved seed while other sources are the primary source for fruit tree seedlings at 50%, 36.5% of paddy rice improved seed, and 30% of dessert and 28% of beer banana seedlings.

Table 24. Season A, Source of improved seeds by crop (Percentage) for Large Scale Farmers

crop	RAB / SECTOR	Recognized seed multipliers/NGO	Shops of improved seeds	Other sources	Total
Maize	55.83	13.33	26.67	4.17	100
Paddy rice	20.34	69.49	3.39	6.78	100
Wheat	40	0	20	40	100
Bush bean	35	35	15	15	100
Climbing bean	75	25	0	0	100
Irish potato	75	25	0	0	100
Sweet potato	0	100	0	0	100
Soybean	77.78	11.11	11.11	0	100
Groundnut	0	100	0	0	100
Cassava	100	0	0	0	100
Cooking banana	50	50	0	0	100
Dessert banana	63.64	27.27	0	9.09	100
Banana for beer	40	40	20	0	100
Fruits	55.56	25.93	14.81	3.7	100
vegetables	0	6.78	84.75	8.47	100
Other crops	47.22	11.11	41.67	0	100
Overall	39.95	25.66	28.84	5.56	100

2017 Seasonal Agricultural Survey-Season A

The Season A source of improved seed for the LSF for most crops comes from the RAB/SECTOR with the survey data indicating 100% of cassava, 78% of soybeans, 75% of both climbing beans and Irish potatoes, 64% of dessert banana seedlings, and 56% of maize improved seed. The LSF obtain a majority of their improved paddy rice seed (69%) from suppliers/NGOs and nearly all (85%) of their vegetable seed from dealers/shops.

3.2.2. Use of fertilizers

Table 25. Season A, Percentage of plots with organic fertilizers use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	51.8	48.2	100
Intensive cropland in marshlands	45.1	54.9	100
Rangelands	26.2	73.8	100
Total	49.9	50.1	100
LSF	43.6	56.5	100

2017 Seasonal Agricultural Survey - Season A

The survey data indicates for Season A that half of the SSFs utilize organic fertilizer. This percentage is representative of all cropland stratum SSF usage but drops to only 26% of those in rangeland. LSF are remarkably close in organic fertilizer usage at 44%.

Table 26. Season A, Percentage of plots with organic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	35.2	64.8	100
Gasabo	57.4	42.6	100
Kicukiro	45.2	54.8	100
Nyanza	41.8	58.2	100
Gisagara	54.2	45.8	100
Nyaruguru	78.7	21.3	100
Huye	58.1	41.9	100
Nyamagabe	72.5	27.5	100
Ruhango	45.5	54.5	100
Muhanga	72	28	100
Kamonyi	61.2	38.8	100
Karongi	61.5	38.6	100
Rutsiro	67.4	32.7	100
Rubavu	24.3	75.7	100
Nyabihu	60.1	39.9	100
Ngororero	70.8	29.2	100
Rusizi	41	59	100
Nyamasheke	64.7	35.3	100
Rulindo	62	38	100
Gakenke	82.6	17.4	100
Musanze	52.5	47.5	100
Burera	55.7	44.3	100
Gicumbi	70.6	29.4	100
Rwamagana	45.8	54.2	100
Nyagatare	23	77	100
Gatsibo	41.2	58.8	100
Kayonza	26.1	73.9	100
Kirehe	42.9	57.1	100
Ngoma	44.4	55.6	100
Bugesera	23.1	77	100
Total	49.9	50.1	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017, by district the SSF usage of organic fertilizer varies widely with the highest level of usage in Gakenke at 83%, Nyaruguru at 79%, and Nyamagabe at 72.5% and several others around 70%. The lowest organic usage by SSF is in Nyagatare at 77%, Rubavu at 76% and Kayonza at 74%.

Table 27. Season A, Percentage of plots with inorganic fertilizer use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	15.1	84.9	100
Intensive cropland in marshlands	48.8	51.2	100
Rangelands	7.8	92.3	100
Overall	18.9	81.1	100
LSF	43.7	56.3	100

2017 Seasonal Agricultural Survey - Season A

The Season A usage of inorganic fertilizers by SSF is considerably less 19%, however the SSF usage by marshland stratum farmers rises to 49% (presumably with its application on paddy rice). The use of inorganic fertilizers by LSF is visually the same that of organic fertilizers.

Table 28. Season A, Table Percentage of plots with inorganic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	3.3	96.7	100
Gasabo	2.6	97.4	100
Kicukiro	10.7	89.3	100
Nyanza	7.1	92.9	100
Gisagara	25	75	100
Nyaruguru	43.2	56.8	100
Huye	21.4	78.6	100
Nyamagabe	25.6	74.4	100
Ruhango	4.5	95.5	100
Muhanga	4	96	100
Kamonyi	3.3	96.7	100
Karongi	26.5	73.5	100
Rutsiro	25.8	74.2	100
Rubavu	35.8	64.2	100
Nyabihu	35.5	64.5	100
Ngororero	14	86	100

District	Used	Not used	Total
Rusizi	43.5	56.5	100
Nyamasheke	25	75	100
Rulindo	9.5	90.5	100
Gakenke	41.7	58.3	100
Musanze	26.1	73.9	100
Burera	23.4	76.6	100
Gicumbi	10.8	89.2	100
Rwamagana	21.5	78.5	100

District	Used	Not used	Total
Nyagatare	16.6	83.4	100
Gatsibo	10.3	89.7	100
Kayonza	12.1	87.9	100
Kirehe	19.2	80.8	100
Ngoma	17.7	82.3	100
Bugesera	8.1	91.9	100
Overall	18.9	81.1	100
LSF	43.7	56.3	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017, inorganic fertilizer usage varies by districts to a lesser degree because of its overall lower usage. Its highest usage is reported in Rusizi at 43.5%, Nyaruguru at 43%, and in Gakenke at 42%. Its lowest usage is in both Kamonyi and Nyarugenge at 3%, Muhango at 4% and Ruhango at 4.5%.

Table 29. Season A, Types of inorganic fertilizers use per stratum (in percentage)

	NPK 17-17-17	NPK 20-10-10	NPK 25-5-5	Urea	Liquid urea	DAP	TSP	KCL/MOP	Other Fertilizers	Total
Intensive cropland on hillsides	26.2	1.4	0.1	29.1	0.6	42.1	0.0	-	0.4	100
Intensive cropland in marshlands	29.4	0.1	-	40.7	2.5	23.2	0.1	1.3	2.8	100
Rangelands	24.2	3.2	-	32.3	-	40.3	-	-	-	100
Overall	27.3	0.9	0.1	33.3	1.3	35.3	0.1	0.5	1.3	100
LSF	29.5	0.8	0.3	38.2	1.3	23.7		1.1	5.1	100

2017 Seasonal Agricultural Survey - Season A

In Season A the overall usage of inorganic fertilizer by types is almost equally divided by SSF at 27% using NPK 17-17-17 -17, 33% using Urea, and 35% using DAP. The SSF use of NPK 17-17-17 -17 is nearly the same across all land use stratum but urea usage is 41% in marshland strata versus 29% on hillside strata and 32% on rangelands. DAP is more often used on hillsides at 42% and rangeland at 40% while marshland usage is lowest at 23%. LSF usage is similarly divided between NPK 17-17-17 -17 at 29.5%, urea at 38% and DAP at 24%.

Table 30. Season A, Types of inorganic fertilizers use per district (in percentage)

Districts	NPK 17-17-17	NPK 20-10-10	NPK 25-5-5	Urea	Liquid urea	DAP	TSP	KCL/MOP	Other Fertilizers	Total
Nyarugenge	14.3	-	-	57.1	-	28.6	-	-	-	100
Gasabo	30	-	-	50	-	20	-	-	-	100
Kicukiro	20.9	-	-	37.2	2.3	37.2	-	-	2.3	100
Nyanza	5.7	-	-	37.1	-	54.3	-	-	2.9	100
Gisagara	27.1	0.4	-	44.3	-	28.2	-	-	-	100
Nyaruguru	23.9	0.6	-	14.7	-	60.7	-	-	-	100
Huye	44.1	-	-	48.7	-	7.2	-	-	-	100
Nyamagabe	15.8	-	-	32.3	-	51.9	-	-	-	100
Ruhango	40.9	-	4.6	31.8	-	22.7	-	-	-	100
Muhanga	9.1	-	-	22.7	-	68.2	-	-	-	100
Kamonyi	4.4	-	-	47.8	-	47.8	-	-	-	100
Karongi	15.2	-	-	35.8	0.7	47.7	-	-	0.7	100
Rutsiro	50.6	3.5	-	21.3	-	24.7	-	-	-	100
Rubavu	71.4	1.2	-	11.2	6.2	9.9	-	-	-	100
Nyabihu	59.5	-	-	21.6	0.5	18.5	-	-	-	100
Ngororero	7	-	-	24	-	68	-	-	1	100
Rusizi	27	0.6	-	37.8	-	30.8	-	-	3.8	100
Nyamasheke	11.3	5.7	-	21	-	62.1	-	-	-	100
Rulindo	3.1	3.1	-	46.9	-	46.9	-	-	-	100
Gakenke	6.2	-	-	42.2	0.7	50.5	0.4	-	-	100
Musanze	50	-	-	21.5	0.8	26.2	-	-	1.5	100
Burera	53.7	-	-	15.7	-	30.6	-	-	-	100
Gicumbi	23.7	-	-	44.1	1.7	30.5	-	-	-	100
Rwamagana	15.6	3.3	0.6	35	-	42.2	-	-	3.3	100
Nyagatare	23.3	-	-	46.3	8.6	19.6	-	-	2.1	100
Gatsibo	17.7	1.3	0.7	39.9	-	39.9	-	-	0.7	100
Kayonza	30.8	3.1	-	34	-	27	0.6	-	4.4	100
Kirehe	5.2	1.3	-	28.5	0.4	51.7	-	8.2	4.7	100
Ngoma	12.8	2.3	-	39.5	-	45.4	-	-	-	100
Bugesera	59.5	-	-	21.4	-	19.1	-	-	-	100
Overall	27.3	0.9	0.1	33.3	1.3	35.3	0.1	0.5	1.3	100

2017 Seasonal Agricultural Survey - Season A

Table 30 shows the way different types of inorganic fertilizers was used within districts in Season A 2017. The Season A usage of NPK 17-17-17 -17 is highest in the districts of Rubavu at 71%, and both Nyabihu and Bugesera at 59.5% with several others at a little over 50%. The usage of urea is fairly uniform across districts with the highest usage in Nyarugenge at 57%. DAP usage is more variable across districts with its highest usage in Muhanga and Ngororero with both at 68%.

3.2.3. Use of Pesticides

Table 31. Season A, Percentage of plots with pesticides use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	7.8	92.3	100
Intensive cropland in marshlands	29.1	71	100
Rangelands	3.2	96.8	100
Overall	10.1	89.9	100
LSF	38.0	62.0	100

2017 Seasonal Agricultural Survey - Season A

The survey data indicates for Season A that only 10% of the SSFs used pesticides overall. This percentage is representative of all cropland hillside stratum SSF usage at 8% but drops to 3% in rangeland but has a high usage reported in the crop marshland stratum. LSF are more inclined to pesticide usage at 38%.

Table 32. Season A, Percentage of plots with pesticides use per district

District	Used	Not used	Total
Nyarugenge	3.3	96.7	100
Gasabo	3.6	96.5	100
Kicukiro	7.2	92.8	100
Nyanza	5.3	94.7	100
Gisagara	21.7	78.3	100
Nyaruguru	19.8	80.2	100
Huye	9.4	90.6	100
Nyamagabe	8.1	91.9	100
Ruhango	5.3	94.7	100
Muhanga	2.3	97.8	100
Kamonyi	3.3	96.7	100
Karongi	9	91	100
Rutsiro	15.2	84.8	100
Rubavu	34.2	65.8	100
Nyabihu	27	73	100
Ngororero	5.2	94.8	100

District	Used	Not used	Total
Rusizi	16.4	83.6	100
Nyamasheke	4.5	95.5	100
Rulindo	4.5	95.5	100
Gakenke	10.5	89.5	100
Musanze	21.2	78.8	100
Burera	22.6	77.4	100
Gicumbi	3.1	96.9	100
Rwamagana	10.6	89.5	100
Nyagatare	13	87	100
Gatsibo	3.2	96.8	100
Kayonza	2.4	97.6	100
Kirehe	8.7	91.3	100
Ngoma	5.4	94.6	100
Bugesera	3.6	96.4	100
Overall	10.1	89.9	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017, by district the SSF usage of pesticides fluctuates somewhat with its lower usage with the highest level of usage in Rubavu at 34% and only three next highest around 20%.

Table 33. Season A, Type of pesticides used by stratum (in percentage)

Stratum	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Tilt	Rocket	Other Pesticides	Total
Intensive cropland on hillsides	29.0	9.8	6.6	39.5	1.2	0.2	-	13.7	100
Intensive cropland in marshlands	7.8	0.8	13.7	48.7	2.1	-	-	27.0	100
Rangelands	30.8	15.4	-	26.9	-	-	-	26.9	100
Overall	21.8	6.9	8.9	42.4	1.5	0.1	-	18.4	100
LSF	8.7	1.8	3.9	31.4	-	-	8.9	45.4	100

2017 Seasonal Agricultural Survey - Season A

The SSF usage during Season A of pesticide by type finds that 42% of crop plots reporting application of pesticides used Cypermethrin was the highest application rate, followed by Dithane at 22% and other types accounted for 18% of the usage application. Dithane is equally used in crop hillside and rangeland stratum at 29% and 31% respectively but only at 8% from crop marshland strata. Cypermethrin has its highest usage in the crop marshland strata at 49%, slightly lower in crop hillside strata at 39.5% and its lowest usage is in rangeland strata at 27%. This differed for the LSF with 31% reporting the use of Cypermethrin and 45% other types of pesticides.

Table 34. Season A, Type of pesticides used by District (in percentage)

District	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Tilt	Rocket	Other Pesticides	Total
Nyarugenge	36.4	-	-	-	-	-	-	63.6	100
Gasabo	26.7	-	-	20.0	-	-	-	53.3	100
Kicukiro	10.7	7.1	-	21.4	-	-	-	60.7	100
Nyanza	9.5	4.8	14.3	66.7	-	-	-	4.8	100
Gisagara	8.8	-	8.8	63.5	0.6	-	-	18.2	100
Nyaruguru	29.2	-	-	43.1	-	-	-	27.7	100
Huye	8.9	2.2	4.4	64.4	-	-	-	20.0	100
Nyamagabe	29.4	-	2.9	67.7	-	-	-	-	100
Ruhango	15.0	15.0	-	65.0	-	-	-	5.0	100
Muhanga	20.0	-	-	70.0	10.0	-	-	-	100
Kamonyi	13.3	-	-	60.0	-	-	-	26.7	100
Karongi	3.3	-	10.0	70.0	-	3.3	-	13.3	100
Rutsiro	21.5	20.3	7.6	30.4	5.1	-	-	15.2	100
Rubavu	34.5	26.9	1.0	37.6	-	-	-	-	100
Nyabihu	40.7	20.9	9.9	28.6	-	-	-	-	100
Ngororero	8.7	4.4	-	78.3	-	-	-	8.7	100
Rusizi	10.6	-	32.9	24.7	12.9	-	-	18.8	100
Nyamasheke	10.0	5.0	-	60.0	5.0	-	-	20.0	100
Rulindo	27.3	-	27.3	45.5	-	-	-	-	100

District	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Tilt	Rocket	Other Pesticides	Total
Gakenke	9.1	4.6	4.6	79.6	-	-	-	2.3	100
Musanze	54.8	2.4	12.1	27.4	-	-	-	3.2	100
Burera	45.6	2.4	6.4	44.8	-	-	-	0.8	100
Gicumbi	53.9	15.4	-	23.1	7.7	-	-	-	100
Rwamagana	15.9	1.5	15.9	29.0	7.3	-	-	30.4	100
Nyagatare	3.0	-	15.5	38.6	0.9	0.4	-	41.6	100
Gatsibo	2.1	-	-	44.7	-	-	-	53.2	100
Kayonza	25.0	-	29.2	16.7	-	-	-	29.2	100
Kirehe	-	-	6.5	50.0	-	-	-	43.5	100
Ngoma	10.5	-	-	68.4	-	-	-	21.1	100
Bugesera	-	7.7	-	7.7	15.4	-	-	69.2	100
Overall	21.8	6.9	8.9	42.4	1.5	0.1	-	18.4	100

2017 Seasonal Agricultural Survey - Season A

Table 34 shows the way different types of pesticides was used within districts in Season A 2017. District pesticide usage reported for Dithane varies widely but is generally below 50% across all districts with only Musanze at 55% and Gicumbi at 54% above that level of application. Cypermethrin usage reported across districts is higher because of its wider usage in general with twelve districts reports levels above 60% but the highest is Ngororero at 78%. Other pesticide usage also varies widely with twelve districts reporting usage at zero or less than 10% with the highest reported usage in Bugesera at 69%, Nyarugenge at 64%, and Kicukiro at 61%.

3.3. Agricultural practices

3.3.1. Irrigation practices

Table 35. Season A, Use of Irrigation per stratum (Percentage)

Stratum	Used	Not used	Total
Intensive cropland on hillsides	1.0	99.0	100
Intensive cropland in marshlands	26.2	73.8	100
Rangelands	0.4	99.7	100
Overall	4.0	96.0	100
LSF	27.8	72.2	100

2017 Seasonal Agricultural Survey - Season A

In Rwanda during Season A the SSF only irrigates overall 4% of the crop area, however, this is heavily influenced by visually no usage of irrigation on the crop hillside and rangeland stratum cropland while the marshland strata farmers practice irrigation on 26% of their cultivated crop land. The LSF practice nearly the same amount of irrigation as the marshland strata SSF's with 28% of their cropland reported to have been irrigation.

Table 36. Season A, Use of Irrigation per district (Percentage)

District	Used	Not used	Total
Nyarugenge	2	98.1	100
Gasabo	2.3	97.7	100
Kicukiro	4.1	95.9	100
Nyanza	4.5	95.6	100
Gisagara	9.8	90.2	100
Nyaruguru	3.8	96.2	100
Huye	19	81	100
Nyamagabe	0.5	99.5	100
Ruhango	2.5	97.5	100
Muhanga	0.8	99.3	100
Kamonyi	0.8	99.2	100
Karongi	0.3	99.7	100
Rutsiro	0.2	99.8	100
Rubavu	-	100	100
Nyabihu	0.3	99.7	100
Ngororero	0.3	99.8	100

District	Used	Not used	Total
Rusizi	18	82	100
Nyamasheke	1.1	99	100
Rulindo	1.5	98.5	100
Gakenke	1.5	98.5	100
Musanze	0.3	99.8	100
Burera	0.5	99.5	100
Gicumbi	1.7	98.3	100
Rwamagana	2.5	97.6	100
Nyagatare	8.9	91.1	100
Gatsibo	2.6	97.4	100
Kayonza	4.7	95.3	100
Kirehe	3.7	96.3	100
Ngoma	1.8	98.2	100
Bugesera	0.7	99.4	100
Overall	4	96	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017 the highest occurrence of irrigation usage was in districts Huye at 19% and Rusizi at 18% of cropland (see Table 36).

Table 37. Season A, Types of irrigation used by stratum (in percentage)

Stratum	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Intensive cropland on hillsides	38.2	0.0	4.6	57.3	100
Intensive cropland in marshlands	85.6	0.5	0.9	13.0	100
Rangelands	0.0	0.0	0.0	100.0	100
Overall	75.4	0.4	1.7	22.5	100
LSF	90.18	0.89	8.04	0.89	100

2017 Seasonal Agricultural Survey - Season A

During Season A the SSF overall used surface irrigation on three-quarters of their irrigated cropland versus 90% of the LSF irrigated cropland. The LSF use sprinkler irrigation on 8% of their irrigated cropland versus 5% of the SSF in the hillside strata. The remaining portion of SSF irrigation utilizes traditional methods on 57% of the hillside, 13% of the marshland, and 100% of the rangeland stratum while LSF have reported use of the traditional methods on only 1% of their irrigated cropland.

Table 38. Season A, Types of irrigation used by district (in percentage)

District	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Nyarugenge	0	0	0	100	100
Gasabo	14.29	0	14.29	71.43	100
Kicukiro	53.85	0	7.69	38.46	100
Nyanza	6.67	0	0	93.33	100
Gisagara	77.27	0	0	22.73	100
Nyaruguru	0	0	0	100	100
Huye	92.21	1.3	0	6.49	100
Nyamagabe	0	0	0	100	100
Ruhango	88.89	0	0	11.11	100
Muhanga	25	0	0	75	100
Kamonyi	33.33	0	0	66.67	100
Karongi	100	0	0	0	100
Rutsiro	0	0	100	0	100
Nyabihu	0	0	0	100	100
Ngororero	0	0	0	100	100
Rusizi	95.06	0	0	4.94	100
Nyamasheke	50	0	0	50	100
Rulindo	0	0	25	75	100
Gakenke	0	0	28.57	71.43	100
Musanze	0	0	0	100	100
Burera	0	0	0	100	100
Gicumbi	14.29	0	0	85.71	100
Rwamagana	30.77	0	7.69	61.54	100
Nyagatare	90.2	0	1.96	7.84	100
Gatsibo	86.36	4.55	0	9.09	100
Kayonza	92.31	0	0	7.69	100
Kirehe	85.71	0	0	14.29	100
Ngoma	83.33	0	0	16.67	100
Bugesera	100	0	0	0	100
Overall	75.42	0.37	1.68	22.53	100

2017 Seasonal Agricultural Survey - Season A

The table 38 shows in details how within districts type of irrigation had been used in Season A 2017. Where irrigation is practiced at the district level a majority of the cropland is irrigated using surface irrigation methods. The main exception is sprinkler irrigation usage of 100% in Rutsiro, 29% in Gakenke, 25% in Rulindo, and 14% in Gasabo, with 22 districts reporting zero sprinkler usage and the remaining four districts reporting minor amounts of usage. The traditional method of irrigation is predominately used in six districts with over half or more of their cropland irrigation using this method with the highest being 100% usage in seven districts and 93% in Nyanza and it should be noted that these percentages on techniques of irrigation used are calculated out of only those operators who report to use irrigation in their plots as table 36 showed.

Table 39. Season A, Types of irrigation used by crop type (in percentage) in segments

Crop	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Maize	17.1	-	14.6	68.3	100
Paddy rice	99.7	0.3	-	-	100
Bush bean	16.7	-	-	83.3	100
Climbing bean	33.3	-	-	66.7	100
Irish potato	-	-	-	100	100
Sweet potato	23.1	3.9	3.9	69.2	100
Soybean	25	-	-	75	100
Taro	-	-	-	100	100
Cooking banana	-	-	-	100	100
Dessert banana	-	-	-	100	100
Fruits	50	-	12.5	37.5	100
Vegetables	15.6	-	1.6	82.8	100
Other crops	50	-	-	50	100
Overall	75.7	0.4	1.7	22.3	100

2017 Seasonal Agricultural Survey - Season A

The survey results showed that in Season A 2017 that the small amount of irrigation practiced by SSF is applied using surface irrigation primary on paddy rice at 100% and at lesser rates of 50% on fruit and other crops, while drip irrigation is only 4% of the irrigation type reported used to irrigate sweet potatoes, with sprinklers used to for 15% of the maize, 4% of sweet potato, 12.5% of fruit irrigation, and the traditional is the predominate type of irrigation used on crops except paddy rice at 0%. Most crops are at or above two-thirds of their coming from traditional irrigation means with only fruit at 38% and other crops at 50%. (see table 39).

Table 40. Season A, Types of irrigation used by crop type (in percentage) for Large Scale Farmers

Crop name	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Maize	70.8	4.2	20.8	4.2	100
Paddy rice	99.2	0.0	0.0	0.8	100
Wheat	0.0	0.0	100.0	0.0	100
Bush bean	0.0	0.0	100.0	0.0	100
Soybean	0.0	0.0	100.0	0.0	100
Cassava	100.0	0.0	0.0	0.0	100
Cooking banana	100.0	0.0	0.0	0.0	100
Banana for beer	100.0	0.0	0.0	0.0	100
Fruits	83.3	0.0	16.7	0.0	100
vegetables	95.5	0.0	4.6	0.0	100
Other crops	28.6	14.3	57.1	0.0	100
Overall	90.2	0.9	8.0	0.9	100

2017 Seasonal Agricultural Survey - Season A

The survey results indicate that for Season A the LSF primarily use surface irrigation as their preferred method for maize at 71%, fruit at 83%, vegetables at 96% and cassava, cooking and beer banana at 100% for each. LSF also use drip irrigation on 14% of the other crops being irrigated, and sprinkler irrigation is utilized totally when wheat, bush beans, and cassava are reported being irrigated with maize on 21% and fruit 17% by this method of irrigation (see Table 40).

Table 41. Season A, Source of used water for irrigation per stratum (in percentage)

Stratum	Rainfall	Rain- harvesting water	WASAC water	Underground water	Lake water	Stream water	Recycled water	Other source	Total
Intensive cropland on hillsides	4.4	0.9	7.0	36.8	7.0	32.5	0.9	10.5	100
Intensive cropland in marshlands	2.4	7.5	-	42.1	0.7	44.9	0.9	1.4	100
Rangelands	-	-	-	-	-	100.0	-	-	100
Overall	2.8	6.1	1.5	40.8	2.0	42.6	0.9	3.3	100
LSF	1.3	2.2	22.8	42.4	28.1	3.1	-	-	100

2017 Seasonal Agricultural Survey - Season A

The survey results indicate that for Season A the source of water used for irrigation by the SSF is 43% stream fed followed closely by underground water at 41% as the two main sources of irrigation water. The LSF primarily use an underground water source for 42% of their irrigation, followed by lake water for 28% and WASAC at 23% as their main sources of crop irrigation (see Table 41).

Table 42. Season A, Source of used water for irrigation per district (in percentage)

District	Rainfall	Rain- harvesting water	WASAC water	Underground water	Lake water	Stream water	Recycled water	Other source	Total
Nyarugenge	-	-	-	-	-	42.9	-	57.1	100
Gasabo	-	-	14.3	57.1	-	28.6	-	-	100
Kicukiro	-	-	30.8	15.4	-	46.2	-	7.7	100
Nyanza	-	-	-	81.3	-	6.3	12.5	-	100
Gisagara	7.6	4.6	-	74.2	-	4.6	-	9.1	100
Nyaruguru	-	-	-	25.0	-	50.0	16.7	8.3	100
Huye	1.3	-	-	46.8	-	52.0	-	-	100
Nyamagabe	-	-	-	-	-	100.0	-	-	100
Ruhango	66.7	22.2	-	11.1	-	-	-	-	100
Muhanga	-	-	-	-	-	100.0	-	-	100
Kamonyi	-	-	-	66.7	-	33.3	-	-	100
Karongi	-	-	-	100.0	-	-	-	-	100
Rutsiro	-	-	-	-	-	100.0	-	-	100
Nyabihu	-	-	-	-	-	100.0	-	-	100
Ngororero	-	-	-	100.0	-	-	-	-	100
Rusizi	-	32.1	-	19.8	-	43.2	1.2	3.7	100
Nyamasheke	20.0	-	-	-	40.0	40.0	-	-	100
Rulindo	-	-	20.0	-	-	60.0	-	20.0	100
Gakenke	-	14.3	-	28.6	-	57.1	-	-	100
Musanze	-	-	-	-	-	100.0	-	-	100
Burera	-	-	-	-	100.0	-	-	-	100
Gicumbi	14.3	-	-	42.9	-	42.9	-	-	100
Rwamagana	7.7	-	7.7	46.2	23.1	7.7	-	7.7	100
Nyagatare	-	1.0	-	27.5	-	71.6	-	-	100
Gatsibo	-	-	-	4.6	-	95.5	-	-	100
Kayonza	-	-	-	85.0	2.5	10.0	-	2.5	100
Kirehe	-	-	-	50.0	-	50.0	-	-	100
Ngoma	-	-	16.7	83.3	-	-	-	-	100
Bugesera	-	-	-	-	100.0	-	-	-	100
Overall	2.8	6.1	1.5	40.8	2.0	42.6	0.9	3.3	100

2017 Seasonal Agricultural Survey - Season A

Table 42 indicates how in season A 2017 source of water used in irrigation differs within districts. At the district level the primary sources of irrigation water considerately with rainfall the main source in Ruhango with lesser application in five other districts, rain-harvesting has its highest usage in Rusizi at

32% and Ruhango at 22% as the source of their irrigation water, WASAC is reported as a source in five districts with Kicukiro at 31% and Rulindo at 20% the highest percentage usage, underground water is the primary source in nine district and not reported used in ten districts, lake water is the total source in Burera and Bugesera districts, while stream water is the primary source in twelve districts. Recycled water is reported used in three districts to a lesser extent and other sources of water are reported being used in eight district with Nyarugenge reporting this as 57% of their source of irrigation water.

3.3.2. Erosion control

Erosion refers to the process in which the earth's surface is worn away. Due to the mountainous landscape of Rwanda, most of the agricultural operators practice anti-erosive activities to minimize and reduce the degree of wasting away of their topsoil.

Table 43. Season A, Percentage of plot with Anti-erosion activities use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	68.9	31.1	100
Intensive cropland in marshlands	74.8	25.2	100
Rangelands	23.2	76.8	100
Overall	67.6	32.4	100
LSF	69.2	30.8	100

2017 Seasonal Agricultural Survey - Season A

The survey results show the distribution of anti-erosion activities within strata. During the 2017 Season A the SSF reported to have practiced erosion control on two-thirds of their cropland which is only slightly less than the 69% of cropland that erosion control practices are utilized by the LSF. However, erosion control is practiced to a lesser extent by the SSF in the rangeland strata at only 23% of the cropland having reported a control applied.

Table 44. Season A, Percentage of plot with Anti-erosion activities use per District

District	Used	Not used	Total
Nyarugenge	58.0	42.0	100
Gasabo	71.9	28.1	100
Kicukiro	51.7	48.3	100
Nyanza	72.1	27.9	100
Gisagara	84.0	16.1	100
Nyaruguru	86.0	14.0	100
Huye	73.4	26.6	100
Nyamagabe	85.7	14.3	100
Ruhango	89.9	10.1	100
Muhanga	66.3	33.8	100
Kamonyi	83.8	16.2	100
Karongi	78.6	21.4	100
Rutsiro	77.3	22.7	100
Rubavu	51.9	48.2	100
Nyabihu	63.6	36.4	100
Ngororero	60.3	39.7	100
Rusizi	51.2	48.8	100

District	Used	Not used	Total
Nyamasheke	70.8	29.2	100
Rulindo	81.5	18.5	100
Gakenke	97.3	2.7	100
Musanze	77.4	22.6	100
Burera	80.1	20.0	100
Gicumbi	90.8	9.2	100
Rwamagana	73.1	26.9	100
Nyagatare	48.4	51.6	100
Gatsibo	51.6	48.4	100
Kayonza	55.4	44.6	100
Kirehe	48.3	51.7	100
Ngoma	68.8	31.2	100
Bugesera	51.0	49.0	100
Overall	67.6	32.4	100

2017 Seasonal Agricultural Survey - Season A

The survey results show the distribution of anti-erosion activities within districts.
In season A 2017 twenty-one districts are estimated to have erosion controls applied to 60% or more their cropland. Only Nyagatare and Kirehe at 48% report erosion controls used on less than half their cropland land (see Table 44).

Table 45. Season A, Type of anti-erosion activities by stratum (Percentages)

Stratum	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/grasses	Water drainage	Mulching	Beds/ridges	Others	Total
Intensive cropland on hillsides	13.6	2.9	4.5	9.7	59.2	0.8	3.7	5.3	0.4	100
Intensive cropland in marshlands	7.8	1.2	0.2	1.1	22.4	45.3	0.4	20.5	1.1	100
Rangelands	24.5	16.3	-	5.4	34	0.7	17.7	0.7	0.7	100
Overall	13	2.8	3.9	8.6	54.4	6.2	3.5	7.1	0.5	100
LSF	27.7	5.5	5.1	2.7	18.4	28.2	6.7	4.5	1.3	100

2017 Seasonal Agricultural Survey - Season A

The Survey showed that in Season A 2017, in Rwanda the methods of erosion control vary widely but cover plants/grasses are the major erosion control method practiced by SSF at 54% of the cropland reported utilizing a control method. The LSF are more diversified with implementation of water drainage and ditching each at 28% usage as their preferred method of erosion control followed by cover plants/grasses at 18% (see Table 45).

Table 46. Season A, Types of anti-erosion activities by district (Percentages)

District	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Nyarugenge	16.4	1.9	1.4	16.0	58.2	-	4.2	1.4	0.5	100
Gasabo	2.6	2.2	0.7	13.8	75.5	3.0	0.7	1.5	-	100
Kicukiro	32.0	-	4.6	12.4	43.8	0.5	2.6	4.1	-	100
Nyanza	7.0	3.0	0.4	-	68.2	0.4	1.5	19.6	-	100
Gisagara	33.7	0.3	5.0	6.0	33.9	13.0	0.8	7.1	0.3	100
Nyaruguru	11.2	1.9	4.5	14.9	58.9	0.8	0.3	6.9	0.5	100
Huye	15.5	0.6	-	0.3	58.5	22.7	0.9	1.2	0.3	100
Nyamagabe	4.5	0.8	7.9	5.3	66.7	3.4	1.1	7.1	3.2	100
Ruhango	7.8	1.0	-	2.9	67.4	9.7	2.6	8.6	-	100
Muhanga	31.3	0.8	5.7	4.6	53.3	0.8	0.3	3.0	0.3	100
Kamonyi	11.4	0.4	-	26.2	55.6	3.2	2.0	1.0	0.2	100
Karongi	7.8	0.3	4.7	23.8	55.3	4.1	3.1	0.6	0.3	100

District	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Rutsiro	9.8	1.6	7.8	18.4	46.6	8.3	4.7	1.0	1.8	100
Rubavu	3.5	22.9	-	14.6	13.9	-	1.4	43.8	-	100
Nyabihu	2.9	4.2	15.8	10.0	53.9	-	1.2	12.0	-	100
Ngororero	9.9	1.4	2.8	29.3	49.5	2.5	2.2	2.2	0.3	100
Rusizi	10.0	7.0	-	8.9	39.4	31.3	2.3	0.8	0.4	100
Nyamasheke	18.2	4.8	11.0	2.1	55.3	0.7	4.5	2.8	0.7	100
Rulindo	-	1.0	3.1	10.4	80.3	1.6	1.0	2.6	-	100
Gakenke	2.9	7.1	4.4	2.7	76.5	2.9	2.9	0.2	0.4	100
Musanze	2.6	5.4	4.4	6.7	25.6	3.1	0.3	51.7	0.5	100
Burera	2.0	1.4	6.3	7.1	37.6	2.9	-	42.5	0.3	100
Gicumbi	1.9	1.5	10.5	7.5	75.8	2.2	0.2	0.4	-	100
Rwamagana	6.6	3.7	6.6	3.0	66.0	3.4	8.2	2.3	0.2	100
Nyagatare	11.2	5.2	-	8.6	54.5	12.5	5.7	1.2	1.1	100
Gatsibo	15.8	3.2	-	1.4	62.7	6.8	5.6	3.6	1.0	100
Kayonza	17.9	4.5	5.6	0.4	37.7	9.5	20.0	4.5	-	100
Kirehe	28.7	4.3	0.5	1.3	45.4	11.4	6.9	1.5	-	100
Ngoma	6.4	0.8	-	2.8	81.2	2.8	5.2	0.8	-	100
Bugesera	48.2	1.5	1.5	11.2	33.0	2.0	-	2.5	-	100
Overall	13.0	2.8	3.9	8.6	54.4	6.2	3.5	7.1	0.5	100

2017 Seasonal Agricultural Survey - Season A

Table 46 shows how erosion control measures had been used within districts in season A 2017. Looking across districts the methods used by SSF of erosion control vary widely based on which method is most applicable to local conditions. For example ditches are in common usage in all districts but one and only in Bugesera at 48% is it the preferred method of the district's cropland erosion control. The same can be said for the trees/wind breaks/shelterbelts method which is applied in all districts but one and only in Rubavu at 22% is it main erosion control measure. Bench terraces are being utilized to a lesser extent in Nyabihu at 16%, Nyamasheke at 11% and Gicumbi at 10.5% as protection for cropland where erosion control is practiced in each of these districts. Progressive terraces are utilized in all but one district but are not a preferred method with its usage the highest in Ngororero at 29%, Kamonyi at 26%, and Karongi at 24%. Cover plants/grasses are the predominate method of erosion control in 26 of the 30 districts with its lowest usage in Rubavu at 14% and Musanze at 26% as those district's form of erosion control. Water drainage is in use in all districts to some lesser degree but three but its highest usage is in Rusizi at 31% and Huye at 23%. Likewise mulching is used to a lesser extent in all districts but two and its highest usage is in Kayonza at 20%. Beds/ridges are used to some lesser degree in most districts but is the predominant form of erosion control in Musanze at 52%, in Rubavu at 44%, and in Burera at 42.5%. There are other forms of erosion control used in 17 of the 30 districts but mostly account for only a fraction of the total area cropland protected by erosion controls in those districts.

Table 47. Season A, Degree of erosion per stratum (Percentage)

Stratum	Severe (Rill erosion, Gully erosion, Mass movement/ landslides)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Intensive cropland on hillsides	1.2	8.9	89.8	100
Intensive cropland in marshlands	0.1	4.3	95.6	100
Rangelands	1.4	5.5	93.1	100
Overall	1.1	8.2	90.7	100
LSF	5.0	8.5	86.5	100

2017 Seasonal Agricultural Survey - Season A

Degree of erosion refers to the level of erosion on the soil as one drop reaches the ground it creates erosion. The survey results indicate that in season A 2017 the degree erosion observations estimate that 91% of SSF cultivated land had minimal to low degree of "splash" erosion, 8.5% has a moderate degree, and 1% severe erosion. This compares to LSF cultivated land which was observed to have 86.5% of its cultivated land minimally to lowly eroded, 8.5% moderately eroded, and 5% severely eroded (see Table 47).

Table 48. Season A, Degree of erosion per district (Percentage)

District	Severe (Rill erosion, Gully erosion, Mass movement/ landslide)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Nyarugenge	0.3	6.5	93.2	100
Gasabo	0.7	7.7	91.6	100
Kicukiro	0.0	0.7	99.3	100
Nyanza	1.2	5.3	93.5	100
Gisagara	0.0	4.0	96.0	100
Nyaruguru	0.0	13.0	87.0	100
Huye	0.0	0.0	100.0	100
Nyamagabe	0.0	2.7	97.3	100
Ruhango	0.0	1.1	98.9	100
Muhanga	0.3	9.0	90.8	100
Kamonyi	1.3	15.9	82.8	100
Karongi	0.3	34.6	65.1	100
Rutsiro	1.8	29.0	69.2	100
Rubavu	0.4	11.1	88.5	100

District	Severe (Rill erosion, Gully erosion, Mass movement/ landslide)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Nyabihu	11.2	14.5	74.3	100
Ngororero	0.5	24.5	75.0	100
Rusizi	0.4	19.1	80.5	100
Nyamasheke	1.8	12.6	85.5	100
Rulindo	0.5	4.0	95.5	100
Gakenke	3.7	3.9	92.4	100
Musanze	0.3	2.5	97.3	100
Burera	4.9	13.6	81.5	100
Gicumbi	0.5	9.6	89.9	100
Rwamagana	0.0	3.8	96.2	100
Nyagatare	1.2	3.3	95.4	100
Gatsibo	0.4	3.4	96.3	100
Kayonza	0.1	3.4	96.5	100
Kirehe	2.5	3.4	94.1	100
Ngoma	0.3	5.4	94.3	100
Bugesera	0.0	3.6	96.4	100
Overall	1.1	8.2	90.7	100

2017 Seasonal Agricultural Survey - Season A

Table 48 shows the degree of erosion within districts in Season A 2017, the SSF land at the district level with the most severely eroded land is Nyabihu at 11% and Burera at 5%. The degree of SSF land across districts with moderate erosion varies considerably with the highest observed moderate erosion in Karongi at 35%, Rutsiro at 29%, and Ngororero at 24.5%.

Chapter 4: Results of the 2017 Season B

4.1. Farm characteristics

4.1.1. Areas

4.1.1.1. Agricultural land use area for potential arable land

Table 49. Season A, Agricultural land use area for potential arable land per stratum (Ha)

Stratum	Cultivated Land	Pasture	Fallow	Non-agricultural land	Total
Intensive cropland on hillsides	844,770	30,585	170,533	395,386	1,441,273
Intensive cropland in marshlands	27,234	3,416	13,877	46,056	90,582
Rangelands	25,026	124,939	4,672	22,032	176,669
SSF	897,029	158,939	189,081	463,474	1,708,524
LSF	18,097	6,220	2,039	1,042	27,398
Total	915,126	165,159	191,120	464,516	1,735,922

2017 Seasonal Agricultural Survey - Season B

Potential arable land refers to the three main USAS stratum plus large scale farmer land area (see table 49). The table indicates that land use area within each stratum for Season B with a total cultivated land at 915,126 hectares out of a total of 1,735,922 hectares and relatively closely equal amounts of land being utilized for pasture and being lay fallow.

Table 50. Season A, Agricultural land use area for potential arable land per district (Ha)

District	Cultivated Land	Pasture	Fallow	Non-agricultural land	Total
Nyarugenge	4,083	160	733	2,574	7,551
Gasabo	16,703	138	4,308	6,918	28,066
Kicukiro	4,280	463	1,808	3,584	10,135
Nyanza	29,248	702	12,720	15,307	57,976
Gisagara	29,915	891	8,061	15,211	54,079
Nyaruguru	14,307	31	7,947	24,878	47,163
Huye	16,011	848	6,162	20,422	43,444
Nyamagabe	19,614		9,695	24,213	53,522
Ruhango	30,485	234	9,869	14,667	55,254
Muhanga	29,633		9,698	12,166	51,498
Kamonyi	37,281		7,057	12,991	57,329
Karongi	21,079		9,258	26,354	56,691
Rutsiro	21,054	6,214	8,443	19,162	54,874
Rubavu	15,721	1,404	2,393	8,154	27,672
Nyabihu	22,393	3,526	6,468	8,306	40,693

District	Cultivated Land	Pasture	Fallow	Non-agricultural land	Total
Ngororero	23,027	2,426	7,844	22,483	55,780
Rusizi	27,233	8	1,955	10,156	39,351
Nyamasheke	25,624	54	2,481	17,107	45,266
Rulindo	23,288		2,616	17,613	43,517
Gakenke	35,840		4,249	17,187	57,276
Musanze	19,819	1,529	5,228	8,113	34,688
Burera	28,664	18	2,909	13,882	45,473
Gicumbi	44,547	854	7,317	10,736	63,455
Rwamagana	36,148	4,721	3,750	12,076	56,695
Nyagatare	66,321	76,054	7,071	8,145	157,590
Gatsibo	53,228	17,032	2,935	13,179	86,375
Kayonza	51,590	30,807	6,923	22,390	111,711
Kirehe	54,244	6,992	2,810	26,357	90,402
Ngoma	43,098	3,835	4,083	24,078	75,094
Bugesera	52,549		22,291	25,065	99,905
SSF	897,029	158,939	189,081	463,474	1,708,524
LSF	18,097	6,220	2,039	1,042	27,398
Total	915,126	165,159	191,120	464,516	1,735,922

2017 Seasonal Agricultural Survey - Season B

Table 50 illustrates the distribution of land use area within districts whereby in Season B cultivated land is dominated by Nyagatare district at 66,321 ha followed by Kirehe and then by Gatsibo while large scale farmers are cultivating 18,097 ha of the arable land.

4.1.1.2. Crop area

In general, all crops are cultivated to a high degree in stratum of intensive cropland on hillsides. However, paddy rice makes an exception as it is mainly found in the stratum of marshlands and large scale farmers who are major contributors to the total paddy rice area under cultivation in Season B.

Table 51. Season A, Cultivated area by crop type by stratum (Ha)

	Stratum						
	Intensive cropland on hillsides	Intensive cropland Marshland	Rangelands	SSF Total	LSF Total	TOTAL	Percent
Cereals	**187,097**	**7,613**	**13,775**	**208,486**	***15,268***	***223,754***	**18.7**
Maize	74,015	2,057	8,179	84,252	878	85,130	7.1
Sorghum	103,481	3,604	5,338	112,422	272	112,694	9.4
Paddy rice	1,236	1,953		3,189	14,094	17,283	1.4
Wheat	7,193	-	236	7,430	18	7,448	0.6
Other Cereals	1,172	-	22	1,193	6	1,199	0.1
Tubers and Roots	**301,822**	**11,261**	**4,389**	**317,473**	***208***	***317,680***	**26.6**
Cassava	159,785	1,900	2,757	164,443	86	164,529	13.8
Sweet potato	77,276	7,182	709	85,166	34	85,200	7.1
Irish potato	44,022	943	871	45,836	87	45,923	3.8
Yams & Taro	20,738	1,237	52	22,027	0	22,028	1.8
Bananas	**219,375**	**1,755**	**5,217**	**226,347**	***125***	**226,472**	**19.0**
Cooking Banana	88,566	462	4,427	93,455	93	93,549	7.8
Dessert banana	31,946	438	172	32,556	19	32,575	2.7
Banana for beer	98,864	854	618	100,335	13	100,348	8.4
Legumes and Pulses	**315,037**	**6,583**	**15,355**	**336,976**	***695***	**337,671**	**28.3**
Beans	256,822	5,235	13,887	275,944	491	276,435	23.2
Bush bean	174,336	3,413	13,721	191,470	485	191,955	16.1
Climbing bean	82,487	1,823	166	84,475	6	84,481	7.1
Pea	10,136	60	80	10,276	22	10,298	0.9
Groundnut	19,316	142	986	20,444	8	20,451	1.7
Soyabean	28,763	1,146	402	30,311	175	30,486	2.6
Vegetables and Fruits	**23,755**	**1,668**	**162**	**25,586**	***268***	**25,854**	**2.2**
Vegetables	17,205	1,629	100	18,934	76	19,010	1.6
Fruits	6,550	39	63	6,652	192	6,844	0.6
Other crops	58,145	2,076	437	60,659	1,701	62,359	5.2
Developed land	**1,105,232**	**30,957**	**39,336**	**1,175,525**	**18,266**	**1,193,791**	**100.00**
Agricultural Physical land	844,770	27,234	25,026	897,029	18,097	915,126	
Fallow land	170,533	13,877	4,672	189,081	2,039	191,120	

2017 Seasonal Agricultural Survey - Season B

Note that the reported area of large scale farmers is not included in the strata area although their land is also potentially located in a sample segment and when this occurs any duplicated data is administratively removed at headquarters during the processing of the survey data.

The total "developed land" means simply the cropland with regards to perennial crops being under cultivation using standard practices and being sometimes mixed with seasonal crops while the "agricultural physical land" is defined as including only arable land actually being cultivated with crops.

The survey results indicate that the four largest main cultivated crops grown in the 2017 Season B were Beans at 276,435 ha is the largest planted crop and this estimate is a 18% increase from the 2016 B estimates, bananas are the second largest with a 27% decrease from 2016 B estimates, cassava at 164,529 ha is the third largest but with a 41% decrease in area from 2016 B estimates, and the sorghum is the fourth largest cultivated crop at 112,694 ha which is a 13% decrease from 2016 B estimates (see Table 51).

Table 52. Season B, Cultivated area by crop type by province (Ha)

Crop/Crop category	Cereals	Maize	Sorghum	Paddy rice	Wheat	Other cereals	Tubers and Roots	Cassava	Sweet potato	Irish potato
Kigali City	**6,895**	2,231	4,639	25	-	-	**5,938**	3,465	1,408	382
Southern Province	**40,356**	9,159	28,169	1,562	1,261	205	**94,165**	52,464	28,372	5,531
Western Province	**16,910**	9,857	2,655	279	3,782	337	**92,507**	44,704	22,023	19,190
Northern Province	**28,939**	8,984	18,074	-	1,881	-	**48,812**	13,737	16,425	15,805
Eastern Province	**115,384**	54,019	58,886	1,322	505	651	**76,050**	50,074	16,938	4,928
SSF Total	**208,486**	84,252	112,422	3,189	7,430	1,193	**317,473**	164,443	85,166	45,836
LSF Total	**15,268**	878	272	14,094	18	6	**208**	86	34	87
Overall Total 2017 B	**223,754**	85,130	112,694	17,283	7,448	1,199	**317,680**	164,529	85,200	45,923
Overall Total 2016 B	**220,710**	66,843	129,884	16,389	6,494	1,099	**422,949**	277,804	70,530	52,185
Percentage change	**1%**	27%	-13%	5%	15%	9%	**-25%**	-41%	21%	-12%

Table 52. Season B, Cultivated area by crop type by province (Ha) (Cont'd)

Crop/Crop category	Yams & Taro	Bananas	Cooking banana	Dessert banana	Banana for beer	Legumes and Pulses	Beans	Bush bean	Climbing bean	Pea
Kigali City	683	**6,151**	2,287	1,604	2,260	**8,694**	**7,401**	7,212	189	217
Southern Province	7,799	**58,457**	8,849	10,523	39,085	**89,385**	**65,317**	49,451	15,866	3,325
Western Province	6,590	**33,187**	6,611	5,870	20,707	**40,610**	**32,183**	9,541	22,642	2,616
Northern Province	2,845	**29,842**	7,972	7,440	14,429	**56,341**	**51,239**	12,679	38,560	2,708
Eastern Province	4,111	**98,710**	67,737	7,118	23,855	**141,946**	**119,805**	112,587	7,218	1,410
SSF Total	22,027	**226,347**	93,455	32,556	100,335	**336,976**	**275,944**	191,470	84,475	10,276
LSF Total	0	**125**	93	19	13	**695**	**491**	485	6	22
Overall Total 2017 B	22,028	**226,472**	93,549	32,575	100,348	**337,671**	**276,435**	191,955	84,481	10,298
Overall Total 2016 B	22,429	**310,756**	115,038	36,015	159,703	**281,829**	**234,057**	159,143	74,913	8,900
Percentage change	-2%	**-27%**	-19%	-10%	-37%	**20%**	**18%**	21%	13%	16%

Table 52. Season B, Cultivated area by crop type by province (Ha) (Cont'd)

Crop/Crop category	Groundnut	Soybean	Vegetables and Fruits	vegetables	Fruits	Other crops	*Developed land*	*Agricultural physical land*	*Fallow land*
Kigali City	414	662	**1,337**	946	391	**3,803**	**32,818**	**25,067**	**6,849**
Southern Province	4,971	15,772	**5,499**	4,235	1,264	**14,632**	**302,495**	**206,495**	**71,209**
Western Province	-	5,810	**7,038**	5,791	1,246	**17,177**	**207,428**	**156,131**	**38,842**
Northern Province	147	2,248	**5,145**	3,800	1,346	**9,107**	**178,187**	**152,158**	**22,319**
Eastern Province	14,912	5,819	**6,567**	4,162	2,406	**15,939**	**454,597**	**357,179**	**49,863**
SSF Total	20,444	30,311	**25,586**	18,934	6,652	**60,659**	**1,175,525**	**897,029**	**189,081**
LSF Total	8	175	**268**	76	192	**1,701**	**18,266**	**18,097**	**2,039**
Overall Total 2017 B	20,451	30,486	**25,854**	19,010	6,844	**62,359**	**1,193,791**	**915,126**	**191,120**
Overall Total 2016 B	14,142	24,730	**20,892**	12,451	8,440	**59,810**	**1,316,946**	**1,193,872**	**220,838**
Percentage change	45%	23%	**24%**	53%	-19%	**4%**	**-9%**	**-23%**	**-13%**

2017 Seasonal Agricultural Survey - Season B

The 2017 survey results indicated that province with the largest overall Season B crop cultivated area was Eastern province at 357,179 ha, the second largest was southern province at 206,495 ha, and the third largest was western province at 156,131 ha (see Table 52). District level estimates are found in appendix.

4.1.1.3. Plot Size

Table 53. Season B, Average plot size per crop type by stratum (Ha/100)

Crop	Intensive cropland on hillside	Intensive cropland in marshland	Rangelands	Total	LSF
Maize	2.8	17.5	9.5	4.6	4.6
Sorghum	9.7	5.5	31.1	10.9	4.6
Paddy rice	7.5	13.9	0.0	12.2	169.8
Wheat	6.6	0.0	5.0	6.6	2.3
Other cereals	3.4	0.0	7.8	3.5	0.6
Cassava	3.6	2.2	9.6	3.8	1.1
Sweet potato	2.8	3.6	5.3	3.0	0.6
Irish potato	4.4	7.6	7.2	4.8	1.7
Taro	2.1	1.1	3.6	2.0	0.1
Yams	1.3	0.0	0.0	1.3	0.0
Cooking banana	4.3	3.1	23.9	5.4	0.8
Dessert banana	2.7	2.8	3.3	2.7	0.4
Banana for beer	4.4	5.1	10.6	4.6	0.7
Bush bean	5.9	6.0	38.9	8.5	2.2
Climbing bean	5.1	4.6	8.2	5.1	1.2
Pea	2.0	2.5	5.6	2.1	4.0

Crop	Intensive cropland on hillside	Intensive cropland in marshland	Rangelands	Total	LSF
Groundnut	4.5	3.8	10.3	5.0	0.4
Soybean	3.2	3.2	19.1	3.9	4.1
vegetables	3.4	2.6	2.2	3.2	0.4
Fruits	4.4	2.0	4.3	4.3	1.1
Other crops	7.0	28.9	6.6	9.2	6.3
Overall average	4.4	7.2	15.9	5.2	10.7

2017 Seasonal Agricultural Survey - Season B

In Season B 2017, the survey results showed that the average size of plots for cultivated land in Rwanda was 5.2 Ares for segments while for large scale farmers the average plot size is 10.7 Ares. The rangeland stratum has the largest overall average plot size at (15.9 Ares) but this is skewed due its limited cultivation of more drought resistant crops.

Concerning crops, plots with paddy rice are the largest with an average of 12.2 Ares in segments, as well as, for the LSF where paddy plots are an average of 169.8 Ares (See table 53).

Table 54. Season B, Average plot size per crop type by district (Ha/100)

District	Maize	Paddy rice	Sorghum	Wheat	Other cereals	Cassava	Irish potato	Sweet potato	Taro	Yarms	Bush bean	Climbing bean	Pea	Groundnut	Soybean
Nyarugenge	1.6	9.2	-	-	-	4.2	2.0	1.3	2.6	-	4.8	2.2	1.3	1.5	1.8
Gasabo	2.6	10.0	9.4	-	-	2.5	4.3	3.0	4.5	-	8.9	2.9	1.1	2.1	4.4
Kicukiro	2.2	12.6	-	-	-	3.3	2.1	8.6	1.4	1.6	5.8	4.8	1.0	2.1	3.6
Nyanza	1.2	6.7	7.5	-	-	4.0	3.2	2.2	1.0	-	3.3	3.1	1.5	4.6	3.4
Gisagara	1.0	3.7	5.0	-	-	2.0	2.1	1.9	0.8	0.7	3.0	4.3	1.2	2.1	3.0
Nyaruguru	2.1	4.7	-	2.9	3.9	1.9	2.9	2.7	0.9	-	2.1	3.0	1.6	-	2.8
Huye	1.3	5.9	4.5	-	-	1.9	1.6	1.6	0.8	-	4.0	3.7	0.6	1.5	3.3
Nyamagabe	1.2	2.3	-	7.4	3.8	1.6	1.8	2.8	1.6	0.4	1.4	2.7	1.5	-	1.4
Ruhango	1.0	4.4	9.4	-	-	4.3	2.4	1.8	1.2	1.2	2.2	5.4	0.9	3.2	2.1
Muhanga	1.1	3.0	5.7	-	4.1	2.2	1.8	0.5	1.4	-	2.3	2.9	1.0	-	3.6
Kamonyi	0.6	6.1	2.1			2.0	1.7	1.3	0.8	1.0	3.6	4.3	0.7	1.7	2.9
Karongi	1.3	4.6	-	1.8	6.0	2.8	2.4	1.7	1.5	-	3.6	2.2	1.2	-	2.1
Rutsiro	2.4	2.8	-	7.5	-	1.2	3.0	4.3	1.6	-	1.1	5.6	4.8	-	2.0
Rubavu	9.4	8.7	-	15.3	-	8.0	7.3	13.6	1.6	-	2.2	3.9	3.8	-	1.4
Nyabihu	2.4	-	-	6.0	-	1.3	1.2	9.5	1.4	-	1.9	2.0	2.2	-	1.7
Ngororero	0.6	-	5.9	2.8	-	1.6	1.6	2.7	1.7	-	1.7	2.3	1.1	-	1.4
Rusizi	8.1	2.8	21.0	-	-	7.6	2.7	0.9	1.5	1.6	6.2	7.2	0.2	-	4.4
Nyamasheke	0.8	0.6	6.8	-	-	3.8	3.0	0.8	2.4	0.9	1.9	4.8	0.5	-	2.7
Rulindo	1.5	10.2	-	6.7	-	1.9	2.4	3.9	0.9	0.4	4.9	4.6	3.3	1.9	2.1
Gakenke	2.8	7.3	-	10.2	-	1.5	2.8	1.6	2.7	-	6.2	4.6	1.8	-	1.7
Musanze	3.2	-	-	12.1	-	0.5	1.8	17.8	1.0	-	0.7	5.9	4.3	-	4.3
Burera	2.6	6.0		5.8		0.4	2.6	6.8	2.1		4.0	6.3	2.5		0.5

District	Maize	Paddy rice	Sorghum	Wheat	Other cereals	Cassava	Irish potato	Sweet potato	Taro	Yarms	Bush bean	Climbing bean	Pea	Groundnut	Soybean
Gicumbi	1.1	7.1	-	1.4	-	2.0	2.3	10.7	0.9	-	3.0	4.7	2.6	-	2.7
Rwamagana	3.3	14.8	5.9	-	-	2.3	2.6	3.2	5.1	-	9.0	2.7	2.6	2.1	2.3
Nyagatare	9.8	15.9	33.2	-	-	6.1	5.9	3.6	2.6	-	21.1	4.6	3.2	10.1	5.2
Gatsibo	4.1	13.2	21.9	9.2	-	3.8	4.2	3.7	3.1	-	22.4	7.5	1.6	5.7	4.9
Kayonza	5.7	26.0	9.1	-	7.8	8.7	4.8	3.1	3.3	-	12.3	18.1	3.3	4.6	4.5
Kirehe	3.0	11.6	10.0	-	-	5.2	3.2	3.3	2.5	-	9.2	15.8	2.3	5.1	15.9
Ngoma	2.3	14.8	3.2	-	-	5.3	3.6	2.4	2.4	1.4	7.6	16.8	-	2.5	2.4
Bugesera	29.2	15.1	27.4	-	2.9	5.1	3.7	-	2.6	2.3	9.0	3.6	0.6	7.2	3.4
Total	4.6	10.9	12.2	6.6	3.5	3.8	3.0	4.8	2.0	1.3	8.5	5.1	2.1	5.0	3.9

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Table 55. Season B, Average plot size per crop type by district (Ha/100) *(Cont.)*

District	Cooking banana	Dessert banana	Banana for beer	vegetables	Fruits	Other crops	Total
Nyarugenge	3.5	2.7	7.3	3.7	4.8	74.0	10.1
Gasabo	3.9	4.0	4.3	3.3	5.0	32.2	7.4
Kicukiro	3.8	2.9	7.4	5.2	4.1	19.0	6.0
Nyanza	1.6	2.5	2.5	3.7	2.6	22.2	4.7
Gisagara	1.6	1.6	2.3	1.9	0.7	4.1	2.4
Nyaruguru	1.9	1.6	3.3	1.3	1.3	3.9	2.6
Huye	5.1	1.8	2.6	1.2	-	3.6	2.7
Nyamagabe	1.5	2.1	3.4	1.6	2.8	4.5	2.2
Ruhango	1.2	3.0	3.4	1.3	9.5	2.4	3.1
Muhanga	1.6	2.3	6.5	1.4	0.2	2.5	2.4
Kamonyi	1.8	2.4	5.0	1.8	2.7	3.0	2.6
Karongi	1.7	2.2	7.0	1.4	0.4	6.5	2.9
Rutsiro	1.8	1.3	1.9	2.0	2.7	9.4	3.7
Rubavu	8.7	2.6	1.8	7.9	2.3	6.4	6.8
Nyabihu	1.1	1.1	1.6	4.8	8.9	8.1	4.4
Ngororero	1.2	2.2	3.3	1.3	3.5	5.1	2.1
Rusizi	2.9	2.0	3.8	3.4	5.0	4.9	4.7
Nyamasheke	0.9	1.1	3.4	1.8	2.9	8.4	3.2
Rulindo	1.5	2.7	3.5	2.7	1.0	10.1	3.6
Gakenke	3.1	4.1	7.5	1.8	2.2	3.4	3.4
Musanze	1.8	1.8	1.7	3.9	10.4	5.5	5.3
Burera	2.1	1.9	2.6	2.0	4.0	2.9	3.7
Gicumbi	1.8	1.8	2.4	2.6	7.5	5.0	3.7

District	Cooking banana	Dessert banana	Banana for beer	vegetables	Fruits	Other crops	Total
Rwamagana	5.7	2.1	4.0	3.4	7.4	9.2	5.3
Nyagatare	15.2	4.9	5.3	10.1	2.7	4.9	9.7
Gatsibo	7.6	2.5	4.6	2.3	3.8	4.9	6.8
Kayonza	10.2	3.1	6.4	3.3	4.7	4.0	7.8
Kirehe	9.0	4.3	9.5	4.8	4.3	4.0	6.9
Ngoma	8.0	3.5	3.0	4.7	7.0	3.0	5.2
Bugesera	9.1	4.9	5.5	8.0	3.3	5.1	8.6
Total	5.4	2.7	4.6	3.2	4.3	9.2	5.2

2017 Seasonal Agricultural Survey - Season B

In season B 2017, the survey results showed that Nyarugenge district has the largest plots with an average plot size of 10.1 Ares followed by Nyagatare at 9.7 and the smallest average size is Ngororero with 2.1 Ares of average plot size (See Table 54).

4.1.2. Crop Yield

Crop yield refers to the measure of production of a crop per unit area of land cultivation of that crop and this is done for both province and district levels (see Table 55). District level estimates are found in appendix.

Table 56. Season B, Yield of main crops by Province (Kg/Ha)

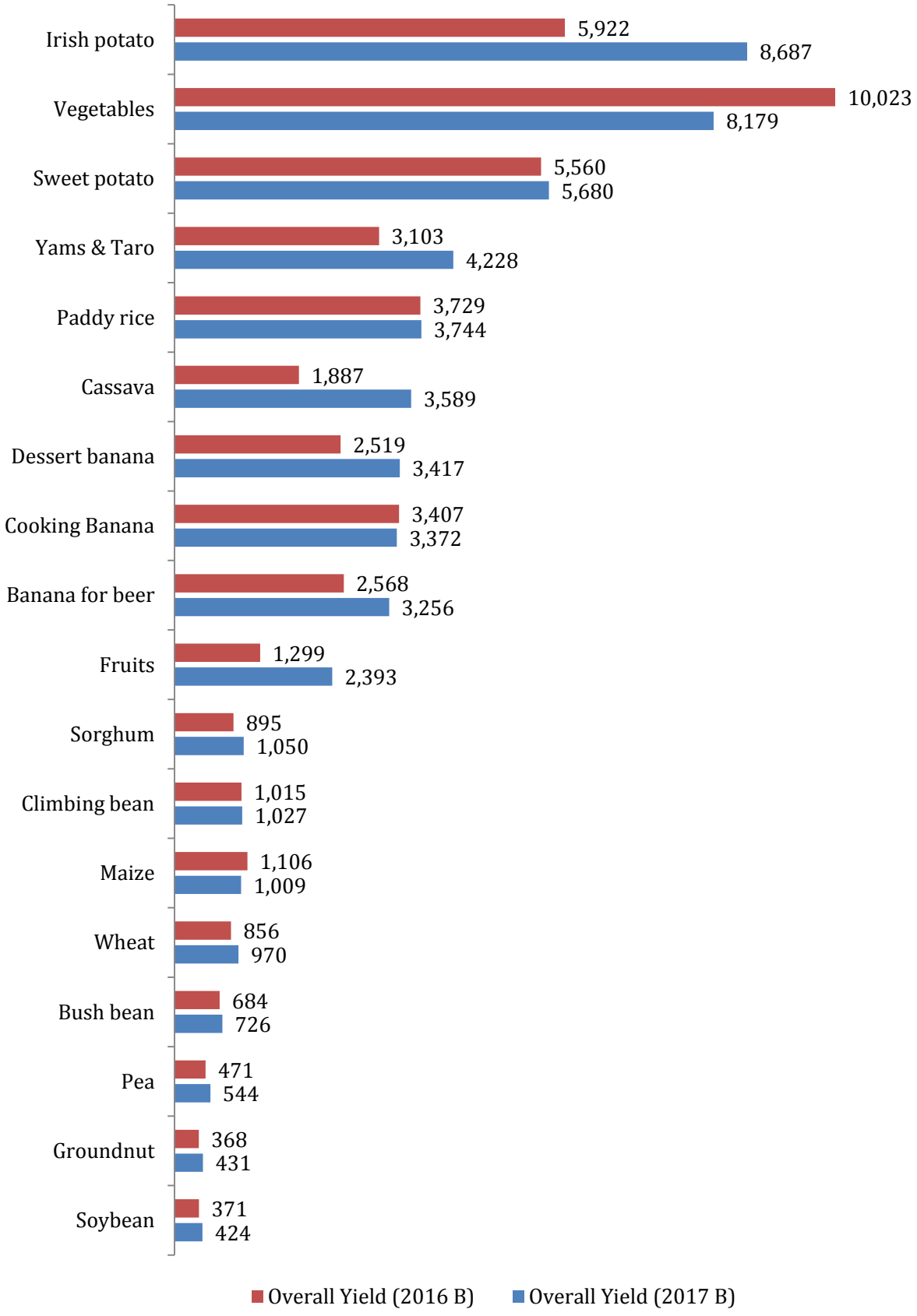
Crop	Maize	Sorghum	Paddy rice	Wheat	Cassava	Sweet potato	Irish potato	Yams & Taro	Cooking Banana
Kigali City	719	1,149	-	-	2,372	4,971	5,024	2,682	4,172
Southern Province	805	1,036	3,023	617	4,557	5,779	5,047	4,234	3,197
Western Province	788	1,143	3,558	885	3,603	5,759	10,493	4,219	4,962
Northern Province	853	1,192	-	1,291	3,435	6,003	9,530	6,568	3,762
Eastern Province	1,087	1,001	3,304	1,272	2,676	5,157	3,265	2,867	3,167
SSF Total	987	1,050	3,162	969	3,585	5,680	8,681	4,228	3,372
LSF Total	3,152	915	3,876	1,526	11,224	4,798	11,889	1,008	4,006
Overall Yield (2017 B)	1,009	1,050	3,744	970	3,589	5,680	8,687	4,228	3,372
Overall Yield (2016 B)	1,106	895	3,729	856	1,887	5,560	5,922	3,103	3,407

Table 56. Season B, Yield of main crops by Province (Kg/Ha) (Cont'd)

Crop	Dessert banana	Banana for beer	Bush bean	Climbing bean	Pea	Groundnut	Soybean	Vegetables	Fruits
Kigali City	3,916	3,406	763	1,633	605	581	535	9,098	1,745
Southern Province	3,248	3,476	762	1,015	519	462	399	6,535	3,480
Western Province	2,992	3,341	563	793	503	-	385	8,113	1,555
Northern Province	4,299	3,109	578	1,163	668	741	454	10,868	2,093
Eastern Province	2,982	2,895	737	1,048	436	413	479	7,290	2,594
SSF Total	3,417	3,256	725	1,027	544	430	419	8,181	2,417
LSF Total	3,883	4,284	966	1,328	242	692	1,301	7,567	1,574
Overall Yield (2017 B)	3,417	3,256	726	1,027	544	431	424	8,179	2,393
Overall Yield (2016 B)	2,519	2,568	684	1,015	471	368	371	10,023	1,299

2017 Seasonal Agricultural Survey - Season B

Figure 8. Season B, Comparison of Yields 2016 and 2017 of main crops (Kg/Ha) at national level



4.1.3. Crop Production

Crop production is calculated by using the summation of production estimated for each crop at each province level. During 2017 Season B in terms of production grown, cassava was 590,481 MT, a 13% increase from the 2016 production estimates, sweet potatoes were 483,898 MT, a 23% increase from 2016 estimates, and Irish potatoes were 398,934MT, a 29% increase from 2016 estimates. District level estimates are found in appendix.

Table 57. Season B, Production of main crops by province (MT)

Crop	Maize	Sorghum	Paddy rice	Wheat	Cassava	Sweet potato	Irish potato	Yams & Taro	Cooking Banana
Kigali City	1,605	5,330	-	-	8,219	7,001	1,920	1,831	9,540
Southern Province	7,378	29,197	4,722	778	239,080	163,950	27,916	33,022	28,287
Western Province	7,767	3,035	994	3,347	161,046	126,835	201,351	27,805	32,802
Northern Province	7,660	21,550	-	2,429	47,183	98,597	150,619	18,685	29,987
Eastern Province	58,735	58,950	4,368	643	133,985	87,352	16,091	11,788	214,492
SSF Total	83,144	118,061	10,084	7,196	589,515	483,734	397,897	93,131	315,108
LSF Total	2,768	249	54,631	28	966	163	1,037	0	373
Overall Total (2017 B)	85,912	118,310	64,715	7,224	590,481	483,898	398,934	93,131	315,481
Overall Total (2016 B)	73,937	116,310	61,114	5,558	524,259	392,114	309,052	69,590	391,886
Percentage change	16%	2%	6%	30%	13%	23%	29%	34%	-19%

Table 57. Season B, Production of main crops by province (MT) (Cont'd)

Crop	Dessert banana	Banana for beer	Bush bean	Climbing bean	Pea	Groundnut	Soybean	Vegetables	Fruits
Kigali City	6,282	7,696	5,502	308	131	241	354	8,609	682
Southern Province	34,180	135,861	37,690	16,104	1,724	2,296	6,298	27,677	4,398
Western Province	17,560	69,188	5,372	17,950	1,317	-	2,240	46,985	1,938
Northern Province	31,990	44,866	7,326	44,856	1,809	109	1,021	41,294	2,817
Eastern Province	21,227	69,061	82,984	7,562	614	6,154	2,786	30,336	6,241
SSF Total	111,239	326,673	138,874	86,781	5,595	8,800	12,698	154,901	16,076
LSF Total	74	56	468	8	5	5	228	575	303
Overall Total (2017 B)	111,312	326,729	139,343	86,788	5,600	8,805	12,925	155,476	16,378
Overall Total (2016 B)	90,720	410,186	108,902	76,049	4,192	5,206	9,183	124,801	10,963
Percentage change	23%	-20%	28%	14%	34%	69%	41%	25%	49%

4.1.4. Sowing Date

Sowing dates for crops such as dessert banana, cooking banana, cassava and other crops were not applicable. This is due to the fact that these crops may have been sown in the previous seasons especially for perennial crops.

Table 58. Season B, Sowing dates per crop (Percentage) in segments

Crop	Before 31/12	Between 01-31/01	Between 01-28/02	Between 01-15/03	Between 16-31/03	After 31/03	Not applicable	Total
Maize	0.1	4.7	60.6	28.7	4.6	1.2	0.1	100
Paddy rice	6.4	22.8	59.2	-	10.2	1.4	-	100
Sorghum	2.9	62.0	31.6	2.9	0.2	-	0.5	100
Wheat	-	2.2	8.7	15.2	29.4	44.6	-	100
Bush bean	0.0	4.1	54.5	37.9	2.8	0.5	0.2	100
Climbing bean	0.2	1.2	44.1	36.9	13.0	4.6	0.2	100
Pea	-	4.6	48.2	30.0	10.3	7.0	-	100
Irish potato	0.4	7.8	26.5	20.0	13.8	19.8	11.8	100
Sweet potato	7.9	14.2	26.1	16.9	9.4	24.6	0.8	100
Soybean	0.6	3.6	66.3	23.4	4.4	1.1	0.6	100
Groundnut	0.2	3.6	60.3	33.1	1.5	0.2	1.1	100
Taro	59.4	8.9	7.5	2.2	1.6	1.9	18.6	100
Yam	63.0	3.7	11.1	-	-	-	22.2	100
Cassava	43.6	0.4	0.4	0.1	0.2	0.2	55.2	100
Cooking banana	9.4	0.1	-	0.1	0.1	-	90.4	100
Dessert banana	5.2	0.1	0.1	-	-	0.1	94.5	100
Banana for beer	6.5	-	0.1	0.1	0.1	0.1	93.1	100
Vegetables	13	11	22	13	7	27	6	100
Other crops	10.8	0.9	1.0	2.5	1.6	2.2	80.9	100
Other cereals	0.8	5.8	68.5	20.3	2.5	0.3	2.0	100
Overall	7.2	8.7	34.4	17.3	4.7	4.4	23.3	100

2017 Seasonal Agricultural Survey - Season B

In season B 2017, for the majority of crops, sowing of crops in segments started in February 2017 (34.4%) especially a large portion of the paddy rice which was sown in that period (59.2%) while a large portion of perennial crops such as cassava or banana were “not applicable” based on sowing date due to the fact that they have been planted in the previous seasons (See Table 57).

Table 59. Season B, Sowing dates per crop (Percentage) for Large Scale Farmers

crop	Before 31/12	Between 01-31/01	Between 01-28/02	Between 01-15/03	Between 16-31/03	After 31/03	Not applicable	Total
Maize	0.5	4.3	59.1	25.3	2.7	5.4	2.7	100
Paddy rice	14.5	53.0	27.7	-	2.4	2.4	-	100
Sorghum	-	41.8	45.5	12.7	-	-	-	100
Wheat	-	-	-	12.5	50.0	37.5	-	100
Bush bean	-	0.5	37.8	49.3	11.0	1.5	-	100
Climbing bean	-	-	33.3	33.3	33.3	-	-	100
Pea	-	-	16.7	-	33.3	50.0	-	100
Irish potato	-	2.0	20.0	38.0	30.0	10.0	-	100
Sweet potato	12.2	26.8	4.9	17.1	24.4	14.6	-	100
Soybean	-	-	30.8	56.4	7.7	5.1	-	100
Groundnut	-	-	40.0	60.0	-	-	-	100
Taro	25.0	-	25.0	-	-	25.0	25.0	100
Cassava	20.0	-	4.0	-	-	-	76.0	100
Cooking banana	15.5	-	-	-	-	1.4	83.1	100
Dessert banana	22.2	-	-	-	-	-	77.8	100
Banana for beer	-	-	-	-	-	-	100.0	100
Vegetables	8.6	15.9	19.2	17.2	6.6	32.5	-	100
Other crops	38.0	1.8	15.8	5.0	4.1	5.0	30.3	100
Other cereals	-	-	-	100.0	-	-	-	100
Overall	11.7	9.4	26.9	20.4	6.7	7.8	17.2	100

2017 Seasonal Agricultural Survey - Season B

In Season B 2017 53% of the LSF farmers indicated that they sowed paddy rice before in January 2017 and the majority of other main crops were sown in February (26.9) with the exception of perennial crops which were sown by the majority of LSF farmers in previous seasons and the reason why it is indicated as "Not applicable" as the date of sowing (See Table 58).

Table 60. Season B, Sowing dates per district (Percentage)

District	Before 31/12	Between 01-31/01	Between 01-28/02	Between 01-15/03	Between 16-31/03	After 31/03	Not applicable	Total
Nyarugenge	5.3	7.9	50.0	7.2	0.2	2.6	27.0	100
Gasabo	6.7	12.5	38.8	8.8	2.0	1.3	29.9	100
Kicukiro	11.9	9.8	38.3	11.5	1.3	0.8	26.4	100
Nyanza	2.3	15.6	39.8	10.1	3.8	3.7	24.8	100
Gisagara	8.4	10.0	47.5	7.9	2.2	1.4	22.5	100
Nyaruguru	15.0	15.0	18.2	10.8	4.5	15.8	20.6	100
Huye	11.5	21.4	41.3	5.6	3.4	2.3	14.4	100
Nyamagabe	4.2	17.3	31.5	12.3	6.2	9.6	18.9	100
Ruhango	4.7	13.9	52.6	4.4	0.4	1.9	22.1	100

District	Before 31/12	Between 01-31/01	Between 01-28/02	Between 01-15/03	Between 16-31/03	After 31/03	Not applicable	Total
Muhanga	7.0	4.9	31.2	10.2	3.0	5.6	38.2	100
Kamonyi	9.5	9.1	43.1	11.1	1.6	2.3	23.4	100
Karongi	4.9	7.4	33.3	7.6	4.9	9.9	32.0	100
Rutsiro	9.6	5.1	28.6	9.6	3.9	12.9	30.4	100
Rubavu	0.8	4.3	24.6	27.3	17.6	14.6	10.8	100
Nyabihu	4.5	5.1	17.3	27.4	18.4	17.3	10.1	100
Ngororero	8.5	5.4	20.5	15.3	4.2	13.5	32.6	100
Rusizi	19.1	6.7	26.4	8.5	4.7	4.7	30.0	100
Nyamasheke	9.8	4.1	38.0	5.0	3.0	3.1	37.0	100
Rulindo	3.9	6.5	27.9	18.6	5.5	8.3	29.3	100
Gakenke	3.1	2.5	10.3	18.7	14.0	9.6	41.9	100
Musanze	7.2	2.6	12.5	28.0	19.5	17.6	12.5	100
Burera	3.7	20.6	19.3	17.7	12.3	11.0	15.4	100
Gicumbi	2.8	7.0	35.3	21.6	3.6	4.3	25.5	100
Rwamagana	7.7	12.9	35.6	10.4	4.4	2.5	26.7	100
Nyagatare	6.3	2.2	27.5	44.4	7.2	1.2	11.2	100
Gatsibo	4.2	2.9	37.9	22.6	3.2	1.6	27.6	100
Kayonza	9.7	9.8	29.3	26.5	4.1	1.8	18.9	100
Kirehe	8.5	15.2	45.1	6.3	1.0	0.5	23.4	100
Ngoma	4.8	5.2	36.8	21.0	3.4	2.6	26.2	100
Bugesera	8.8	10.3	44.0	20.6	1.6	0.6	14.1	100
Overall	7.2	8.7	34.4	17.3	4.7	4.4	23.3	100

2017 Seasonal Agricultural Survey - Season B

In season B 2017, the survey results showed that dates of sowing vary widely from district to district but it can be mentioned that all district have “not applicable” at around one-quarter of the time due to the same issue mentioned above due to the many perennial crops that have been planted in the previous seasons (See Table 59).

4.1.5. Cropping system

Table 61. Season B, Percentage of plots with number of crops per plot

District	1 crop	2 crops	3 crops	4 crops	5 crops and above	Total	Average number of crops per plot
Nyarugenge	24.1	27.7	28.0	11.2	9.0	100	2.6
Gasabo	27.7	27.4	21.1	12.2	11.7	100	2.6
Kicukiro	22.4	27.6	24.6	13.7	11.8	100	2.7
Nyanza	40.6	34.9	16.0	5.8	2.7	100	2
Gisagara	42.3	19.3	18.6	12.3	7.4	100	2.3
Nyaruguru	56.1	26.1	12.1	5.0	0.7	100	1.7
Huye	43.5	21.5	16.2	11.2	7.6	100	2.2

District	1 crop	2 crops	3 crops	4 crops	5 crops and above	Total	Average number of crops per plot
Nyamagabe	36.4	30.5	19.1	9.9	4.1	100	2.2
Ruhango	33.3	29.3	20.1	11.8	5.6	100	2.3
Muhanga	37.1	27.3	18.0	10.3	7.3	100	2.3
Kamonyi	32.8	26.9	22.9	11.6	5.8	100	2.3
Karongi	51.2	28.7	13.3	5.6	1.2	100	1.8
Rutsiro	50.0	29.9	13.7	4.8	1.6	100	1.8
Rubavu	63.4	27.8	6.8	1.4	0.6	100	1.5
Nyabihu	64.5	26.4	4.5	3.0	1.6	100	1.5
Ngororero	45.1	28.4	16.3	7.0	3.3	100	2
Rusizi	50.9	24.7	13.0	8.2	3.3	100	1.9
Nyamasheke	45.2	26.2	15.6	8.5	4.6	100	2
Rulindo	43.1	27.8	16.5	8.2	4.4	100	2
Gakenke	48.1	30.4	14.2	5.4	1.9	100	1.8
Musanze	60.3	29.5	8.0	1.6	0.6	100	1.5
Burera	54.3	33.8	9.2	1.5	1.2	100	1.6
Gicumbi	41.3	26.9	17.7	8.9	5.2	100	2.1
Rwamagana	30.7	25.1	22.1	13.5	8.6	100	2.5
Nyagatare	21.7	40.6	26.0	8.9	2.9	100	2.3
Gatsibo	24.7	28.4	24.9	14.3	7.6	100	2.6
Kayonza	25.0	29.9	23.5	13.7	8.0	100	2.5
Kirehe	36.2	30.1	20.9	8.4	4.3	100	2.2
Ngoma	24.0	17.0	23.1	18.3	17.6	100	3
Bugesera	29.4	30.9	24.3	11.3	4.1	100	2.3
Overall	38.2	28.6	18.7	9.3	5.2	100	2.2
LSF	65.1	21.3	8.7	3.7	1.2	100	1.6

2017 Seasonal Agricultural Survey - Season B

In general, agricultural operators in many districts used most of their agricultural land to cultivate mixed crops in segments as it is found that only 38.2% of cultivated plots are in pure stand. LSF devoted most of their agricultural land to cultivate crops in pure stand with 65.1% of all cultivated plots and this is confirmed by the average number of crops per plots (See Table 60).

Table 62. Season B, Share of pure and mixed crop agricultural land per stratum (in percentage)

Stratum	Pure cropping	Mixed cropping	Total
Intensive cropland on hillsides	25.8	74.2	100
Intensive cropland in marshlands	62.1	37.9	100
Rangelands	17.1	82.9	100
Total	26.7	73.3	100
LSF	89.5	10.5	100

2017 Seasonal Agricultural Survey - Season B

The survey results indicate that in Season B 2017 the share of agricultural land used to grow crops in pure stand and mixed stand in Rwanda was respectively 26.7% and 73.3% of total cultivated area.

For LSF, the share between pure stand and mixed stand was respectively 89.5% and 10.5% of total cultivated area (See table 61).

Table 63. Season B, Share of pure and mixed crop agricultural land per district (in percentage)

District	Pure cropping	Mixed cropping	Total
Nyarugenge	34.6	65.4	100
Gasabo	21.9	78.1	100
Kicukiro	18.5	81.5	100
Nyanza	28.5	71.5	100
Gisagara	18.2	81.8	100
Nyaruguru	44.9	55.1	100
Huye	21.4	78.6	100
Nyamagabe	31.4	68.6	100
Ruhango	20.9	79.1	100
Muhanga	24.7	75.3	100
Kamonyi	23.2	76.8	100
Karongi	46.8	53.2	100
Rutsiro	41.2	58.8	100
Rubavu	62.4	37.6	100
Nyabihu	64.6	35.4	100
Ngororero	33.6	66.4	100
Rusizi	34.6	65.4	100
Nyamasheke	34.8	65.2	100
Rulindo	25.9	74.1	100
Gakenke	34.3	65.7	100
Musanze	52.8	47.2	100
Burera	43.3	56.7	100
Gicumbi	34.6	65.4	100
Rwamagana	16.2	83.8	100
Nyagatare	12.4	87.6	100
Gatsibo	11.6	88.4	100
Kayonza	16.8	83.2	100
Kirehe	23.0	77.0	100
Ngoma	13.6	86.4	100
Bugesera	15.9	84.1	100
Total	26.7	73.3	100

2017 Seasonal Agricultural Survey - Season B

The survey results illustrate that in Season B 2017 Gatsibo and Nyagatare districts had the highest rate of mixing crop with respectively 88.4 % and 87.6 % of their total cultivated area and Nyabihu had the least with 35.4%.(See table 62).

4.2. Agricultural inputs

4.2.1. Use of Seed

Table 64. Season B, Type of seeds used by stratum (Percentage)

Stratum	Traditional seeds	Improved seeds	Total
Intensive cropland on hillsides	96.3	3.7	100
Intensive cropland in marshlands	86.7	13.3	100
Rangelands	97.8	2.2	100
Total	95.4	4.6	100
LSF	59.7	40.3	100

2017 Seasonal Agricultural Survey - Season B

During the 2017 crop year the USAS found that the type of seed used for Season B crop plantings by small scale farmers (SSF) were overall 95% traditional seeds versus 5% improved variety seeds. However, the data indicates that in the marshland stratum those SSF farmers used 13% improved seed. The SSF percentage contrasts greatly with the large scale farmers (LSF) who utilized improved seed for 60% of their planted area.

Table 65. Season B, Type of seeds used by district (Percentage)

District	Traditional seeds	Improved seeds	Total
Nyarugenge	95.7	4.3	100
Gasabo	97.3	2.7	100
Kicukiro	97.5	2.5	100
Nyanza	92.5	7.5	100
Gisagara	93.5	6.5	100
Nyaruguru	97.1	2.9	100
Huye	97.8	2.2	100
Nyamagabe	97.5	2.5	100
Ruhango	96.8	3.2	100
Muhanga	98.3	1.7	100
Kamonyi	96.7	3.3	100
Karongi	94.6	5.4	100
Rutsiro	92.5	7.6	100
Rubavu	85.4	14.6	100
Nyabihu	95.5	4.5	100
Ngororero	96.8	3.2	100
Rusizi	97.5	2.5	100
Nyamasheke	96.2	3.8	100
Rulindo	97.9	2.1	100
Gakenke	96.2	3.8	100
Musanze	98.5	1.5	100
Burera	97.4	2.6	100
Gicumbi	94.8	5.2	100
Rwamagana	93.6	6.4	100
Nyagatare	95.0	5.0	100
Gatsibo	94.2	5.8	100
Kayonza	96.8	3.2	100
Kirehe	97.6	2.4	100
Ngoma	97.3	2.7	100
Bugesera	88.4	11.6	100
Total	95.4	4.6	100

2017 Seasonal Agricultural Survey - Season B

For SSF on a district basis there were only two districts during Season B which used improved seed on over 10% of their planted area: The largest percentage was in Rubavu at 15% followed by Bugesera at 12% (see Table 64).

Table 66. Season B, Type of seeds used by crop (Percentage)

crop	Traditional seeds	Improved seeds	Total
Vegetables	67.2	32.8	100
Other crops	86.8	13.2	100
Other celeals	100.0	-	100
Maize	87.5	12.6	100
Paddy rice	56.1	43.9	100
Sorghum	99.9	0.1	100
Wheat	76.7	23.3	100
Bush bean	99.1	0.9	100
Climbing bean	99.6	0.4	100
Pea	99.3	0.7	100
Irish potato	99.1	1.0	100
Sweet potato	99.8	0.2	100
Soybean	98.6	1.4	100
Groundnut	100.0	-	100
Small red bean	100.0	-	100
Taro	100.0	-	100
Yarms	100.0	-	100
Cassava	99.7	0.4	100
Cooking banana	99.7	0.3	100
Dessert banana	98.9	1.1	100
Banana for beer	99.6	0.4	100
Overall	95.4	4.6	100

2017 Seasonal Agricultural Survey - Season B

The SSF during Season B primarily saw their use of improved seed decrease from Season A while the use of traditional seed for planting of paddy rice increased to 56%. The use of improved seed for wheat is down 7 percentage points to 23% and down 11 percentage points at 13% of maize. Vegetables at 33%

are an increase in 21 percentage points and other minor crops at 13% are cut in half their percentage use of improved varieties (see Table 65).

Table 67. Season B, Source of improved seeds by district (Percentage)

District	RAB/ NAEB/ SECTOR	Recognized seed multipliers/NGO	Shops of improved seeds	Other sources	Total
Nyarugenge	36.0	32.0	32.0	-	100
Gasabo	21.1	10.5	63.2	5.3	100
Kicukiro	30.8	7.7	61.5	-	100
Nyanza	51.2	39.5	9.3	-	100
Gisagara	9.1	40.3	18.2	32.5	100
Nyaruguru	9.1	27.3	27.3	36.4	100
Huye	16.7	33.3	16.7	33.3	100
Nyamagabe	30.8	7.7	46.2	15.4	100
Ruhango	27.3	40.9	22.7	9.1	100
Muhanga	36.4	-	63.6	-	100
Kamonyi	4.0	56.0	36.0	4.0	100
Karongi	27.3	22.7	31.8	18.2	100
Rutsiro	43.2	21.6	29.7	5.4	100
Rubavu	22.2	11.1	66.7	-	100
Nyabihu	29.4	11.8	58.8	-	100
Ngororero	31.3	-	62.5	6.3	100
Rusizi	29.4	11.8	52.9	5.9	100
Nyamasheke	39.1	21.7	21.7	17.4	100
Rulindo	8.3	8.3	83.3	-	100
Gakenke	45.0	-	50.0	5.0	100
Musanze	57.1	14.3	14.3	14.3	100
Burera	57.1	7.1	35.7	-	100
Gicumbi	19.4	-	66.7	13.9	100
Rwamagana	11.9	10.5	35.8	41.8	100
Nyagatare	23.6	13.2	35.9	27.4	100
Gatsibo	23.5	29.6	32.7	14.3	100
Kayonza	35.3	19.6	15.7	29.4	100
Kirehe	40.6	6.3	6.3	46.9	100
Ngoma	42.1	21.1	26.3	10.5	100
Bugesera	40.6	26.6	14.8	18.0	100
Overall	28.5	21.1	32.9	17.6	100

2017 Seasonal Agricultural Survey - Season B

The SSF Season B three main sources of improved seed: government agencies (referred to as RAB/NAEB/SECTOR) contributed 28% (down 14 percentage points from Season A), suppliers/NGOs provide 21%, and dealer/shops supply 33% (both up slightly from Season A) of the improved seed. Other sources this season contributed 18% which doubled in percentage terms of the amount they supplied. For Season B the districts continued to vary substantially as to the availability and access to improved seed by sources. The RAB/NAEB/SECTOR provides only a high of 57% of the improved seed in Musanze and Burera but a low of 4% in Kamonyi. Suppliers/NGOs contribute a high of 56% of the improved seed for Kamonyi farmers and the second highest is 41% in Ruhango and four districts reported zero usage of

this source for obtaining their improved seed. The survey data indicates that a number of districts utilize the dealer/shops to obtain a majority their improved seed in Rulindo at a high of 83% and to a lesser degree in six districts in the 67% to 61% range. Other sources reach a high of 47% as the source of improved seed in Kirehe and 42% in Rwamagana (see Table 66).

Table 68. Season B, Source of improved seeds by crop (Percentage) in segments

Crop	RAB/ NAEB/SECTOR	Recognized seed multipliers/ NGO	Shops of improved seeds	Other sources	Total
Maize	38.1	21.3	33.8	6.8	100
Paddy rice	7.9	25.2	9.4	57.5	100
Sorghum	-	-	100.0	-	100
Wheat	66.7	-	33.3	-	100
Bush bean	36.4	24.2	33.3	6.1	100
Climbing bean	20.0	20.0	40.0	20.0	100
Pea	-	33.3	66.7	-	100
Irish potato	11.1	66.7	22.2	-	100
Sweet potato	33.3	33.3	-	33.3	100
Soybean	50.0	-	50.0	-	100
Cassava	25.0	50.0	25.0	-	100
Cooking banana	60.0	40.0	-	-	100
Dessert banana	22.2	55.6	-	22.2	100
Banana for beer	-	100.0	-	-	100
Vegetables	5.3	6.0	82.8	6.0	100
Other crops	55.1	24.7	5.6	14.6	100
Overall	28.5	21.1	32.9	17.6	100

2017 Seasonal Agricultural Survey - Season B

For Season B the SSF will vary their purchases of improved seed considerably by the different crops they plant. The survey data indicate that the RAB/NAEB/SECTOR provides two-thirds of wheat as the largest percentage and 60% of cooking banana rhizomes. Suppliers/NGOs provided 100% of the beer banana rhizomes and two-thirds of the Irish potato “eyes” for planting. Dealers/shops provided 100% of sorghum, 83% of the vegetable seeds and supply 67% of pea improved seed while other sources are the primary source for paddy rice at 58%, sweet potatoes at 33% (see table 67).

Table 69. Season B, Source of improved seeds by crop (Percentage) for Large Scale Farmers

crop	RAB / NAEB/ SECTOR	Recognized seed multipliers/NGO	Shops of improved seeds	Other sources	Total
Maize	74.5	8.5	16.0	1.1	100
Paddy rice	12.8	83.0	2.1	2.1	100
Wheat	100.0	-	-	-	100
Bush bean	41.9	12.2	39.2	6.8	100
Climbing bean	-	-	100.0	-	100
Irish potato	6.7	80.0	13.3	-	100
Sweet potato	-	100.0	-	-	100
Soybean	64.7	11.8	23.5	-	100

crop	RAB / NAEB/ SECTOR	Recognized seed multipliers/NGO	Shops of improved seeds	Other sources	Total
Cassava	66.7	33.3	-	-	100
Cooking banana	92.3	7.7	-	-	100
Dessert banana	71.4	14.3	14.3	-	100
Banana for beer	62.5	37.5	-	-	100
Vegetables	5.2	3.5	87.9	3.5	100
Other crops	48.8	6.1	17.1	28.1	100
Other cereals	100.0	-	-	-	100
Overall	40.3	17.9	34.8	7.0	100

2017 Seasonal Agricultural Survey-Season B

The Season B source of improved seed for the LSF for most crops comes from the RAB/NAEB/SECTOR with the survey data indicating 100% of wheat and other cereals, 92% of cooking banana, 74.5% of maize improved seed. The LSF obtain a majority of their improved paddy rice seed (83%) from suppliers/NGOs and all of their climbing beans and nearly all (88%) of their vegetable seed from dealers/shops (see Table 68).

4.2.2. Use of fertilizers

Table 70. Season B, Percentage of plots with organic fertilizers use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	36.0	64.0	100
Intensive cropland in marshlands	35.4	64.6	100
Rangelands	11.7	88.3	100
Total	34.7	65.3	100
LSF	32.7	67.3	100

2017 Seasonal Agricultural Survey - Season B

The survey data indicates for Season B that slightly more than one-third of the SSFs utilize organic fertilizer. This percentage is representative of all cropland stratum SSF usage but drops to only 12% which is less than half the usage in percentage point terms compared to Season A by SSF in rangeland. LSF are nearly identical in organic fertilizer usage at 33% (see Table 69).

Table 71. Season B, Percentage of plots with organic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	35.8	64.2	100
Gasabo	28.0	72.0	100
Kicukiro	30.6	69.4	100
Nyanza	27.2	72.8	100
Gisagara	29.3	70.7	100
Nyaruguru	62.7	37.3	100
Huye	33.4	66.6	100
Nyamagabe	58.7	41.3	100
Ruhango	40.4	59.6	100
Muhanga	50.9	49.1	100
Kamonyi	49.3	50.7	100

District	Used	Not used	Total
Karongi	47.8	52.2	100
Rutsiro	46.4	53.6	100
Rubavu	20.2	79.9	100
Nyabihu	60.8	39.2	100
Ngororero	53.7	46.3	100
Rusizi	16.8	83.2	100
Nyamasheke	48.8	51.2	100
Rulindo	68.8	31.2	100
Gakenke	69.4	30.6	100
Musanze	51.6	48.4	100
Burera	50.3	49.7	100

District	Used	Not used	Total
Gicumbi	64.4	35.6	100
Rwamagana	21.7	78.3	100
Nyagatare	12.8	87.3	100
Gatsibo	24.6	75.4	100
Kayonza	17.7	82.3	100
Kirehe	15.6	84.4	100
Ngoma	19.7	80.3	100
Bugesera	17.1	82.9	100
Total	34.7	65.3	100
LSF	32.7	67.3	100

2017 Seasonal Agricultural Survey - Season B

The survey indicates that for Season B 2017 by district the SSF usage of organic fertilizer varies widely with the highest level of usage in Gakenke and Rulindo at 69%, Gicumbi at 64%, and several others around 60% are all lower in usage than reported in Season A. The lowest organic usage by SSF is in Nyagatare at 13% and Kirehe at 16% are drastically lower than Season A reported usage. In general eastern districts have large amounts of uncultivated land that does not require an application of fertilizer as the reason for the low rate of usage of organic fertilizer in Season B (See Table 70).

Table 72. Season B, Percentage of plots with inorganic fertilizer use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	12.1	87.9	100
Intensive cropland in marshlands	36.2	63.8	100
Rangelands	4.7	95.3	100
Overall	15.1	84.9	100
LSF	32.5	67.5	100

2017 Seasonal Agricultural Survey - Season B

The Season B usage of inorganic fertilizers by SSF is fairly low 15% which is 4 percentage points lower than Season A usage, however the SSF usage by marshland stratum farmers increases to 36% (presumably with its application on paddy rice) but again it is 13 percentage points lower than Season A usage. The use of inorganic fertilizers by LSF is visually the same that as that of organic fertilizers (see Table 71).

Table 73. Season B, Table Percentage of plots with inorganic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	4.9	95.1	100
Gasabo	6.2	93.9	100
Kicukiro	8.9	91.1	100
Nyanza	9.5	90.5	100
Gisagara	19.6	80.4	100
Nyaruguru	29.3	70.7	100
Huye	17.0	83.0	100
Nyamagabe	20.8	79.2	100
Ruhango	9.3	90.7	100
Muhanga	2.1	97.9	100
Kamonyi	3.6	96.4	100
Karongi	16.4	83.6	100
Rutsiro	30.8	69.2	100
Rubavu	42.6	57.4	100
Nyabihu	51.3	48.7	100
Ngororero	8.3	91.7	100
Rusizi	17.8	82.2	100
Nyamasheke	35.8	64.2	100
Rulindo	12.0	88.0	100
Gakenke	22.5	77.5	100
Musanze	29.9	70.1	100
Burera	18.6	81.4	100
Gicumbi	9.5	90.5	100
Rwamagana	17.3	82.7	100
Nyagatare	12.4	87.7	100
Gatsibo	8.1	91.9	100
Kayonza	6.7	93.3	100
Kirehe	7.2	92.8	100
Ngoma	6.5	93.5	100
Bugesera	14.9	85.1	100
Total	15.1	84.9	100

2017 Seasonal Agricultural Survey - Season B

Inorganic fertilizer usage varies by districts to a lesser degree because of its overall lower usage. Its highest usage is reported in Nyabihu at 51%, Rubavu at 43%, and in Nyamasheke at 36%. Its lowest usage is in Muhango at 2% and Kamongi at 4% (see Table 72).

Table 74. Season B, Types of inorganic fertilizers use per stratum (in percentage)

	NPK 17-17-17	NPK 20-10-10	NPK 25-5-5	Urea	Liquid urea	DAP	TSP	KCL/MOP	Other Fertilizers	Total
Intensive cropland on hillsides	37.2	2.7	0.8	24.5	0.5	33.4	-	0.1	0.9	100
Intensive cropland in marshlands	41.0	0.5	0.2	44.2	0.6	11.3	-	2.1	0.1	100
Rangelands	50.0	15.6	-	15.6	-	6.3	-	-	12.5	100
Overall	38.9	2.0	0.5	32.3	0.5	24.2	-	0.9	0.7	100
LSF	29.0	0.9	-	35.1	0.2	24.2	-	0.4	10.2	100

2017 Seasonal Agricultural Survey - Season B

In Season B the overall usage of inorganic fertilizer by types is less equally divided compared with Season A by SSF with 39% using NPK 17-17-17 (at 12 percentage point increase), 32% using Urea (unchanged from Season A), and 32% using DAP (down 3 percentage points). The SSF use of NPK 17-17-17 varies more across land use stratum with a high use on rangeland but urea usage is 44% in marshland strata (an increase) versus 24.5% on hillside strata and 16% on rangelands which are both down from Season A. DAP is more often used on hillsides at 33% is down 9 percentage points in usage compared to Season A while rangeland at 6% and marshland usage is lowest at 11% and substantially less than Season A usage. LSF usage is closely divided between NPK 17-17-17 at 29%, urea at 35% and DAP at 24% which are visually unchanged percentages from Season A usages (see Table 73).

Table 75. Season B, Types of inorganic fertilizers use per district (in percentage)

District	NPK 17-17-17	NPK 20-10	NPK 25-5	Urea	Liquid urea	DAP	KCL/MOP	Other Fertilizers	Total
Nyarugenge	15.0	-	-	65.0	-	20.0	-	-	100
Gasabo	19.2	-	-	42.3	-	38.5	-	-	100
Kicukiro	24.1	-	-	48.3	-	27.6	-	-	100
Nyanza	28.9	8.9	11.1	26.7	-	24.4	-	-	100
Gisagara	42.4	0.5	-	52.6	-	4.6	-	-	100
Nyaruguru	24.2	1.1	1.1	18.7	-	53.9	-	1.1	100
Huye	50.0	-	-	46.7	-	3.3	-	-	100
Nyamagabe	22.5	-	-	30.0	-	47.5	-	-	100
Ruhango	38.5	3.9	5.8	46.2	1.9	3.9	-	-	100
Muhanga	-	12.5	-	50.0	-	37.5	-	-	100
Kamonyi	23.1	-	-	76.9	-	-	-	-	100
Karongi	7.7	-	-	19.2	-	73.1	-	-	100
Rutsiro	21.4	10.7	-	38.2	-	29.8	-	-	100

District	NPK 17-17-17	NPK 20-10	NPK 25-5	Urea	Liquid urea	DAP	KCL/MOP	Other Fertilizers	Total
Rubavu	79.1	-	-	11.9	3.7	5.2	-	-	100
Nyabihu	81.1	0.6	-	6.1	0.6	11.7	-	-	100
Ngororero	53.6	-	-	14.3	-	32.1	-	-	100
Rusizi	51.3	4.2	-	35.3	-	9.2	-	-	100
Nyamasheke	35.2	0.6	-	31.8	-	32.4	-	-	100
Rulindo	42.9	2.0	-	20.4	-	34.7	-	-	100
Gakenke	11.1	-	-	16.7	-	72.2	-	-	100
Musanze	59.5	-	-	16.4	-	22.4	-	1.7	100
Burera	73.1	-	-	9.0	-	17.9	-	-	100
Gicumbi	39.5	2.3	2.3	34.9	-	20.9	-	-	100
Rwamagana	27.2	5.2	-	39.0	0.7	25.0	-	2.9	100
Nyagatare	25.9	-	-	49.6	1.8	22.3	-	0.5	100
Gatsibo	17.2	5.1	-	40.4	-	35.4	-	2.0	100
Kayonza	28.1	3.1	3.1	31.3	-	34.4	-	-	100
Kirehe	14.3	5.4	1.8	29.5	-	24.1	20.5	4.5	100
Ngoma	24.0	-	-	32.0	4.0	24.0	-	16.0	100
Bugesera	47.9	-	-	42.9	-	9.2	-	-	100
Total	38.9	2.0	0.5	32.3	0.5	24.2	0.9	0.7	100

2017 Seasonal Agricultural Survey - Season B

Table 74 shows the way different types of fertilizers was used within districts in Season B 2017. The Season B usage of NPK 17-17-17 is highest in the districts of Nyabihu at 81%, and Rubavu at 79% and Burera at 73% with four others at over 50%. The usage of urea is much more fairly uniform across districts with the highest usage in Kamonyi at 77%. DAP usage is more variable across districts with its highest usage in Gakenke at 72% and then drops down to 54% usage in Nyaruguru.

4.2.3. Use of Pesticides

Table 76. Season B, Percentage of plots with pesticides use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	10.0	90.0	100
Intensive cropland in marshlands	23.9	76.1	100
Rangelands	5.1	94.9	100
Overall	11.7	88.3	100
LSF	31.8	68.2	100

2017 Seasonal Agricultural Survey - Season B

The survey data indicates for Season B that only 12% of the SSFs used pesticides overall which is a two percentage point increase from Season A usage. This percentage is representative of all cropland hillside stratum SSF usage at 10% but drops to 5% in rangeland but has a high usage reported in the crop marshland stratum of 24%. LSF are more inclined to pesticide usage at 32% but this is a six percentage point decrease from Season A (see Table 75).

Table 77. Season B, Percentage of plots with pesticides use per district

District	Used	Not used	Total
Nyarugenge	9.1	90.9	100
Gasabo	4.6	95.4	100
Kicukiro	7.2	92.8	100
Nyanza	3.9	96.2	100
Gisagara	16.3	83.7	100
Nyaruguru	8.8	91.3	100
Huye	1.0	99.1	100
Nyamagabe	10.7	89.3	100
Ruhango	3.4	96.6	100
Muhanga	1.8	98.2	100
Kamonyi	2.5	97.5	100
Karongi	6.6	93.4	100
Rutsiro	22.4	77.6	100
Rubavu	48.3	51.7	100
Nyabihu	59.3	40.7	100
Ngororero	5.4	94.6	100
Rusizi	7.3	92.7	100
Nyamasheke	12.8	87.3	100
Rulindo	7.5	92.6	100
Gakenke	13.5	86.5	100
Musanze	47.2	52.8	100
Burera	17.4	82.6	100
Gicumbi	9.2	90.8	100
Rwamagana	8.5	91.6	100
Nyagatare	11.4	88.7	100
Gatsibo	5.2	94.8	100
Kayonza	5.6	94.4	100
Kirehe	6.8	93.2	100
Ngoma	3.7	96.3	100
Bugesera	17.5	82.6	100
Total	11.7	88.3	100

2017 Seasonal Agricultural Survey - Season B

The survey results showed that in Season B 2017, by district that the SSF usage of pesticides fluctuates somewhat with its lower overall usage with the highest level of usage in Nyabihu at 59%, Rubavu at 48% and Musanze at 47% and all the remaining districts are less than 23%in pesticide usage (see Table 76).

Table 78. Season B, Type of pesticides used by stratum (in percentage)

Stratum	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Pilkare	Rocket	Other Pesticides	Total
Intensive cropland on hillsides	32.7	13.5	4.2	31.8	0.4	0.1	10.8	6.7	100
Intensive cropland in marshlands	7.9	1.5	4.0	48.7	0.3	-	7.2	30.4	100
Rangelands	24.4	8.9	17.8	11.1	-	-	28.9	8.9	100
Overall	25.6	10.0	4.4	36.1	0.4	0.0	10.1	13.3	100
LSF	9.2	3.8	1.1	26.0	-	-	19.1	40.9	100

2017 Seasonal Agricultural Survey - Season B

The SSF usage during Season B of pesticide by type finds that 36% of crop plots reporting application of pesticides used Cypermethrin was the highest application rate but down 6 percentage points in usage from Season A, followed by Dithane at 26% (a six percentage point increase in usage from Season A) and other types accounted for 13% of the usage application (down five percentage points). Dithane is more widely used in Season B at 33% on hillside stratum plots compared to its usage on rangeland stratum plots at 24% but only at 8% from crop marshland strata. Cypermethrin has its highest usage in the crop marshland strata at 49% (unchanged from Season A usage), slightly lower in crop hillside strata at 32% and its lowest usage is in rangeland strata at 11% (less than half Season A usage). This differed for the LSF with 26% reporting the use of Cypermethrin (a 5 percentage point decrease from Season A) and 41% other types of pesticides (down 4 percentage points in usage). For SSF within the rangeland strata plots

they benefited most from the application of Rocket at 29% than in any other stratum and LSF also used it on 19% of plots (see Table 77).

Table 79. Season B, Type of pesticides used by District (in percentage)

District	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Pilkare	Rocket	Other Pesticides	Total
Nyarugenge	31.9	-	-	29.8	-	-	27.7	10.6	100
Gasabo	5.6	-	-	50.0	-	-	27.8	16.7	100
Kicukiro	20.8	-	-	8.3	-	-	37.5	33.3	100
Nyanza	7.7	-	-	23.1	-	-	38.5	30.8	100
Gisagara	14.4	-	0.9	58.5	-	-	11.0	15.3	100
Nyaruguru	69.6	-	-	30.4	-	-	-	-	100
Huye	33.3	-	-	-	-	-	33.3	33.3	100
Nyamagabe	42.9	2.0	-	51.0	-	-	2.0	2.0	100
Ruhango	6.7	6.7	-	53.3	-	-	26.7	6.7	100
Muhanga	-	-	-	83.3	-	-	16.7	-	100
Kamonyi	50.0	7.1	7.1	28.6	-	-	7.1	-	100
Karongi	26.3	5.3	-	63.2	-	-	5.3	-	100
Rutsiro	36.1	6.2	8.3	41.2	-	-	3.1	5.2	100
Rubavu	37.2	23.9	9.3	28.9	-	-	0.7	-	100
Nyabihu	35.9	24.8	-	35.9	-	-	2.4	1.0	100
Ngororero	33.3	-	-	33.3	-	-	33.3	-	100
Rusizi	6.9	-	17.2	15.5	-	-	24.1	36.2	100
Nyamasheke	14.3	3.2	1.6	46.0	3.2	-	-	31.8	100
Rulindo	35.1	10.8	-	35.1	-	-	16.2	2.7	100
Gakenke	6.1	2.0	4.1	77.6	2.0	-	4.1	4.1	100
Musanze	42.3	15.0	16.8	23.6	-	-	-	2.3	100
Burera	52.0	15.7	-	31.4	-	-	-	1.0	100
Gicumbi	31.0	9.5	-	16.7	-	2.4	28.6	11.9	100
Rwamagana	19.0	1.7	-	39.7	-	-	20.7	19.0	100
Nyagatare	6.3	2.6	3.7	33.2	2.6	-	16.3	35.3	100
Gatsibo	6.7	1.7	-	31.7	-	-	36.7	23.3	100
Kayonza	-	-	-	59.5	-	-	35.7	4.8	100
Kirehe	1.4	-	4.2	50.0	-	-	12.5	31.9	100
Ngoma	15.8	-	-	36.8	-	-	5.3	42.1	100
Bugesera	0.7	-	-	35.3	-	-	19.6	44.4	100
Total	25.6	10.0	4.4	36.1	0.4	0.0	10.1	13.3	100

2017 Seasonal Agricultural Survey - Season B

Table 78 shows the way different types of pesticides were used within districts in Season B 2017. District pesticide usage reported for Dithane varies widely but is generally at or below 50% across all districts with only Nyaruguru at 70% and Burera at 52% above that level of application and four have 1% or less usage. Cypermethrin the main usage reported across districts which is higher because of its wider usage in general with three districts reports levels above 60% but this is down from twelve districts in Seaon A

with the highest being Muhanga at 83%. Other pesticide usage also varies widely with fifteen districts reporting usage at zero or less than 10% with the highest reported usage in Bugesera at 44% and Ngoma at 42%. Rocket usage has increased to ten districts usage greater than 25%.

4.3. Agricultural practices

4.3.1. Irrigation practices

Table 80. Season B, Use of Irrigation per stratum (Percentage)

Stratum	Used	Not used	Total
Intensive cropland on hillsides	1.0	99.0	100
Intensive cropland in marshlands	27.5	72.5	100
Rangelands	-	100.0	100
Overall	4.6	95.4	100
LSF	20.7	79.3	100

2017 Seasonal Agricultural Survey - Season B

In Rwanda during Season B the SSF only irrigates overall 5% of the crop area, however, this is heavily influenced by visually no usage of irrigation on the crop hillside and rangeland stratum cropland while the marshland strata farmers practice irrigation on 27.5% of their cultivated crop land. The LSF practice seven percentage points less compared to Season A irrigation at 21% of their cropland reported to have been irrigation (see Table 79).

Table 81. Season B, Use of Irrigation per district (Percentage)

District	Used	Not used	Total
Nyarugenge	2.5	97.5	100
Gasabo	0.6	99.4	100
Kicukiro	4.7	95.3	100
Nyanza	4.4	95.6	100
Gisagara	8.2	91.9	100
Nyaruguru	1.9	98.1	100
Huye	16.4	83.6	100
Nyamagabe	0.7	99.3	100
Ruhango	5.7	94.4	100
Muhanga	1.8	98.2	100
Kamonyi	0.8	99.2	100
Karongi	1.5	98.5	100
Rutsiro	0.3	99.7	100
Rubavu	-	100.0	100
Nyabihu	-	100.0	100
Ngororero	0.6	99.4	100
Rusizi	14.8	85.2	100

District	Used	Not used	Total
Nyamasheke	12.7	87.3	100
Rulindo	6.9	93.1	100
Gakenke	1.5	98.5	100
Musanze	0.3	99.7	100
Burera	-	100.0	100
Gicumbi	1.4	98.6	100
Rwamagana	7.4	92.6	100
Nyagatare	7.2	92.8	100
Gatsibo	2.8	97.3	100
Kayonza	2.7	97.4	100
Kirehe	5.1	94.9	100
Ngoma	1.4	98.6	100
Bugesera	10.2	89.8	100
Overall	4.6	95.4	100

2017 Seasonal Agricultural Survey - Season B

The survey results indicate that in Season B 2017 the highest occurrence of irrigation usage was in districts Huye at 16% and Rusizi at 15% of cropland (see Table 80).

Table 82. Season B, Types of irrigation used by stratum (in percentage)

Stratum	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Intensive cropland on hillsides	45.3	-	5.3	49.5	100
Intensive cropland in marshlands	86.5	-	-	13.5	100
Rangelands	-	-	-	-	-
Overall	79.6	-	0.9	19.5	100
LSF	82.5	4.7	1.4	11.4	100

2017 Seasonal Agricultural Survey - Season B

During Season B the SSF overall used surface irrigation on 80% (a 5 percentage increase from Season A) of their irrigated cropland versus 82.5% (a 7.5 percentage point decrease) of the LSF irrigated cropland. The LSF reported use of sprinkler irrigation on only 1% of their irrigated (down 7 percentage points from Season A) cropland versus 1% overall of the SSF which is all in the hillside strata at 5% usage. The remaining portion of SSF irrigation utilizes traditional methods on 50% of the irrigated hillside plots (down 7 percentage points), 14% of the marshland (visually unchanged), and 0% of the rangeland stratum while LSF have reported use of the traditional methods on 11% of their irrigated cropland (see Table 81).

Table 83. Season B, Types of irrigation used by district (in percentage)

District	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Nyarugenge	14.3	-	-	85.7	100
Gasabo	-	-	-	100.0	100
Kicukiro	72.7	-	-	27.3	100
Nyanza	46.7	-	-	53.3	100
Gisagara	91.5	-	-	8.5	100
Nyaruguru	-	-	-	100.0	100
Huye	96.2	-	-	3.9	100
Nyamagabe	-	-	-	100.0	100
Ruhango	95.0	-	-	5.0	100
Muhanga	16.7	-	-	83.3	100
Kamonyi	100.0	-	-	-	100
Karongi	50.0	-	-	50.0	100
Rutsiro	-	-	-	100.0	100
Ngororero	50.0	-	-	50.0	100

District	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Rusizi	84.8	-	-	15.3	100
Nyamasheke	86.4	-	-	13.6	100
Rulindo	16.7	-	-	83.3	100
Gakenke	-	-	-	100.0	100
Musanze	100.0	-	-	-	100
Gicumbi	-	-	-	100.0	100
Rwamagana	83.8	-	2.7	13.5	100
Nyagatare	87.5	-	5.6	6.9	100
Gatsibo	52.4	-	-	47.6	100
Kayonza	94.7	-	-	5.3	100
Kirehe	97.4	-	-	2.6	100
Ngoma	100.0	-	-	-	100
Bugesera	98.2	-	-	1.8	100
Overall	79.6	-	0.9	19.5	100

2017 Seasonal Agricultural Survey - Season B

The Table 82 shows in details how within districts type of irrigation had been used in Season B 2017. During Season B where irrigation is practiced at the district level a majority of the cropland are irrigated using surface irrigation methods with 13 of the 30 districts averaging more than 80% of the irrigation, however, 9 districts have usage below 20%. The usage of traditional irrigation is at 100% in six districts

and two are at 83%. During Season B 28 districts compared with 22 districts in Season A reported zero sprinkler usage and the remaining two districts reported minor amounts of usage in Season B.

Table 84. Season B, Types of irrigation used by crop type (in percentage) in segments

Crop	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Maize	66.7	-	-	33.3	100
Paddy rice	99.8	-	-	0.3	100
Bush bean	40.0	-	60.0	-	100
Climbing bean	-	-	-	100.0	100
Irish potato	25.0	-	-	75.0	100
Sweet potato	41.2	-	5.9	52.9	100
Soybean	-	-	50.0	50.0	100
Taro	50.0	-	-	50.0	100
Cooking	100.0	-	-	-	100
banana					
Dessert banana	-	-	-	100.0	100
Banana for beer	-	-	-	100.0	100
Fruits	-	-	-	100.0	100
Vegetables	26.6	-	-	73.4	100
Overall	79.6	-	0.9	19.5	100

2017 Seasonal Agricultural Survey - Season B

During Season B the small amount of irrigation practiced by SSF is primarily applied using surface irrigation which again is the primary irrigation means on cooking banana and paddy rice at 100% each and at lesser rates of 67% on maize, and 50% on taro, while drip irrigation had no reports of it use and the minimal use of sprinklers usage was primarily on bush beans at 60% and soybeans at 50%, and the traditional is the predominate type of irrigation used on crops except paddy rice and cooking banana at 0%. Most crops are at or above half of their irrigation coming from traditional irrigation means with only maize at 33% and bush beans at 0% (see table 83).

Table 85. Season B, Types of irrigation used by crop type (in percentage) for Large Scale Farmers

Crop name	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Maize	100.0	-	-	-	100
Paddy rice	98.7	-	-	1.4	100
Wheat	100.0	-	-	-	100
Bush bean	100.0	-	-	-	100
Soybean	100.0	-	-	-	100
Cassava	100.0	-	-	-	100
Cooking banana	100.0	-	-	-	100
Banana for beer	100.0	-	-	-	100
Fruits	54.6	45.5	-	-	100
vegetables	58.1	6.8	4.1	31.1	100
Other crops	100.0	-	-	-	100
Overall	82.5	4.7	1.4	11.4	100

2017 Seasonal Agricultural Survey - Season B

The survey reports that in Season B 2017 for the LSF that they primarily use surface irrigation as their preferred method for all crops with 9 of the 11 at 100% or nearly 100% for each. LSF also use drip irrigation on 46% of their fruit being irrigated, and sprinkler irrigation is utilized during Season B only for 4% of their vegetable irrigation while 31% of vegetable irrigation is traditional (see table 84).

Table 86. Season B, Source of used water for irrigation per stratum (in percentage)

Stratum	Rainfall	Rain- harvesting water	WASAC water	Underground water	Lake water	Stream water	Recycled water	Other source	Total
Intensive cropland on hillsides	1.1	6.3	4.2	22.1	6.3	56.8	1.1	2.1	100
Intensive cropland in marshlands	0.9	1.5	-	28.0	4.7	58.6	0.4	6.0	100
Rangelands	-	-	-	-	-	-	-	-	-
Overall	0.9	2.3	0.7	27.0	5.0	58.3	0.5	5.3	100
LSF	4.3	2.8	-	17.1	22.8	51.2	-	1.9	100

2017 Seasonal Agricultural Survey - Season B

The source of water during Season B used for irrigation by the SSF is 58% stream fed (an increase of 7 percentage points from Season A) followed by underground water at 27% (a 14 percentage point decrease from Season A) as the two main sources of irrigation water. The LSF primarily use stream water for 51% of their Season B irrigation compared to underground water sources at 17% (a 25 percentage point decrease from Season A usage) of their irrigation, followed by lake water for 23% (a 5 percentage point decrease). The WASAC is not reported as a source used by LSF for Season B irrigation compared with 23% as their main sources of crop irrigation during Season A (see Table 85).

Table 87. Season B, Source of used water for irrigation per district (in percentage)

District	Rainfall	Rain- harvesting water	WASAC water	Underground water	Lake water	Stream water	Recycled water	Other source	Total
Nyarugenge	-	14.3	14.3	-	-	57.1	-	14.3	100
Gasabo	-	50.0	-	-	-	50.0	-	-	100
Kicukiro	-	18.2	-	-	-	81.8	-	-	100
Nyanza	-	-	-	100.0	-	-	-	-	100
Gisagara	-	2.1	-	63.8	-	34.0	-	-	100
Nyaruguru	-	-	-	40.0	-	20.0	40.0	-	100
Huye	5.8	-	-	48.1	-	44.2	-	1.9	100
Nyamagabe	-	-	-	-	-	100.0	-	-	100
Ruhango	5.0	-	-	45.0	-	50.0	-	-	100
Muhanga	-	-	33.3	16.7	-	50.0	-	-	100
Kamonyi	-	-	-	100.0	-	-	-	-	100
Karongi	-	-	-	-	-	100.0	-	-	100

District	Rainfall	Rain- harvesting water	WASAC water	Underground water	Lake water	Stream water	Recycled water	Other source	Total
Rutsiro	-	-	-	-	-	100.0	-	-	100
Ngororero	-	-	-	-	-	50.0	-	50.0	100
Rusizi	-	-	-	5.1	3.4	91.5	-	-	100
Nyamasheke	-	-	-	29.6	6.8	63.6	-	-	100
Rulindo	-	-	4.2	66.7	-	29.2	-	-	100
Gakenke	-	-	-	40.0	-	60.0	-	-	100
Musanze	-	-	-	100.0	-	-	-	-	100
Gicumbi	-	-	-	60.0	-	40.0	-	-	100
Rwamagana	-	2.7	-	37.8	-	59.5	-	-	100
Nyagatare	-	-	-	-	-	95.8	-	4.2	100
Gatsibo	-	-	-	-	9.5	85.7	4.8	-	100
Kayonza	-	-	-	5.3	5.3	10.5	-	79.0	100
Kirehe	-	2.6	-	30.8	-	66.7	-	-	100
Ngoma	-	-	-	-	-	100.0	-	-	100
Bugesera	1.8	10.7	-	3.6	35.7	32.1	-	16.1	100
Overall	0.9	2.3	0.7	27.0	5.0	58.3	0.5	5.3	100

2017 Seasonal Agricultural Survey - Season B

At the district level during Season B the primary sources of irrigation water vary considerately with rainfall a virtual non-use for Season B in all but four districts, rain-harvesting is reported used in only 8 of the 30 districts with the highest usage in Gasabo at 50% and the few others less than 20% as the source of their irrigation water. WASAC is reported as a source in only four districts with use in Muhanga at 33% the highest. Underground water is the primary source in six districts and still not being reported used in ten districts during Season B, and lake water is now only a minor source in six districts. Stream water is the primary source at 50% or more in eighteen districts. Recycled water is reported used in three districts to a lesser extent and other sources of water are reported being used in seven districts with Kayonza reporting this as 79% of their source of irrigation water (see Table 86).

4.3.2. Erosion control

Erosion refers to the process in which the earth's surface is worn away. Due to the mountainous landscape of Rwanda, most of the agricultural operators practice anti-erosive activities to prevent the wasting away of the topsoil.

Table 88. Season B, Percentage of plot with Anti-erosion activities use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	64.9	35.1	100
Intensive cropland in marshlands	76.3	23.7	100
Rangelands	21.6	78.4	100
Overall	64.4	35.6	100
LSF	56.6	43.4	100

2017 Seasonal Agricultural Survey - Season B

During the 2017 Season B the SSF reported to have practiced erosion control on nearly two-thirds of their cropland which is 7 percentage points higher than the 57% of cropland that erosion control practices are utilized by the LSF (which is 12 percentage points lower than LSF usage during Season A). However, erosion control is practiced to a lesser extent by the SSF in the rangeland strata at only 22% of the cropland having reported a control applied (see Table 87).

Table 89. Season B, Percentage of plot with Anti-erosion activities use per District

District	Used	Not used	Total
Nyarugenge	77.5	22.5	100
Gasabo	65.5	34.5	100
Kicukiro	39.6	60.4	100
Nyanza	60.7	39.4	100
Gisagara	70.0	30.0	100
Nyaruguru	88.6	11.4	100
Huye	61.8	38.2	100
Nyamagabe	88.6	11.4	100
Ruhango	84.8	15.3	100
Muhanga	74.9	25.2	100
Kamonyi	82.7	17.3	100
Karongi	93.1	6.9	100
Rutsiro	63.3	36.7	100
Rubavu	86.7	13.3	100
Nyabihu	66.9	33.1	100
Ngororero	56.9	43.1	100
Rusizi	53.1	46.9	100
Nyamasheke	70.5	29.5	100
Rulindo	77.1	22.9	100
Gakenke	87.4	12.6	100
Musanze	84.0	16.0	100
Burera	68.3	31.7	100
Gicumbi	90.0	10.1	100
Rwamagana	67.4	32.6	100
Nyagatare	43.5	56.5	100
Gatsibo	58.4	41.6	100
Kayonza	43.1	56.9	100
Kirehe	31.1	68.9	100
Ngoma	69.4	30.6	100
Bugesera	54.0	46.0	100
Overall	64.4	35.6	100

2017 Seasonal Agricultural Survey - Season B

During the Season B for SSF there are twenty-two districts estimated to have erosion controls applied to 60% or more their cropland (an increase of one district from Season A). Only four report erosion controls used on less than half their cropland land (see Table 88).

Table 90. Season B, Type of anti-erosion activities by stratum (Percentages)

Stratum	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Intensive cropland on hillsides	11.6	2.5	4.5	11.0	57.4	0.8	4.5	6.9	0.8	100
Intensive cropland in marshlands	4.3	0.5	0.3	0.6	18.6	48.1	1.2	25.4	1.0	100
Rangelands	40.7	6.7	3.7	4.4	34.1	0.7	8.2	1.5	-	100
Overall	11.0	2.3	3.9	9.3	51.3	7.9	4.1	9.6	0.8	100
LSF	22.4	8.4	6.4	0.5	23.1	24.4	6.7	3.0	5.0	100

2017 Seasonal Agricultural Survey - Season B

During Season B the methods of erosion control vary widely but cover plants/grasses are the major erosion control method practiced by SSF on 51% of the cropland reported utilizing a control method. The LSF are more diversified with implementation of water drainage at 24% usage as one of their primary and preferred methods of erosion control followed by cover plants/grasses at 23% and ditching at 22% (see Table 89).

Table 91. Season B, Types of anti-erosion activities by district (Percentages)

District	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Nyarugenge	1.2	3.9	-	6.3	73.6	0.4	11.0	3.5	-	100
Gasabo	9.3	2.1	-	0.4	80.6	0.4	0.4	6.8	-	100
Kicukiro	26.8	0.8	3.9	18.9	36.2	1.6	7.1	4.7	-	100
Nyanza	3.3	0.9	2.3	-	63.3	3.7	0.5	26.1	-	100
Gisagara	34.4	0.4	2.8	3.5	24.8	20.3	1.5	12.2	-	100
Nyaruguru	5.7	1.7	4.0	18.6	39.2	14.6	0.3	1.3	14.6	100
Huye	4.9	3.4	-	1.0	56.6	24.4	2.0	7.8	-	100
Nyamagabe	3.4	0.9	8.1	3.8	65.0	10.3	1.9	6.6	-	100
Ruhango	31.6	0.6	-	2.0	45.5	8.8	2.3	9.3	-	100
Muhanga	7.0	0.6	3.8	11.1	69.0	3.2	4.1	1.3	-	100
Kamonyi	9.6	0.5	-	22.8	59.7	5.5	1.6	0.5	-	100
Karongi	1.3	2.6	2.6	33.8	42.7	2.6	0.6	11.2	2.9	100
Rutsiro	1.4	1.8	8.3	11.9	53.2	7.3	10.1	6.0	-	100
Rubavu	1.1	13.5	-	13.9	15.3	-	0.7	55.5	-	100
Nyabihu	1.3	1.3	16.2	5.6	49.6	-	0.9	24.8	0.4	100
Ngororero	15.0	-	2.3	19.9	55.8	1.1	2.3	2.6	1.1	100
Rusizi	7.8	14.3	-	0.5	35.5	32.3	5.1	4.2	0.5	100
Nyamasheke	12.6	3.6	7.4	3.6	44.5	13.9	12.6	0.7	1.3	100
Rulindo	6.2	-	4.9	6.8	69.1	10.1	2.3	0.3	0.3	100
Gakenke	1.4	2.8	5.1	3.1	74.9	3.4	2.8	5.7	0.9	100
Musanze	2.1	2.8	4.6	0.4	22.7	-	-	66.8	0.7	100
Burera	2.1	2.4	10.7	6.9	45.0	1.0	-	32.0	-	100
Gicumbi	1.1	0.7	10.6	14.4	66.0	5.2	2.0	-	-	100
Rwamagana	1.3	1.5	8.2	4.1	65.5	8.4	9.0	2.1	-	100
Nyagatare	21.0	1.1	1.5	13.4	49.1	8.5	4.2	0.3	0.8	100
Gatsibo	15.5	5.7	0.6	0.4	54.8	3.6	5.5	13.9	-	100
Kayonza	23.1	1.4	10.1	1.2	37.8	10.7	13.0	2.9	-	100
Kirehe	27.2	-	-	3.0	39.9	15.7	13.4	0.8	-	100
Ngoma	9.5	-	-	1.8	77.8	2.3	7.7	0.9	-	100
Bugesera	16.7	0.5	-	36.0	30.9	14.3	1.1	0.3	0.3	100
Overall	11.0	2.3	3.9	9.3	51.3	7.9	4.1	9.6	0.8	100

2017 Seasonal Agricultural Survey - Season B

For Season B looking across districts the methods used by SSF for erosion control continue to vary widely based on which method is most applicable to local conditions. For example ditches are in common usage in all districts and only in Gisagara at 34% is it the preferred method of the district's cropland erosion control and in twelve of the 30 districts it amounts to less than 3% usage. The same can be said for the trees/wind breaks/shelterbelts method which is applied in all districts but four and in twenty-six of the 30 districts it amounts to less than 3% usage. Bench terraces are not being reported as in use in ten districts as protection for cropland and four district are at 10% or greater where erosion control is practiced in these districts. Progressive terracing is utilized in all but one district but are not a preferred method with its usage the highest in only in Bugesera at 36%. Cover plants/grasses are the predominate method of erosion control in 27 of the 30 districts with its lowest usage in Rubavu at 15% and Musanze at 23% as those district's form of erosion control. Water drainage is in use in all districts to some lesser degree in all but three districts. Likewise mulching is used to a lesser extent in all districts but two and its highest usage is in Kayonza and Kirehe at 13%. Beds/ridges are used to some lesser degree in all but one district but is the predominant form of erosion control in Musanze at 67% and in Rubavu at 56. There are other forms of erosion control reported used in 12 of the 30 districts but mostly account for only a fraction of the total area cropland protected by erosion controls in those districts except in Nyaruguru at 15% (see Table 90).

Table 92. Season B, Degree of erosion per stratum (Percentage)

Stratum	Severe (Rill erosion, Gully erosion, Mass movement/ landslides)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Intensive cropland on hillsides	1.1	8.1	90.9	100
Intensive cropland in marshlands	0.2	3.8	96.1	100
Rangelands	2.9	11.5	85.6	100
Overall	1.0	7.6	91.3	100
LSF	1.9	3.1	95.0	100

2017 Seasonal Agricultural Survey - Season B

The Season B degree of erosion is estimated at 91% of SSF cultivated land had minimal to low degree of "splash" erosion, 8% has a moderate degree, and 1% severe erosion (visually unchanged from Season A estimates). This compares to LSF cultivated land which was observed to have 95% of its cultivated land minimally to lowly eroded, 3% moderately eroded, and 2% severely eroded (see Table 91).

Table 93. Season B, Degree of erosion per district (Percentage)

District	Severe	Moderate	Low	Total
Nyarugenge	-	0.4	99.7	100
Gasabo	-	1.5	98.5	100
Kicukiro	-	3	97	100
Nyanza	0.3	5	94.7	100
Gisagara	-	3.5	96.5	100
Nyaruguru	0.4	14.1	85.6	100
Huye	-	1	99.1	100
Nyamagabe	0.3	3	96.6	100
Ruhango	-	8.2	91.8	100
Muhanga	0.3	13.9	85.8	100
Kamonyi	1.4	3.1	95.5	100
Karongi	0.4	9.1	90.5	100
Rutsiro	1.6	35.1	63.3	100
Rubavu	0.4	5.3	94.3	100
Nyabihu	-	4.6	95.4	100
Ngororero	-	5.1	94.9	100
Rusizi	9.8	25.1	65.2	100
Nyamasheke	0.6	3.5	96	100
Rulindo	1.2	15.8	83.1	100
Gakenke	0.3	8.1	91.6	100
Musanze	0.3	13.2	86.5	100
Burera	7	10.8	82.3	100
Gicumbi	0.3	4.4	95.4	100
Rwamagana	0.2	1	98.8	100
Nyagatare	1.1	17.3	81.6	100
Gatsibo	-	1.3	98.7	100
Kayonza	0.6	4.9	94.6	100
Kirehe	2.9	3.5	93.6	100
Ngoma	0.3	3.4	96.3	100
Bugesera	-	2.7	97.3	100
Overall	1	7.6	91.3	100

2017 Seasonal Agricultural Survey - Season B

The USAS estimates for Season B of the SSF land at the district level with the most severely eroded land is Rusizi at 10% and Burera at 7%. The degree of SSF land across districts with moderate erosion varies considerably with the highest observed moderate erosion in Rutsiro at 35%, Rusizi at 25%, and Nyagatare at 17% (see Table 92).

Chapter 5: Results of the 2017 Season C

5.1. Farm characteristics

5.1.1. Areas

5.1.1.1. Agricultural land area

Table 94. Season C, Agricultural land per stratum (Ha)

Stratum	Cultivated Land
Intensive cropland on hillsides	11,429
Intensive cropland in marshlands	10,975
Total	22,404

2017 Seasonal Agricultural Survey - Season C

In the 2017 USAS for Season C only considered the two cultivated stratum for the estimation of cool season crops. The results are reported in Table 93 above. The total physical cultivated area for this season is estimated at 22 404 hectares.

Table 95. Season C, Agricultural land per district (Ha)

District	Cultivated Land	District	Cultivated Land
Nyarugenge	18	Rusizi	82
Gasabo	73	Nyamasheke	96
Kicukiro	4	Rulindo	73
Nyanza	1,324	Gakenke	76
Gisagara	2,323	Musanze	4,096
Nyaruguru	524	Burera	1,789
Huye	204	Gicumbi	518
Nyamagabe	467	Rwamagana	204
Ruhango	936	Nyagatare	110
Muhanga	468	Gatsibo	189
Kamonyi	1,208	Kayonza	2
Karongi	74	Kirehe	245
Rutsiro	139	Ngoma	-
Rubavu	2,370	Bugesera	1,373
Nyabihu	3,298	Total	22,404
Ngororero	120		

2017 Seasonal Agricultural Survey - Season C

The new USAS area sampling frame covers all districts and it is found that in the 2017 Season C the most cultivated districts are Musanze (4096 ha) followed by Nyabihu (3298 ha) and then Gisagara with 2323 ha.

5.1.1.2. Crop area

Table 96. Season C, Cultivated area by crop type by stratum (Ha)

Crop name	Stratum			
	Intensive cropland on hillsides	Intensive cropland in marshlands	Total	Percent
Tubers & Roots	**9,221**	**6,914**	**16,135**	**69.1**
Sweet Potato	1,480	6,129	7,609	32.6
Irish Potato	7,741	784	8,526	36.5
Legumes & Pulses	**72**	**3,593**	**3,665**	**15.7**
Beans	51	3,205	3,256	13.9
Bush bean	20	3,189	3,209	13.7
Climbing bean	30	16	47	0.2
Pea	22	81	103	0.4
Groundnut	-	-	-	-
Soybean		307	307	1.3
Vegetables & fruits	**999**	**2,541**	**3,540**	**15.2**
Vegetables	999	2,526	3,525	15.1
Fruits		16	16	0.1
Developed land	**10,293**	**13,048**	**23,341**	**100.0**
Agricultural Physical land	**11,429**	**10,975**	**22,404**	

2017 Seasonal Agriculture Survey_Season C

The survey results indicate that for Season C the main crops grown were tubers and roots (69.1%) with Irish potatoes the largest crop with 8,526 ha or 36% followed by sweet potatoes at 7,609 ha or 33% of Season C production. The third largest crop were vegetables at 3,525 ha or 15% followed by legumes and pulses (15.7%) with beans and bush beans visually equal in area (see Table 95).

Table 97. Season C, Cultivated area by crop type by district(Ha)

Crop/Crop category	Tubers and Roots	Sweet potato	Irish potato	Legumes and Pulses	Beans	Bush bean	Climbing bean
Kigali City	121	121	-	7	-	-	-
Southern Province	4,288	4,190	99	2,451	2,140	2,125	15
Western Province	4,896	1,230	3,666	83	15	15	-
Northern Province	5,552	884	4,667	54	51	20	31
Eastern Province	1,278	1,185	94	1,071	1,049	1,049	-
Total 2017C	**16,135**	7,609	8,526	**3,665**	3,256	3,209	47
Total 2016C	**16,442**	7,958	**8,483**	6,649	4,512	4,254	258
Percentage change	**-2%**	-4%	**1%**	-45%	-28%	-25%	-82%

Table 97. Season C, Cultivated area by crop type by district(Ha) (Cont'd)

Crop/Crop category	Pea	Soybean	Vegetables and Fruits	Vegetables	Fruits	*Developped land*	*Total Physical Land*
Kigali City	-	7	100	100	-	227	95
Southern Province	78	233	1,640	1,640	-	8,379	7,454
Western Province	22	46	640	640	-	5,620	6,180
Northern Province	2	-	669	669	-	6,275	6,552
Eastern Province	-	21	475	475	16	2,824	2,123
Total 2017C	103	307	**3,540**	3,525	16	23,341	22,404
Total 2016C	1,236	900	6,478	6,449	**30**	29,569	29,569
Percentage change	-92%	-66%	-45%	-45%	**-48%**	-21%	-24%

2017 Seasonal Agriculture Survey_Season C

The table 96 shows the distribution of crop area within provinces and what can be mentioned is that southern province is the largest cultivated area at 8,379 ha of the total cultivated area and it is followed by northern province with 6,275 ha. District level estimates are found in annexes.

5.1.1.3. Plot Size

Table 98. Season C, Average plot size per crop type by stratum (Ha/100)

Crop	Intensive cropland on hillside	Intensive cropland in marshland	OVERALL
Sweet potato	3.5	3.3	3.3
Irish potato	13.0	17.7	14.6
Bush bean	3.5	3.4	3.4
Climbing bean	12.2	2.2	5.5
Pea	3.0	2.2	2.3
Soybean	-	2.0	2.0
Vegetables	8.0	4.6	5.1
Fruits	-	7.8	7.8
Overall average	8.9	4.7	5.6

2017 Seasonal Agricultural Survey - Season C

In Season C 2017, the survey results showed that the average size of plots for cultivated land in Rwanda was 5.6 Ares for segments. The Stratum of Intensive cropland on hillside is overall larger on average in plot size than in Marshland (8.9 Ares). Examining the difference between crops, plots with Irish potato are the largest at 14.6 Ares in segments. (See table 97).

Table 99. Season C, Average plot size per crop type by district (ha/100)

Crop/Crop category	Sweet potato	Irish potato	Bush bean	Climbing bean	Pea	Soybean	Vegetables	Fruits	Overall average
Nyarugenge	5.2	-	-	-	-	5.4	1.5	-	4.0
Gasabo	1.8	-	-	-	-	-	11.2	-	7.4
Kicukiro	3.3	-	-	-	-	-	-	-	3.3
Nyanza	2.4	-	5.2	-	6.4	0.4	2.9	-	3.3
Gisagara	4.1	-	3.8	-	-	1.3	1.5	-	2.7
Nyaruguru	4.0	-	2.4	-	-	-	0.8	-	2.6
Huye	1.7	0.6	1.3	2.8	-	-	1.5	-	1.6
Nyamagabe	1.7	0.3	1.4	-	0.6	-	2.5	-	1.6
Ruhango	5.0	-	1.2	-	0.9	-	10.1	-	6.1
Muhanga	1.9	-	4.0	-	0.7	0.9	-	-	1.8
Kamonyi	1.7				0.5	4.1	1.6		1.7
Karongi	2.7	-	-	-	-	-	3.1	-	3.0
Rutsiro	5.6	74.1	-	-	0.7	-	3.4	-	21.3
Rubavu	7.1	10.0	-	-	3.5	-	8.1	-	8.4
Nyabihu	4.2	9.7	-	-	2.5	-	3.8	-	6.9
Ngororero	3.2	-	0.8	-	-	2.5	1.6	-	2.3
Rusizi	10.6	3.2	2.0	-	-	-	4.9	-	5.8
Nyamasheke	5.8	-	-	-	-	-	2.6	-	5.0
Rulindo	2.5	2.1	-	-	-	-	1.7	-	2.0
Gakenke	2.5	1.2	-	-	-	-	2.1	-	2.1
Musanze	2.0	17.2	-	6.9	-	-	8.1	-	9.7
Burera	1.9	12.6	3.5		2.6		5.6		7.2
Gicumbi	3.1	73.9	-	-	-	-	19.9	-	26.3
Rwamagana	0.7	1.1	3.4	-	-	-	4.3	-	3.2
Nyagatare	4.0	-	-	-	-	-	11.0	-	9.2
Gatsibo	4.6	11.0	1.1	-	-	-	7.0	-	6.1
Kayonza	2.1	-	-	-	-	-	1.5	-	1.6
Kirehe	2.1	2.8	3.3	-	-	-	3.8	-	3.1
Ngoma	-	-	-	-	-	-	-	-	-
Bugesera	2.7	0.2	5.0	-	-	2.5	6.4	7.8	4.5
Overall	3.4	14.6	3.4	5.5	2.3	2.0	5.1	7.8	5.6

2017 Seasonal Agricultural Survey - Season C

In season C 2017, the survey results indicate that Gicumbi district has the largest average plot size at 26.3 Ares followed by Rutsiro at 21.3 Ares (See Table 98).

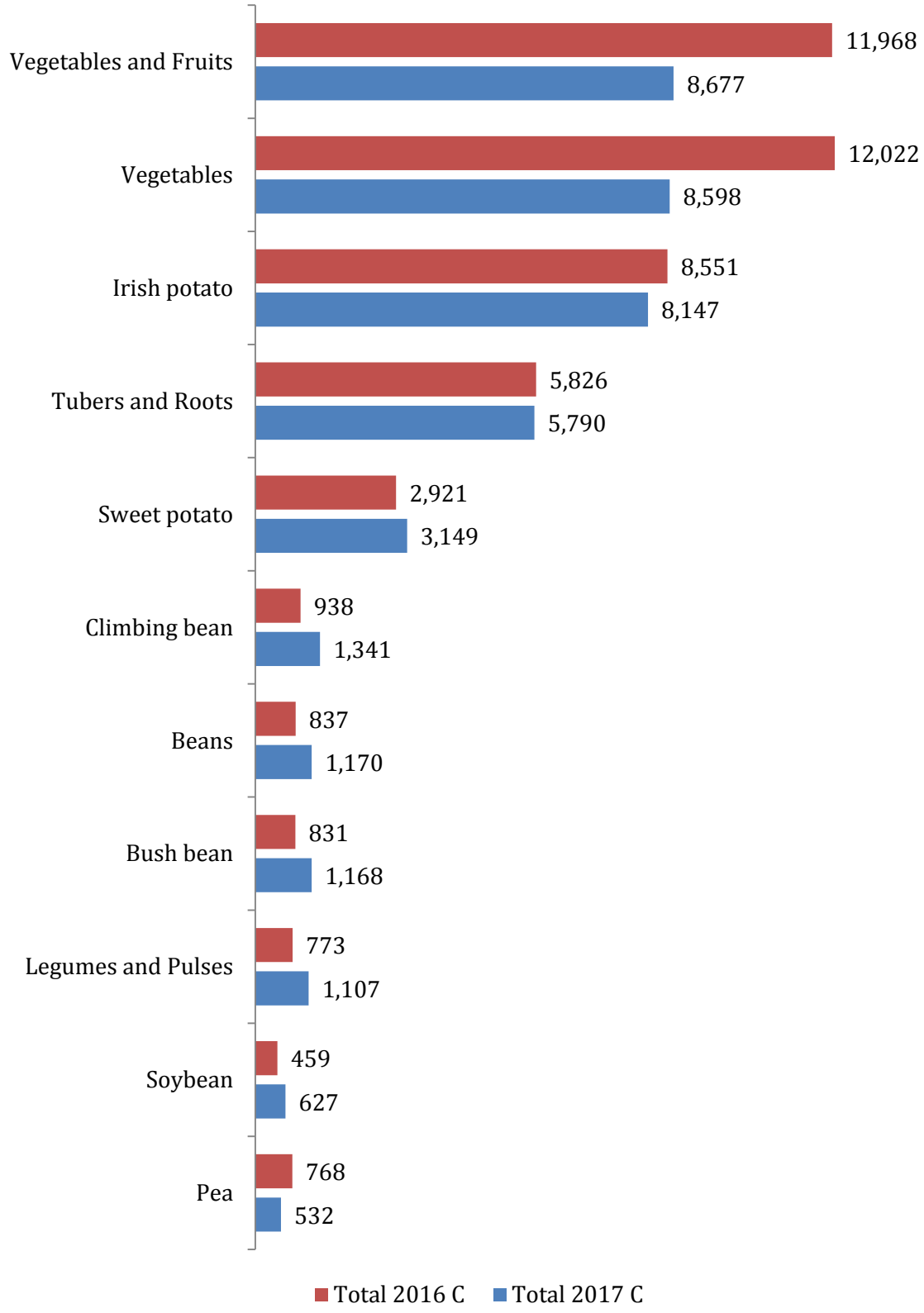
5.1.2. Crop Yield

Table 100. Season C, Yield of main crops by district (Kg/Ha)

Crop/ Crop category	Kigali City	Southern Province	Western Province	Northern Province	Eastern Province	Total 2017 C	Total 2016 C	Percentage change
Tubers and Roots	4,209	3,265	7,081	7,059	3,961	5,790	5,826	-1%
Sweet potato	4,209	3,096	2,904	2,797	3,748	3,149	2,921	8%
Irish potato	-	10,439	8,482	7,866	6,657	8,147	8,551	-5%
Legumes and Pulses	922	961	814	1,773	1,431	1,107	773	43%
Beans	-	1,021	866	1,851	1,446	1,170	837	40%
Bush bean	-	1,017	866	2,852	1,446	1,168	831	41%
Climbing bean	-	1,618	-	1,205	-	1,341	938	43%
Pea	-	553	501	145	-	532	768	-31%
Soybean	922	547	948	-	706	627	459	37%
Vegetables and Fruits	16,691	6,035	6,053	13,077	13,729	8,677	11,968	-27%
Vegetables	16,691	6,035	6,053	13,077	12,857	8,598	12,022	-28%
Fruits	-	-	-	-	26,736	26,736	-	

2017 Seasonal Agriculture Survey_Season C

Figure 9. Season C, Comparison of Yields 2016 and 2017 of main crops (Kg/Ha) at national level



5.1.3. Crop Production

Table 101. Season C, Production of main crops by district (MT)

Crop/Crop category	Kigali City	Southern Province	Western Province	Northern Province	Eastern Province	Total 2017 C	Total 2016C	Percentage change
Tubers and Roots	**508**	**14,000**	**34,670**	**39,187**	**5,064**	**93,428**	**95,790**	**-2%**
Sweet potato	508	12,971	3,573	2,474	4,440	23,966	23,249	3%
Irish potato	-	1,029	31,097	36,713	624	69,462	72,541	-4%
Legumes and Pulses	**6**	**2,356**	**68**	**95**	**1,532**	**4,057**	**5,140**	**-21%**
Beans	-	2,185	13	95	1,517	3,810	**3,778**	**1%**
Bush bean	-	2,160	13	57	1,517	3,748	3,535	6%
Climbing bean	-	25	-	38	-	62	242	-74%
Pea	-	43	11	0	-	55	949	-94%
Soybean	6	127	44	-	15	192	413	-53%
Vegetables and Fruits	**1,667**	**9,896**	**3,875**	**8,755**	**6,527**	**30,720**	**77,528**	**-60%**
Vegetables	1,667	9,896	3,875	8,755	6,113	30,305	**77,528**	**-61%**
Fruits	-	-	-	-	414	414	-	

2017 Seasonal Agriculture Survey_Season C

The Contribution of individual crop per district was calculated using the product of Yield and Area under crop, Table 103 shows that in 2017 Season C, many crops undergo a decrease of production where vegetables decreased by 60%, legumes and pulses by 21%, and tubers and roots by 2 % but it should be noted that be noted that bush bean and sweet potato individually increased respectively by 6% and 3 % by comparing with 2016 season C production estimates. District level estimates are found in appendix.

5.1.4. Sowing Date

Table 102. Season C, Sowing dates per crop (Percentage) in segments

Crop	Before 30/04	Between 01-15/05	Between 16-31/05	Between 01-30/06	Between 01-31/07	After 31/07	Total
Bush bean	-	2.0	6.3	33.4	48.7	9.5	100
Climbing bean	-	25.0	-	50.0	25.0	-	100
Pea	6.3	-	25.0	25.0	43.8	-	100
Irish potato	5.6	7.0	15.3	31.4	38.0	2.7	100
Sweet potato	5.0	11.8	17.4	39.7	23.8	2.3	100
Soybean	1.5	1.5	4.4	65.2	24.6	2.9	100
Vegetables	9.5	18.7	16.6	28.6	19.8	6.7	100
Other crops	-	-	-	33.3	66.7	-	100
Overall	4.8	9.4	14.3	35.6	31.6	4.4	100

2017 Seasonal Agricultural Survey - Season C

In season C 2017, for the majority of crops, sowing of crops in segments started in June 2017 with 35.6 % followed by 31.6% of crops planted in July 2017 (See Table 101).

Table 103. Season C, Sowing dates per district (Percentage)

District	Before 30/04	Between 01-15/05	Between 16-31/05	Between 01-30/06	Between 01-31/07	After 31/07	Total
Nyarugenge	-	12.5	12.5	50.0	12.5	12.5	100
Gasabo	6.3	25.0	31.3	18.8	18.8	-	100
Kicukiro	-	25.0	-	50.0	25.0	-	100
Nyanza	5.2	5.2	2.2	29.6	47.4	10.4	100
Gisagara	3.3	11.9	12.7	44.3	25.8	2.1	100
Nyaruguru	-	-	-	17.1	77.1	5.7	100
Huye	2.8	13.9	25.0	25.0	25.0	8.3	100
Nyamagabe	-	3.6	1.8	14.3	67.9	12.5	100
Ruhango	7.0	7.0	14.0	45.6	22.8	3.5	100
Muhanga	1.3	3.9	12.8	69.2	12.8	-	100
Kamonyi	10.0	23.3	15.0	28.3	18.3	5.0	100
Karongi	2.9	8.8	23.5	50.0	11.8	2.9	100
Rutsiro	3.8	5.7	11.3	73.6	5.7	-	100
Rubavu	7.1	9.1	6.1	14.1	62.6	1.0	100
Nyabihu	5.1	11.6	16.7	40.6	25.4	0.7	100
Ngororero	1.4	8.6	21.4	54.3	11.4	2.9	100
Rusizi	5.4	2.7	13.5	24.3	37.8	16.2	100
Nyamasheke	6.3	18.8	56.3	12.5	6.3	-	100
Rulindo	10.0	10.0	-	30.0	30.0	20.0	100
Gakenke	-	22.2	16.7	44.4	16.7	-	100
Musanze	5.1	9.4	10.3	36.8	36.8	1.7	100
Burera	9.4	6.9	34.6	22.6	26.4	-	100
Gicumbi	17.5	35.0	20.0	15.0	12.5	-	100
Rwamagana	2.9	2.9	5.7	31.4	54.3	2.9	100
Nyagatare	-	27.3	36.4	13.6	18.2	4.6	100
Gatsibo	7.8	3.9	33.3	31.4	21.6	2.0	100
Kayonza	20.0	-	-	20.0	40.0	20.0	100
Kirehe	3.0	3.0	3.0	31.3	32.8	26.9	100
Ngoma	-	-	-	-	-	-	-
Bugesera	2.0	7.6	8.1	38.6	40.1	3.6	100
Overall	4.8	9.4	14.3	35.6	31.6	4.4	100

2017 Seasonal Agricultural Survey - Season C

In season C 2017, the survey results showed that dates of sowing varies district to district but it can be observed from the survey data that in all districts 67.2% of the area was sown during the time period of June through July which corresponds exactly with the usual period of time for season C in Rwanda.

5.1.5. Cropping system

Table 104. Season C, Percentage of plots with number of crops per plot

District	1 crop	2 crops	3 crops	4 crops	5 crops and above	Total	Average number of crops per plot
Nyarugenge	64.3	28.6	7.1	0.0	0.0	100	1.4
Gasabo	76.7	14.0	9.3	0.0	0.0	100	1.3
Kicukiro	100.0	0.0	0.0	0.0	0.0	100	1.0
Nyanza	70.7	23.9	5.4	0.0	0.0	100	1.3
Gisagara	55.5	22.1	20.6	1.4	0.4	100	1.7
Nyaruguru	92.0	8.0	0.0	0.0	0.0	100	1.1
Huye	87.3	10.0	1.8	0.9	0.0	100	1.2
Nyamagabe	68.3	23.6	7.3	0.8	0.0	100	1.4
Ruhango	84.4	14.4	1.1	0.0	0.0	100	1.2
Muhanga	59.3	20.4	7.4	8.3	4.6	100	1.8
Kamonyi	86.4	9.9	3.7	0.0	0.0	100	1.2
Karongi	86.6	12.4	1.0	0.0	0.0	100	1.1
Rutsiro	75.8	21.2	3.0	0.0	0.0	100	1.3
Rubavu	89.4	9.6	1.0	0.0	0.0	100	1.1
Nyabihu	90.0	8.8	1.3	0.0	0.0	100	1.1
Ngororero	63.4	26.7	7.9	2.0	0.0	100	1.5
Rusizi	69.0	17.2	6.9	6.9	0.0	100	1.5
Nyamasheke	92.7	4.9	2.4	0.0	0.0	100	1.1
Rulindo	74.4	20.5	5.1	0.0	0.0	100	1.3
Gakenke	63.6	34.5	1.8	0.0	0.0	100	1.4
Musanze	82.6	14.3	2.8	0.3	0.0	100	1.2
Burera	92.4	7.2	0.4	0.0	0.0	100	1.1
Gicumbi	75.6	24.4	0.0	0.0	0.0	100	1.2
Rwamagana	54.5	24.2	21.2	0.0	0.0	100	1.7
Nyagatare	96.7	3.3	0.0	0.0	0.0	100	1.0
Gatsibo	91.6	7.4	1.1	0.0	0.0	100	1.1
Kayonza	50.0	25.0	25.0	0.0	0.0	100	1.8
Kirehe	88.8	9.6	0.8	0.0	0.8	100	1.1
Bugesera	72.8	14.7	12.4	0.0	0.0	100	1.4
Overall	79.2	14.8	5.1	0.7	0.2	100	1.3

2017 Seasonal Agricultural Survey - Season C

In general in Season C, agricultural operators in all districts used most of their agricultural land to cultivate in pure cropping with 79.2% of cultivated plots are in pure stand. and this is confirmed by the average number of crops per plots which is 1.3 crops per plot (See Table 103).

Table 105. Season C, Share of pure and mixed crop agricultural land per stratum (in percentage)

Stratum	Pure cropping	Mixed cropping	Total
Intensive cropland on hillsides	92.2	7.8	100
Intensive cropland in marshlands	68.5	31.5	100
Total	78.9	21.1	100

2017 Seasonal Agricultural Survey - Season C

The survey results showed that in Season C 2017 the share of agricultural land used to grow crops in pure stand and mixed stand in Rwanda was respectively 79% and 21 % of total cultivated area (See table 104).

Table 106. Season C, Share of pure and mixed crop agricultural land per district (in percentage)

District	Pure cropping	Mixed cropping	Total
Nyarugenge	52.7	47.3	100
Gasabo	89.2	10.8	100
Kicukiro	100.0	-	100
Nyanza	69.7	30.3	100
Gisagara	48.0	52.0	100
Nyaruguru	100.0	-	100
Huye	76.5	23.5	100
Nyamagabe	65.0	35.0	100
Ruhango	87.1	12.9	100
Muhanga	40.3	59.7	100
Kamonyi	59.1	40.9	100
Karongi	91.4	8.6	100
Rutsiro	74.1	25.9	100
Rubavu	91.7	8.3	100
Nyabihu	91.2	8.8	100
Ngororero	28.5	71.5	100
Rusizi	69.5	30.5	100
Nyamasheke	95.0	5.0	100
Rulindo	61.1	38.9	100
Gakenke	60.8	39.2	100
Musanze	96.3	3.7	100
Burera	84.8	15.2	100
Gicumbi	93.4	6.6	100
Rwamagana	39.4	60.6	100
Nyagatare	84.7	15.3	100
Gatsibo	97.6	2.4	100
Kayonza	66.7	33.3	100
Kirehe	74.7	25.3	100
Ngoma	-	-	-
Bugesera	65.5	34.5	100
Total	78.9	21.1	100

2017 Seasonal Agricultural Survey - Season C

The survey results indicate that in Season C 2017 the district with the highest rate of mixed cropping is Ngororero with 71.5 % of its total cultivated area (See table 105).

5.2. Agricultural inputs

5.2.1. Use of Seed

Table 107. Season C, Type of seeds used by stratum (Percentage)

Stratum	Traditional seeds	Improved seeds	Total
Intensive cropland on hillsides	88.5	11.5	100
Intensive cropland in marshlands	92.1	7.9	100
Total	91.4	8.6	100

2017 Seasonal Agricultural Survey - Season C

In Season C 2017, 9% of seed sown were improved seed while 91% were traditional seeds.

Table 108. Season C, Type of seeds used by district (Percentage)

District	Traditional seeds	Improved seeds	Total
Nyarugenge	75.0	25.0	100
Gasabo	93.8	6.3	100
Kicukiro	100.0	-	100
Nyanza	95.5	4.5	100
Gisagara	95.9	4.1	100
Nyaruguru	94.3	5.7	100
Huye	97.2	2.8	100
Nyamagabe	96.4	3.6	100
Ruhango	83.9	16.1	100
Muhanga	100.0	-	100
Kamonyi	70.0	30.0	100
Karongi	85.3	14.7	100
Rutsiro	94.3	5.7	100
Rubavu	79.8	20.2	100
Nyabihu	90.5	9.5	100
Ngororero	92.9	7.1	100
Rusizi	94.6	5.4	100
Nyamasheke	100.0	-	100
Rulindo	85.0	15.0	100
Gakenke	83.3	16.7	100
Musanze	89.7	10.3	100
Burera	96.9	3.1	100
Gicumbi	82.5	17.5	100
Rwamagana	85.7	14.3	100
Nyagatare	72.7	27.3	100
Gatsibo	72.6	27.5	100
Kayonza	100.0	-	100
Kirehe	100.0	-	100
Ngoma	-	-	-
Bugesera	94.9	5.1	100
Overall	91.4	8.6	100

2017 Seasonal Agricultural Survey - Season C

The survey results indicate that in season C 2017, Kamonyi, Gatsibo and Nyagatare are the three leading districts to use improved seeds with respectively 30%, 27.5% and 27% of all seeds sown in the district while the lowest usage of improved seed is Burera district at 3% (See Table 107).

Table 109. Season C, Type of seeds used by crop (Percentage)

Crop	Traditional seeds	Improved seeds	Total
Bush bean	98.9	1.2	100
Climbing bean	100.0	-	100
Pea	100.0	-	100
Irish potato	96.1	3.9	100
Sweet potato	99.4	0.6	100
Soybean	98.6	1.5	100
vegetables	52.7	47.3	100
Other crops	-	100.0	100
Overall	91.4	8.6	100

2017 Seasonal Agricultural Survey - Season C

The survey indicates that during Season C the improved seed varieties are used most for sowing other crops at 100% followed by vegetables at 47% while crops such as climbing beans and peas were found to be reported having zero use of improved seeds. (see Table 108).

Table 110. Season C, Source of improved seeds by district (Percentage)

District	RAB/ NAEB/ SECTOR	Recognized seed multipliers/NGO	Shops of Improved seeds	Other place (specify)	Total
Nyarugenge	-	-	100.0	-	100
Gasabo	-	-	100.0	-	100
Kicukiro					
Nyanza	16.7	16.7	66.7	-	100
Gisagara	-	20.0	80.0	-	100
Nyaruguru	-	50.0	50.0	-	100
Huye	-	-	100.0	-	100
Nyamagabe	-	-	100.0	-	100
Ruhango	-	11.1	88.9	-	100
Muhanga					
Kamonyi	-	-	94.4	5.6	100
Karongi	-	-	100.0	-	100
Rutsiro	-	-	100.0	-	100
Rubavu	30.0	10.0	60.0	-	100
Nyabihu	7.7	15.4	76.9	-	100
Ngororero	-	-	100.0	-	100
Rusizi	-	-	100.0	-	100
Nyamasheke					
Rulindo	-	-	100.0	-	100
Gakenke	-	-	100.0	-	100
Musanze	-	25.0	66.7	8.3	100
Burera	-	60.0	40.0	-	100
Gicumbi	-	14.3	71.4	14.3	100
Rwamagana	-	20.0	80.0	-	100
Nyagatare	-	-	83.3	16.7	100
Gatsibo	-	-	100.0	-	100
Kayonza					
Kirehe					
Ngoma					
Bugesera	-	-	100.0	-	100
Overall	4.9	10.4	82.3	2.4	100

2017 Seasonal Agricultural Survey - Season C

The SSF Season C found that dealer/shops supply 82% of the improved seed and Suppliers/NGOs contributed 10%. For Season C the SSF at the district level relied substantially on the dealer/shops as the main supply of improved seed by sources. The RAB/NAEB/SECTOR provides only a high of 30% of the improved seed in Rubavu and 17% in Nyanza but none in 27 of the 30 districts. Dealer/shops contribute a high of 80% usage or more in 17 districts but six districts reported zero usage of this source for obtaining their improved seed. The survey data indicates that one district utilized the Suppliers/NGOs to obtain a majority their improved seed in Burera at at 60% and to a lesser degree in nine districts. Other sources contributed minimally to the improved seed supply for Season C with a high of only 17% reported in Nyagatare and 26 districts reporting no usage od other sources of improved seed (see Table 109).

Table 111. Season C, Source of improved seeds by crop (Percentage) in segments

Crop	RAB/NAEB/ SECTOR	Recognized seed multipliers/NGO	Shops of Improved seeds	Other places	Total
Bush bean	-	75.0	25.0	-	100
Irish potato	15.8	52.6	31.6	-	100
Sweet potato	75.0	25.0	-	-	100
Soybean	100.0	-	-	-	100
Vegetables	0.8	2.3	94.0	3.0	100
Other crops	-	-	100.0	-	100
Overall	4.9	10.4	82.3	2.4	100

2017 Seasonal Agricultural Survey - Season C

For Season C the SSF varied their purchases of improved seed considerably more by the different crops they planted. The survey data indicates that the RAB/NAEB/SECTOR provided 100% of soybeans as the largest percentage and 75% for sweet potato. Suppliers/NGOs provided 75% of the bush beans and 53% of the Irish potato "eyes" for planting. Dealers/shops provided 100% of other crop seed, 94% of the vegetable seeds and supply 32% of the Irish potato "eyes" for planting (see Table 110).

5.2.2. Use of fertilizers

Table 112. Season C, Percentage of plots with organic fertilizers use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	54.5	45.6	100
Intensive cropland in marshlands	51.2	48.8	100
Total	51.9	48.1	100

2017 Seasonal Agricultural Survey - Season C

For Season C the SSFs utilize organic fertilizer on half (52%) of their cropland. This percentage is closely representative for both cropland stratum SSF usages (see Table 111).

Table 113. Season C, Percentage of plots with organic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	50.0	50.0	100
Gasabo	62.5	37.5	100
Kicukiro	0.0	100.0	100
Nyanza	25.2	74.8	100
Gisagara	51.4	48.6	100
Nyaruguru	100.0	0.0	100
Huye	56.7	43.3	100
Nyamagabe	67.4	32.6	100
Ruhango	51.9	48.1	100
Muhanga	89.7	10.3	100
Kamonyi	57.4	42.6	100
Karongi	42.4	57.6	100
Rutsiro	64.6	35.4	100
Rubavu	28.0	72.0	100
Nyabihu	50.8	49.3	100
Ngororero	84.9	15.1	100
Rusizi	73.3	26.7	100

District	Used	Not used	Total
Nyamasheke	12.5	87.5	100
Rulindo	82.4	17.7	100
Gakenke	100.0	0.0	100
Musanze	80.3	19.7	100
Burera	75.3	24.7	100
Gicumbi	100.0	0.0	100
Rwamagana	48.0	52.0	100
Nyagatare	19.1	81.0	100
Gatsibo	41.2	58.8	100
Kayonza	66.7	33.3	100
Kirehe	14.8	85.3	100
Ngoma	0.0	0.0	0.0
Bugesera	6.4	93.6	100
Total	51.9	48.1	100

2017 Seasonal Agricultural Survey - Season C

By district the SSF usage of organic fertilizer varies widely with the highest level of usage in Nyaruguru, Gakenke, and Gicumbi at 100%, and 17 applied at a rate of 50% or more but two reported no usage because it was Season C (see Table 112).

Table 114. Season C, Percentage of plots with inorganic fertilizer use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	72.0	28.0	100
Intensive cropland in marshlands	27.9	72.1	100
Overall	37.5	62.5	100

2017 Seasonal Agricultural Survey - Season C

The Season C usage of inorganic fertilizers by SSF is considerably higher at 38%, however the SSF usage by marshland stratum farmers is lower at 28% (presumably with its application on paddy rice which is absent from this season) (see Table 113).

Table 115. Season C, Table Percentage of plots with inorganic fertilizer use per district

District	Used	Not used	Total
Nyarugenge	37.5	62.5	100
Gasabo	50.0	50.0	100
Kicukiro	0.0	100.0	100
Nyanza	8.1	91.9	100
Gisagara	10.3	89.7	100
Nyaruguru	2.9	97.1	100
Huye	30.0	70.0	100
Nyamagabe	23.9	76.1	100
Ruhango	19.2	80.8	100
Muhanga	17.2	82.8	100
Kamonyi	13.0	87.0	100
Karongi	9.1	90.9	100
Rutsiro	77.1	22.9	100
Rubavu	83.0	17.0	100
Nyabihu	64.2	35.8	100
Ngororero	7.6	92.5	100
Rusizi	53.3	46.7	100
Nyamasheke	18.8	81.3	100
Rulindo	23.5	76.5	100
Gakenke	38.9	61.1	100
Musanze	67.5	32.5	100
Burera	76.6	23.4	100
Gicumbi	72.5	27.5	100
Rwamagana	44.0	56.0	100
Nyagatare	38.1	61.9	100
Gatsibo	23.5	76.5	100
Kayonza	0.0	100.0	100
Kirehe	8.2	91.8	100
Ngoma	0.0	0.0	0.0
Bugesera	24.4	75.6	100
Overall	37.5	62.5	100

2017 Seasonal Agricultural Survey - Season C

Inorganic fertilizer usage varies considerably by districts because of lower area planted and the crop types planed for Season C. Its highest usage is reported in Rubavu at 83%, Rutsiro and Burera at 77% and five others with application usage 50% or more (see Table 114).

Table 116. Season C, Types of inorganic fertilizers use per stratum (in percentage)

	NPK 17-17-17	Urea	Liquid urea	DAP	Other Fertilizers	Total
Intensive cropland on hillsides	73.2	8.9	4.6	12.0	1.2	100
Intensive cropland in marshlands	44.1	29.7	1.3	19.4	5.6	100
Overall	55.9	21.3	2.6	16.4	3.9	100

2017 Seasonal Agricultural Survey - Season C

In Season C the overall usage of inorganic fertilizer by types favors using NPK 17-17-17 at 56% followed by Urea usage at 21%, and 16% using DAP. The SSF use of NPK 17-17-17 more extensively on hillside cropland strata plots at 73% while urea usage is 30% in marshland strata versus 9% on hillside strata. DAP is more often used on marshland at 19% (see Table 115).

Table 117. Season C, Types of inorganic fertilizers use per district (in percentage)

Districts	NPK 17-17-17	Urea	Liquid urea	DAP	Other Fertilizers	Total
Nyarugenge	-	66.7	-	-	33.3	100
Gasabo	30.8	61.5	-	7.7	-	100
Kicukiro	-	-	-	-	-	-
Nyanza	8.3	66.7	-	8.3	16.7	100
Gisagara	13.6	27.3	-	59.1	-	100
Nyaruguru	-	50.0	-	50.0	-	100
Huye	42.9	35.7	-	21.4	-	100
Nyamagabe	53.9	30.8	-	15.4	-	100
Ruhango	-	90.9	-	9.1	-	100
Muhanga	10.0	-	-	90.0	-	100
Kamonyi	-	70.0	10.0	20.0	-	100
Karongi	33.3	33.3	-	33.3	-	100
Rutsiro	81.0	16.7	-	2.4	-	100
Rubavu	70.7	12.1	13.1	4.0	-	100
Nyabihu	76.2	9.9	1.0	10.9	2.0	100
Ngororero	25.0	50.0	-	25.0	-	100
Rusizi	29.6	33.3	-	25.9	11.1	100
Nyamasheke	75.0	25.0	-	-	-	100
Rulindo	28.6	42.9	-	28.6	-	100
Gakenke	10.0	40.0	-	50.0	-	100
Musanze	68.8	8.3	1.0	19.8	2.1	100
Burera	81.1	2.7	-	7.4	8.8	100
Gicumbi	54.3	42.9	-	2.9	-	100
Rwamagana	30.0	20.0	5.0	20.0	25.0	100
Nyagatare	28.6	35.7	-	35.7	-	100
Gatsibo	12.5	43.8	-	25.0	18.8	100
Kayonza	-	-	-	-	-	-
Kirehe	-	16.7	50.0	33.3	-	100
Ngoma	-	-	-	-	-	-
Bugesera	21.0	43.6	1.6	33.9	-	100
Overall	55.9	21.3	2.6	16.4	3.9	100

2017 Seasonal Agricultural Survey - Season C

The Season C usage of NPK 17-17-17 is highest in the districts of both Rutsiro and Burera at 81%, and six others at over 50%. The usage of urea is fairly uniform across districts with the highest usage in Ruhango at 91% and seven others at 50% or more usage. DAP usage is more variable across districts with its highest usage in Muhanga at 90% but only three others have 50% or more usage (see Table 116).

5.2.3. Use of Pesticides

Table 118. Season C, Percentage of plots with pesticides use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	72.0	28.0	100
Intensive cropland in marshlands	33.5	66.5	100
Overall	41.9	58.1	100

2017 Seasonal Agricultural Survey - Season C

The survey data indicates for Season C that 42% of the SSFs used pesticides overall. This percentage is much more widely used in the cropland hillside stratum at 72% but drops to 33% in the crop marshland stratum (see Table 107).

Table 119. Season C, Percentage of plots with pesticides use per district

District	Used	Not used	Total
Nyarugenge	50.0	50.0	100
Gasabo	56.3	43.8	100
Kicukiro	0.0	100.0	100
Nyanza	17.9	82.1	100
Gisagara	40.0	60.0	100
Nyaruguru	0.0	100.0	100
Huye	26.7	73.3	100
Nyamagabe	8.7	91.3	100
Ruhango	34.6	65.4	100
Muhanga	1.7	98.3	100
Kamonyi	31.5	68.5	100
Karongi	18.2	81.8	100
Rutsiro	81.3	18.8	100
Rubavu	84.0	16.0	100
Nyabihu	66.4	33.6	100
Ngororero	9.4	90.6	100

District	Used	Not used	Total
Rusizi	30.0	70.0	100
Nyamasheke	6.3	93.8	100
Rulindo	17.7	82.4	100
Gakenke	22.2	77.8	100
Musanze	67.5	32.5	100
Burera	77.9	22.2	100
Gicumbi	35.0	65.0	100
Rwamagana	60.0	40.0	100
Nyagatare	85.7	14.3	100
Gatsibo	33.3	66.7	100
Kayonza	33.3	66.7	100
Kirehe	8.2	91.8	100
Ngoma	0.0	0.0	0.0
Bugesera	27.3	72.7	100
Overall	41.9	58.1	100

2017 Seasonal Agricultural Survey - Season C

During Season C the usage of pesticides by district by the SSF varies somewhat with its lower area planted and usage with Season C with the highest level of usage in Nyagatare at 86%, Rubavu at 84% and Rutsiro at 81% and eight have usage at less than 10% (see Table 118).

Table 120. Season C, Type of pesticides used by stratum (in percentage)

Stratum	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Rocket	Other Pesticides	Total
Intensive cropland on hillsides	45.7	17.3	2.9	30.8	-	1.3	2.0	100
Intensive cropland in marshlands	30.8	3.0	2.8	29.7	0.2	27.3	6.4	100
Overall	37.6	9.6	2.9	30.2	0.1	15.3	4.4	100

2017 Seasonal Agricultural Survey - Season C

During Season C the SSF usage of pesticide by type finds that 38% of crop plots reporting application of pesticides used Dithane which was the highest application rate, followed by Cypermethrin at 30% and Rocket accounted for 15% of the usage application. Dithane is used in larger amount in the crop hillside stratum at 46% and 31% in the crop marshland strata. Cypermethrin is used in almost equal amounts in the crop hillside strata at 31% and only slightly lower in crop marshland strata at 30% (see Table 119).

Table 121. Season C, Type of pesticides used by District (in percentage)

District	Dithane	Ridomil	Dimethoate	Cypermethrine	Dursiban	Rocket	Other Pesticides	Total
Nyarugenge	33.3	-	-	-	-	33.3	33.3	100
Gasabo	26.7	-	-	33.3	-	33.3	6.7	100
Kicukiro	-	-	-	-	-	-	-	-
Nyanza	20.0	-	-	23.3	-	53.3	3.3	100
Gisagara	2.6	1.3	-	34.6	-	59.0	2.6	100
Nyaruguru	-	-	-	-	-	-	-	-
Huye	33.3	-	-	33.3	-	25.0	8.3	100
Nyamagabe	20.0	-	-	60.0	-	-	20.0	100
Ruhango	21.7	-	4.4	17.4	-	52.2	4.4	100
Muhanga	-	-	-	100.0	-	-	-	100
Kamonyi	25.0	14.3	3.6	3.6	-	46.4	7.1	100
Karongi	25.0	-	-	50.0	-	25.0	-	100
Rutsiro	67.3	-	-	23.6	-	9.1	-	100
Rubavu	38.7	25.1	2.4	31.4	-	-	2.4	100
Nyabihu	49.1	15.7	5.0	28.9	-	0.6	0.6	100
Ngororero	-	-	-	100.0	-	-	-	100
Rusizi	44.4	-	5.6	11.1	-	22.2	16.7	100
Nyamasheke	-	-	-	-	-	100.0	-	100
Rulindo	25.0	-	-	50.0	-	-	25.0	100
Gakenke	20.0	-	-	60.0	-	20.0	-	100
Musanze	49.0	5.6	2.1	35.7	-	5.6	2.1	100
Burera	50.9	9.6	2.3	34.9	-	-	2.3	100
Gicumbi	50.0	-	6.3	18.8	-	25.0	-	100
Rwamagana	16.0	-	-	20.0	-	36.0	28.0	100
Nyagatare	7.4	3.7	22.2	22.2	3.7	29.6	11.1	100
Gatsibo	23.1	-	-	38.5	-	26.9	11.5	100
Kayonza	-	-	-	-	-	-	100.0	100
Kirehe	22.2	-	33.3	44.4	-	-	-	100
Ngoma	-	-	-	-	-	-	-	-
Bugesera	11.8	2.9	-	19.1	-	52.9	13.2	100
Overall	37.6	9.6	2.9	30.2	0.1	15.3	4.4	100

2017 Seasonal Agricultural Survey - Season C

Season C district pesticide usage reported for Dithane varies widely but is generally below 50% across all districts with only Rutsiro at 67%, Burera at 51% and Gicumbi at 50% are at or above that level of application. Cypermethrin usage reported across numerous districts is higher because of its wider usage in general on specific Season C crops but only six districts reports levels at or above 50% but the highest is Muhanga and Ngororero at 100%. Rocket pesticide usage also varies widely but thirteen districts reporting usage at zero or less than 10% with the highest reported usage in Nyamasheke at 100% and Bugesera at 53% (see Table 120).

5.3. Agricultural practices

5.3.1. Irrigation practices

Table 122. Season C, Use of Irrigation per stratum (Percentage)

Stratum	Used	Not used	Total
Intensive cropland on hillsides	5.4	94.6	100
Intensive cropland in marshlands	28.6	71.4	100
Rangelands	-	-	-
Overall	23.6	76.4	100

2017 Seasonal Agricultural Survey - Season C

During Season C the SSF irrigated overall 24% of the crop area, however, this is heavily influenced by low usage of irrigation on the crop hillside at 5% while the marshland strata farmers practice irrigation on 29% of their cultivated crop land (see Table 121).

Table 123. Season C, Use of Irrigation per district (Percentage)

District	Used	Not used	Total
Nyarugenge	37.5	62.5	100
Gasabo	81.3	18.8	100
Kicukiro	75.0	25.0	100
Nyanza	30.9	69.1	100
Gisagara	10.9	89.1	100
Nyaruguru	20.0	80.0	100
Huye	53.3	46.7	100
Nyamagabe	15.2	84.8	100
Ruhango	42.3	57.7	100
Muhanga	24.1	75.9	100
Kamonyi	68.5	31.5	100
Karongi	39.4	60.6	100
Rutsiro	20.8	79.2	100
Rubavu	5.0	95.0	100
Nyabihu	6.0	94.0	100
Ngororero	13.2	86.8	100

District	Used	Not used	Total
Rusizi	33.3	66.7	100
Nyamasheke	6.3	93.8	100
Rulindo	58.8	41.2	100
Gakenke	44.4	55.6	100
Musanze	11.1	88.9	100
Burera	1.9	98.1	100
Gicumbi	95.0	5.0	100
Rwamagana	76.0	24.0	100
Nyagatare	47.6	52.4	100
Gatsibo	51.0	49.0	100
Kayonza	33.3	66.7	100
Kirehe	31.2	68.9	100
Ngoma	-	-	-
Bugesera	11.6	88.4	100
Overall	23.6	76.4	100

2017 Seasonal Agricultural Survey - Season C

The highest occurrence of irrigation usage on the small area planted during Season C was in districts Gicumbi at 95% and Gasabo at 81% of cropland (see Table 122).

Table 124. Season C, Types of irrigation used by stratum (in percentage)

Stratum	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Intensive cropland on hillsides	40.0	-	5.0	55.0	100
Intensive cropland in marshlands	15.8	0.3	0.5	83.5	100
Rangelands	-	-	-	-	-
Overall	17.0	0.3	0.7	82.1	100

2017 Seasonal Agricultural Survey - Season C

During Season C the SSF overall used traditional irrigation on 82% of irrigated cropland. The remaining portion of SSF irrigation utilizes surface irrigation on 17% of cropland with the hillside stratum plots receiving 40% coverage (see Table 123).

Table 125. Season C, Types of irrigation used by district (in percentage)

District	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Nyarugenge	-	-	-	100.0	100
Gasabo	23.1	-	-	76.9	100
Kicukiro	33.3	-	-	66.7	100
Nyanza	7.9	-	-	92.1	100
Gisagara	14.3	-	-	85.7	100
Nyaruguru	-	-	-	100.0	100
Huye	-	-	-	100.0	100
Nyamagabe	-	-	-	100.0	100
Ruhango	-	-	-	100.0	100
Muhanga	7.1	-	-	92.9	100
Kamonyi	29.7	-	-	70.3	100
Karongi	7.7	-	7.7	84.6	100
Rutsiro	25.0	-	-	75.0	100
Rubavu	60.0	-	-	40.0	100
Nyabihu	50.0	-	-	50.0	100

District	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Ngororero	28.6	-	-	71.4	100
Rusizi	18.2	-	-	81.8	100
Nyamasheke	-	-	-	100.0	100
Rulindo	-	-	-	100.0	100
Gakenke	-	-	-	100.0	100
Musanze	14.3	7.1	7.1	71.4	100
Burera	33.3	-	-	66.7	100
Gicumbi	-	-	2.6	97.4	100
Rwamagana	31.6	-	-	68.4	100
Nyagatare	10.0	-	-	90.0	100
Gatsibo	-	-	-	100.0	100
Kayonza	-	-	-	100.0	100
Kirehe	52.6	-	-	47.4	100
Bugesera	60.0	-	-	40.0	100
Overall	17.0	0.3	0.7	82.1	100

2017 Seasonal Agricultural Survey - Season C

During Season C where irrigation is practiced at the district level a majority of the cropland is irrigated using traditional irrigation methods with 10 of the 30 districts utilizing this method 100% and another fifteen utilizing it on 66% or more of their cropland that is irrigated. Sprinkler irrigation usage is sparingly used in only 3 districts as is drip irrigation reported being used in only one district. Surface irrigation is used in eighteen districts with only four using it on 50% or more of their cropland irrigated area (see Table 124).

Table 126. Season C, Types of irrigation used by crop type (in percentage) in segments

Crop	Surface irrigation	Drip irrigation	Sprinkler irrigation	Traditional irrigation	Total
Bush bean	33.3	-	-	66.7	100
Climbing bean	-	-	-	100.0	100
Irish potato	18.2	-	1.8	80.0	100
Sweet potato	15.2	0.9	-	83.9	100
Soybean	-	-	-	100.0	100
Pea	-	-	-	100.0	100
Vegetables	15.5	-	1.0	83.5	100
Other crops	60.0	-	-	40.0	100
Overall	17.0	0.3	0.7	82.1	100

2017 Seasonal Agricultural Survey - Season C

During Season C the small amount of irrigation practiced by SSF is mainly applied using traditional irrigation with nearly all crops receiving 80% coverage of their irrigated cropland using this method. Drip irrigation and sprinklers are minimally used. Surface irrigation has its highest use on Bush beans at 33% of their irrigation and other crops at 60% (see Table 125).

Table 127. Season C, Source of used water for irrigation per stratum (in percentage)

Stratum	Rainwater harvesting	Water treatment plant	Underground water	Lake/ stream water	Water catchment (dam)	Other source	Total
Intensive cropland on hillsides	-	20.0	30.0	45.0	-	5.0	100
Intensive cropland in marshlands	0.5	0.8	41.8	53.2	2.4	1.3	100
Rangelands	-	-	-	-	-	-	-
Overall	0.5	1.8	41.3	52.8	2.3	1.5	100

2017 Seasonal Agricultural Survey - Season C

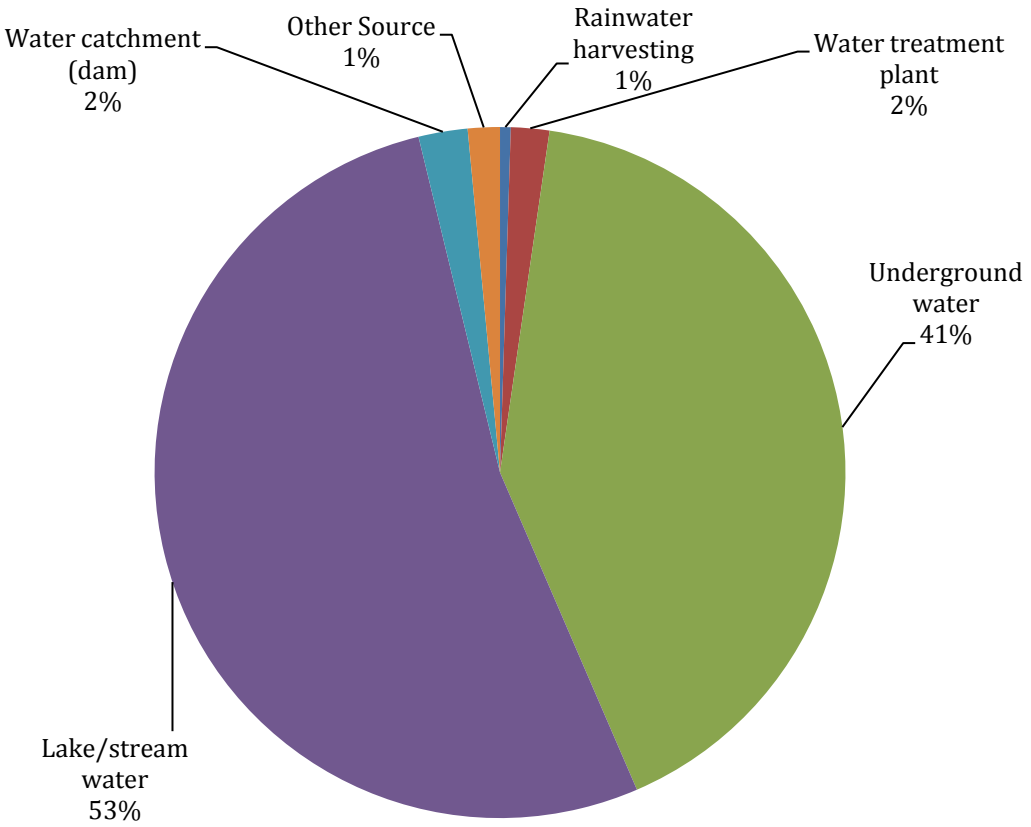
The source of water during Season C used for irrigation by the SSF is 53% lake/stream fed followed closely by underground water at 41% as the two main sources of irrigation water (see Table 126).

Table 128. Season C, Source of water used for irrigation per district (in percentage)

District	Rainwater harvesting	Water treatment plant	Underground water	Lake/stream water	Water catchment (dam)	Other Source	Total
Nyarugenge	0.0	0.0	0.0	100.0	0.0	0.0	100
Gasabo	0.0	0.0	53.9	38.5	7.7	0.0	100
Kicukiro	0.0	0.0	0.0	33.3	0.0	66.7	100
Nyanza	0.0	0.0	36.8	63.2	0.0	0.0	100
Gisagara	0.0	0.0	68.4	31.6	0.0	0.0	100
Nyaruguru	0.0	0.0	28.6	71.4	0.0	0.0	100
Huye	0.0	0.0	87.5	12.5	0.0	0.0	100
Nyamagabe	0.0	0.0	71.4	28.6	0.0	0.0	100
Ruhango	0.0	0.0	100.0	0.0	0.0	0.0	100
Muhanga	0.0	0.0	57.1	42.9	0.0	0.0	100
Kamonyi	0.0	0.0	46.0	46.0	0.0	8.1	100
Karongi	0.0	0.0	0.0	100.0	0.0	0.0	100
Rutsiro	0.0	0.0	0.0	100.0	0.0	0.0	100
Rubavu	0.0	40.0	0.0	60.0	0.0	0.0	100
Nyabihu	0.0	25.0	75.0	0.0	0.0	0.0	100
Ngororero	0.0	0.0	71.4	28.6	0.0	0.0	100
Rusizi	0.0	0.0	60.0	40.0	0.0	0.0	100
Nyamasheke	0.0	0.0	0.0	100.0	0.0	0.0	100
Rulindo	0.0	0.0	70.0	30.0	0.0	0.0	100
Gakenke	0.0	12.5	87.5	0.0	0.0	0.0	100
Musanze	0.0	0.0	7.7	92.3	0.0	0.0	100
Burera	0.0	0.0	0.0	66.7	0.0	33.3	100
Gicumbi	0.0	0.0	0.0	100.0	0.0	0.0	100
Rwamagana	0.0	0.0	47.4	31.6	21.1	0.0	100
Nyagatare	0.0	0.0	0.0	80.0	20.0	0.0	100
Gatsibo	0.0	0.0	30.8	69.2	0.0	0.0	100
Kayonza	0.0	0.0	0.0	0.0	100.0	0.0	100
Kirehe	5.3	0.0	52.6	36.8	5.3	0.0	100
Bugesera	5.0	10.0	20.0	65.0	0.0	0.0	100
Overall	0.5	1.8	41.3	52.8	2.3	1.5	100.0

2017 Seasonal Agricultural Survey - Season C

Figure 10. Season c, Source of water used for irrigation at national level



At the district level during Season C the primary sources of irrigation water across districts was lake/stream water with five districts being their total source of irrigation water and eight others it contributes 50% or more of their irrigation water. Underground is the second leading source across districts and in twelve districts it contributes 50% or more of their irrigation water. Rain-harvesting has only minor usage in two districts and water treatment plants are a source in only four districts with Rubavu having the highest usage at 40%. Water catchment/dams have minor usage in five districts except Kayonza where is accounts for 100% as a source of irrigation water (see Table 127).

5.3.2. Erosion control

Table 129. Season C, Percentage of plot with Anti-erosion activities use per stratum

Stratum	Used	Not used	Total
Intensive cropland on hillsides	87.1	12.9	100
Intensive cropland in marshlands	81.5	18.5	100
Overall	82.7	17.3	100

2017 Seasonal Agricultural Survey - Season C

The survey results show the distribution of anti-erosion activities within USAS land use stratum (see Table 128). During the 2017 Season C the SSF reported to have practiced erosion control on 83% of their cropland. Erosion control is practiced similarly across cropland stratum but to a lesser extent by the SSF in the marshland strata at 82% of the cropland compared with 87% of those SSF in the hillside stratum having reported a control applied.

Table 130. Season C, Percentage of plot with Anti-erosion activities use per District

District	Used	Not used	Total
Nyarugenge	62.5	37.5	100
Gasabo	100.0	-	100
Kicukiro	50.0	50.0	100
Nyanza	99.2	0.8	100
Gisagara	88.6	11.4	100
Nyaruguru	85.7	14.3	100
Huye	63.3	36.7	100
Nyamagabe	97.8	2.2	100
Ruhango	67.3	32.7	100
Muhanga	96.6	3.5	100
Kamonyi	94.4	5.6	100
Karongi	93.9	6.1	100
Rutsiro	97.9	2.1	100
Rubavu	91.0	9.0	100
Nyabihu	80.6	19.4	100
Ngororero	96.2	3.8	100
Rusizi	86.7	13.3	100
Nyamasheke	43.8	56.3	100
Rulindo	76.5	23.5	100
Gakenke	88.9	11.1	100
Musanze	93.2	6.8	100
Burera	94.3	5.7	100
Gicumbi	97.5	2.5	100
Rwamagana	76.0	24.0	100
Nyagatare	76.2	23.8	100
Gatsibo	96.1	3.9	100
Kayonza	33.3	66.7	100
Kirehe	26.2	73.8	100
Ngoma	-	-	-
Bugesera	46.5	53.5	100
Overall	82.7	17.3	100

2017 Seasonal Agricultural Survey - Season C

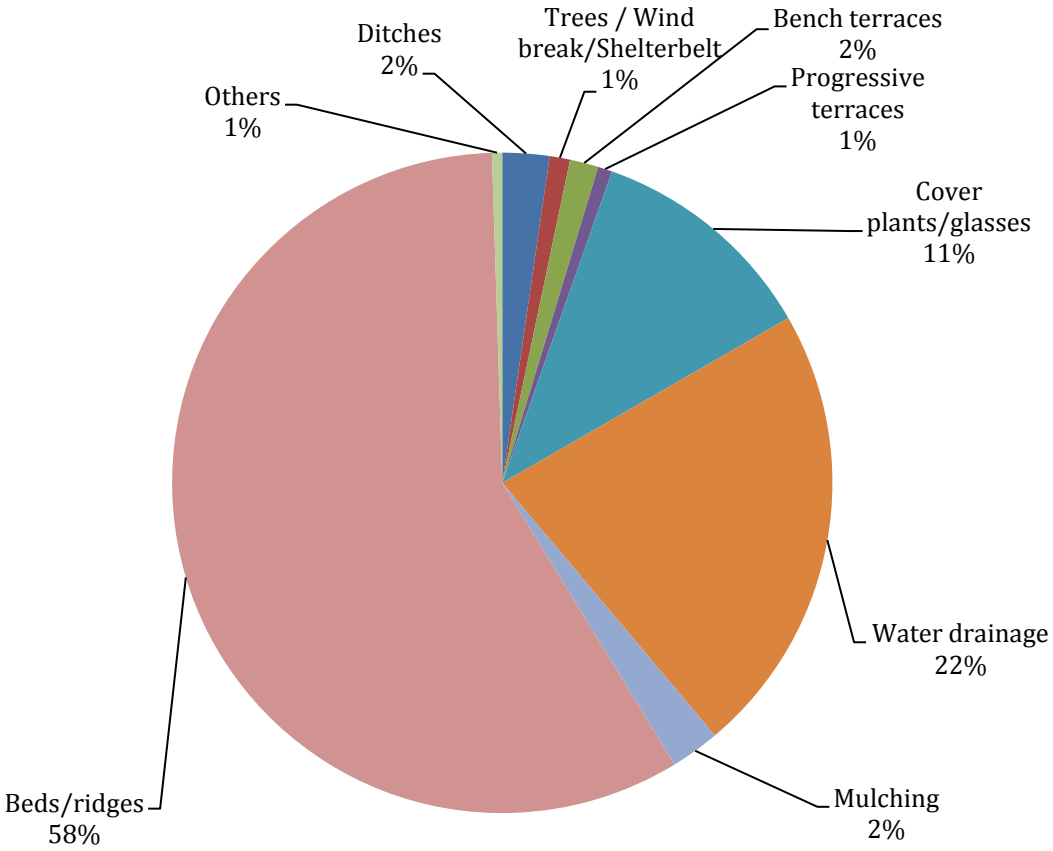
During Season C twenty-four districts are estimated to have erosion controls applied to 60% or more their cropland (an increase of two districts compared to Season A). The report indicates Ngoma with zero erosion control but this is an anomaly of the low Season C USAS sample and reduced overall season C crop planted area. However, the report indicates that erosion controls was used on less than half the cropland land in four districts with Kirehe the lowest at 26% of plots (see Table 129).

Table 131. Season C, Type of anti-erosion activities by stratum (Percentages)

Stratum	Ditches	Trees / Wind break/Shelterbelt	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Intensive cropland on hillsides	3.6	2.8	6.2	1.5	24.9	2.1	0.5	58.1	0.3	100
Intensive cropland in marshlands	1.9	0.4	-	0.4	7.2	28.2	3.0	58.4	0.5	100
Overall	2.3	1.0	1.4	0.7	11.3	22.2	2.4	58.3	0.5	100

2017 Seasonal Agricultural Survey - Season C

Figure 11. Type of anti-erosion activities at national level (Percentages)



The methods of erosion control in Season C vary widely but beds/ridges are the major erosion control method practiced by SSF at 58% of the cropland reported utilizing a control method and the degree of its use is visually equal in both cropland stratum. Water drainage is the second leading method used at 22% of the cropland followed by cover plants/grasses at 11% (see Table 130).

Table 132. Season C, Types of anti-erosion activities by district (Percentages)

District	Ditches	Trees / Wind break/Shelterbel	Bench terraces	Progressive terraces	Cover plants/glasses	Water drainage	Mulching	Beds/ridges	Others	Total
Nyarugenge	-	-	-	-	-	40.0	40.0	20.0	-	100
Gasabo	-	4.8	-	-	14.3	23.8	19.1	38.1	-	100
Kicukiro	-	-	-	-	-	-	-	100.0	-	100
Nyanza	-	-	-	-	5.3	18.3	2.3	74.1	-	100
Gisagara	-	-	-	-	0.5	33.9	1.8	62.9	0.9	100
Nyaruguru	3.0	-	-	-	9.1	87.9	-	-	-	100
Huye	-	-	-	-	-	-	-	84.2	15.8	100
Nyamagabe	-	-	-	-	9.6	84.6	5.8	-	-	100
Ruhango	5.4	-	-	-	8.1	-	-	86.5	-	100
Muhanga	1.6	-	-	-	11.5	-	-	86.9	-	100
Kamonyi	1.8	-	-	-	12.3	21.1	5.3	59.7	-	100
Karongi	-	-	-	7.3	19.5	29.3	4.9	39.0	-	100
Rutsiro	-	1.3	-	-	2.7	42.7	-	53.3	-	100
Rubavu	0.9	4.6	0.9	1.9	12.0	-	-	79.6	-	100
Nyabihu	5.7	-	13.5	0.7	31.9	12.8	1.4	34.0	-	100
Ngororero	1.9	1.9	-	1.9	7.7	-	-	86.5	-	100
Rusizi	-	-	-	-	-	34.5	17.2	48.3	-	100
Nyamasheke	44.4	-	-	-	-	55.6	-	-	-	100
Rulindo	-	-	-	-	30.0	55.0	-	15.0	-	100
Gakenke	-	-	-	-	52.0	36.0	-	12.0	-	100
Musanze	5.2	5.2	2.2	-	17.9	4.5	-	64.2	0.8	100
Burera	1.8	-	0.6	1.8	14.1	9.8	-	71.8	-	100
Gicumbi	-	-	-	-	17.8	82.2	-	-	-	100
Rwamagana	-	-	-	-	6.7	50.0	3.3	40.0	-	100
Nyagatare	10.5	-	-	-	5.3	10.5	15.8	47.4	10.5	100
Gatsibo	3.7	1.9	-	-	5.6	11.1	5.6	72.2	-	100
Kayonza	-	-	-	-	-	100.0	-	-	-	100
Kirehe	10.5	-	-	5.3	5.3	-	15.8	63.2	-	100
Ngoma	-	-	-	-	-	-	-	-	-	-
Bugesera	3.6	-	-	-	2.4	3.6	3.6	86.8	-	100
Overall	2.3	1.0	1.4	0.7	11.3	22.2	2.4	58.3	0.5	100

2017 Seasonal Agricultural Survey - Season C

For Season C looking across districts the methods used by SSF of erosion control vary widely based on which method is most applicable to local conditions and the effect of reduced Season C cropland across districts. For example ditches were in common usage in all districts during Season A but now during Season C this method of erosion control appears used in only half of the districts and Nyamasheke has the highest usage at 44% of its cropland. Likewise the same can be said for the trees/wind breaks/shelterbelts method which is applied in all districts but one district during Season A but during Season C it is reported being used in to a minor extent in only seven districts. The same for bench terraces which is reported used in only five districts and progressive terraces are reported in us in seven

districts. Beds/ridges are the predominate methods of erosion control in 21 of the 30 districts with zero reported as the lowest usage in six districts. Water drainage has the second highest overall usage and is in use in all but 8 districts. Likewise cover plants/grasses are the third most frequently employed erosion control method but is used to a lesser extent in all districts but seven districts. Mulching is used to some lesser degree in half of the districts but it is one of the predominant forms of erosion control in Nyarugenge at 40%. There were other forms of erosion control used in only 5 of the 30 districts (see Table 131).

Table 133. Season C, Degree of erosion per stratum (Percentage)

Stratum	Severe (Rill erosion, Gully erosion, Mass movement/ landslides)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Intensive cropland on hillsides	0.9	14.9	84.2	100
Intensive cropland in marshlands	2.9	3.6	93.5	100
Overall	2.5	6.1	91.4	100

2017 Seasonal Agricultural Survey - Season C

For Season C observations on the degree of erosion are estimated at 91% of SSF cultivated land with minimal to low degree of "splash" erosion (unchanged from Season A), 6% has a moderate degree, and 2.5% rated as having severe erosion (see Table 132).

Table 134. Season C, Degree of erosion per district (Percentage)

District	Severe (Rill erosion, Gully erosion , Mass movement/ landslides)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Nyarugenge	-	12.5	87.5	100
Gasabo	9.5	9.5	81.0	100
Kicukiro	25.0	-	75.0	100
Nyanza	18.9	3.0	78.0	100
Gisagara	-	0.4	99.6	100
Nyaruguru	-	2.6	97.4	100
Huye	-	-	100.0	100
Nyamagabe	-	3.8	96.2	100
Ruhango	-	-	100.0	100
Muhanga	-	1.6	98.4	100
Kamonyi	-	-	100.0	100
Karongi	-	2.3	97.7	100
Rutsiro	-	-	100.0	100
Rubavu	0.9	16.2	82.9	100
Nyabihu	3.6	15.6	80.8	100
Ngororero	-	7.4	92.6	100

District	Severe (Rill erosion, Gully erosion , Mass movement/ landslides)	Moderate (Diffuse overland flow erosion, Overland flow erosion, erosion by infiltration)	Low (Splash erosion)	Total
Rusizi	-	-	100.0	100
Nyamasheke	-	5.6	94.4	100
Rulindo	-	33.3	66.7	100
Gakenke	-	22.2	77.8	100
Musanze	-	17.6	82.4	100
Burera	2.3	2.9	94.8	100
Gicumbi	-	-	100.0	100
Rwamagana	-	-	100.0	100
Nyagatare	8.3	-	91.7	100
Gatsibo	-	19.6	80.4	100
Kayonza	-	-	100.0	100
Kirehe	-	4.7	95.3	100
Ngoma	-	-	-	-
Bugesera	4.6	-	95.4	100
Overall	2.5	6.1	91.4	100

2017 Seasonal Agricultural Survey - Season C

During Season C the SSF land at the district level with the most severely eroded land is Kicukiro at 25% followed by Nyabihu at 19% and Nyagatare at 8%. The degree of SSF land across districts with moderate erosion varies considerably in 18 of the 30 districts with the highest observed moderate erosion in Rulindo at 33%, Gakenke at 22%, and Gatsibo at 20% (see Table 133). During Season C the SSF land at the district level with the most severely eroded land is Kicukiro at 25% followed by Nyabihu at 19% and Nyagatare at 8%. The degree of SSF land across districts with moderate erosion varies considerably in 18 of the 30 districts with the highest observed moderate erosion in Rulindo at 33%, Gakenke at 22%, and Gatsibo at 20%.

Appendix

Summary of Area, Yield and Production for 2017 USAS

Crops	Season A			Season B			Season C		
	Area	**Yield**	**Production**	**Area**	**Yield**	**Production**	**Area**	**Yield**	**Production**
Maize	212,085	1,284	272,303	85,362	1,009	86,114			
Sorghum	30,106	1,360	40,959	113,384	974	110,488			
Paddy rice	14,693	3,087	45,351	16,890	3,766	63,607			
Wheat	3,242	1,103	3,575	7,516	978	7,351			
Other cereals	7,336			1,199					
Cassava	218,853	2,058	450,305	164,843	3,589	591,681			
Sweet potato	87,854	6,515	572,350	89,146	5,414	482,657	7,609	3,149	23,966
Irish potato	39,396	9,595	378,008	46,069	8,655	398,714	8,526	8,147	69,462
Yams & Taro	35,631	3,665	130,590	22,176	4,229	93,770			
Cooking banana	96,699	4,230	409,063	93,613	3,372	315,689			
Dessert banana	35,470	3,172	112,514	32,614	3,417	111,436			
Banana for beer	105,995	4,277	453,321	100,470	3,256	327,127			
Bush bean	187,931	778	146,207	192,567	726	139,792	3,209	1,168	3,748
Climbing bean	80,945	975	78,893	84,741	1,028	87,120	47	1,341	62
Pea	9,398	719	6,758	10,309	544	5,607	103	532	55
Groundnut	25,039	475	11,889	20,473	431	8,814			
Soybean	22,411	480	10,749	30,643	424	12,993	307	627	192
vegetables	20,282	6,603	133,910	18,991	8,171	155,168	3,525	8,598	30,305
Fruits	6,573	8,460	55,604	6,849	2,495	17,090	16	26,736	414
Other crops	25,950			62,639			23,341		

2017 Seasonal Agricultural survey

Crop Cutting Experiment (CCE) Yields

Name	Maize	Rice	Sorghum	Wheat	Irish potato	Sweet potato	Soybean	Cassava
Nyarugenge	3,744	-	1,228	-	-	13,633	988	26,291
Gasabo	3,297	-	1,675	-	5,269	8,632	749	25,755
Kicukiro	2,535	-	1,609	-	22,464	6,755	1,413	24,020
Nyanza	3,362	3,863	1,626	-	-	6,360	533	9,783
Gisagara	3,398	3,879	1,037	-	4,992	8,463	945	9,506
Nyaruguru	809	-	1,885	1,450	4,437	12,679	462	8,900
Huye	3,788	3,925	2,229	-	10,955	6,412	750	23,380
Nyamagabe	-	-	2,230	3,095	9,809	5,785	561	29,400
Ruhango	1,952	3,453	1,869	-	2,773	13,949	523	11,267
Muhanga	2,161	-	2,080	-	-	13,658	843	20,600
Kamonyi	1,704	-	1,442	-	-	11,566	594	21,404
Karongi	3,296	-	1,207	-	8,424	16,301	386	22,429
Rutsiro	2,183	-	1,279	3,380	7,715	10,150	372	-
Rubavu	2,484	-	480	-	38,546	13,578	-	-
Nyabihu	3,544	-	-	-	42,254	15,893	667	16,000

Name	Maize	Rice	Sorghum	Wheat	Irish potato	Sweet potato	Soybean	Cassava
Ngororero	1,996	-	-	1,218	-	7,448	311	12,067
Rusizi	4,509	5,590	2,273	-	-	17,813	880	4,747
Nyamasheke	-	4,743	-	-	-	-	438	2,600
Rulindo	-	-	-	-	8,320	11,750	572	17,325
Gakenke	-	-	-	-	7,488	15,233	1,600	31,563
Musanze	3,301	-	-	-	17,608	7,275	1,000	-
Burera	-	-	-	-	7,488	17,427	-	-
Gicumbi	2,960	-	2,137	-	12,249	11,843	630	25,653
Rwamagana	2,224	3,932	1,310	-	4,160	12,361	709	21,900
Nyagatare	4,828	4,151	1,232	-	6,136	8,307	1,331	28,400
Gatsibo	5,374	-	1,782	1,420	8,017	11,527	1,150	36,250
Kayonza	5,463	6,292	1,674	-	7,223	12,910	1,644	7,867
Kirehe	5,430	8,171	821	-	6,822	-	488	50,000
Ngoma	2,855	2,832	1,868	-	5,269	10,694	333	26,800
Bugesera	5,732	3,506	1,838	-	-	8,409	707	-
Overall yield	3,440	4,412	1,658	1,631	18,380	10,838	773	19,216

2017 Seasonal Agricultural Survey - Season A

Season A- Cultivated area by crop type by district (ha)

Crop/Crop category	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi
Cereals	446	3,891	927	5,905	7,896	2,466	2,864	3,265	3,519	2,251	5,974
Maize	446	3,821	925	4,920	5,793	2,405	1,308	3,202	2,906	1,829	5,869
Sorghum	-	-	-	635	403	-	-	16	52	15	5
Paddy rice	-	25	-	44	572	-	1,305	-	66	200	9
Wheat	-	-	-	-	-	44	-	-	-	-	-
Other cereals	-	45	2	306	1,128	16	250	47	496	207	90
Tubers and Roots	**1,339**	**6,424**	**1,305**	**10,058**	**10,698**	**11,550**	**7,533**	**14,379**	**15,347**	**19,081**	**15,021**
Cassava	1,031	4,531	764	6,081	7,224	4,214	5,094	4,600	11,606	10,961	9,794
Sweet Potatoes	240	998	353	2,448	1,720	4,312	1,481	7,248	2,128	4,028	3,301
Irish potatoes	11	301	23	295	505	1,576	373	1,125	227	110	150
Yams & Taro	56	594	165	1,233	1,250	1,447	585	1,407	1,386	3,981	1,775
Banana	**1,339**	**4,374**	**1,108**	**6,486**	**9,802**	**2,708**	**5,182**	**5,404**	**6,849**	**13,394**	**11,674**
Cooking banana	249	2,093	488	1,315	2,146	607	599	805	382	1,760	2,003
Dessert banana	154	1,369	281	2,168	1,438	703	1,189	675	1,225	2,582	1,926
Banana for beer	935	911	339	3,002	6,218	1,397	3,395	3,924	5,242	9,051	7,745
Legumes & Pulses	**1,462**	**6,751**	**1,428**	**11,849**	**15,458**	**4,597**	**8,976**	**8,985**	**13,478**	**9,758**	**15,551**
Beans	1,363	5,991	1,258	9,948	13,267	3,557	7,530	7,143	10,325	6,523	12,173
Bush beans	1,255	5,903	1,230	8,943	12,243	871	6,413	2,025	9,376	3,897	11,280

Crop/Crop category	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi
Climbing beans	109	88	28	1,005	1,024	2,686	1,117	5,118	949	2,625	893
Peas	6	73	1	211	104	285	332	840	133	129	160
Groundnuts	46	423	57	727	583	190	246	-	1,402	-	1,375
Soya beans	46	265	113	963	1,504	565	868	1,003	1,619	3,106	1,843
Vegetables and Fruits	**580**	**665**	**362**	**887**	**634**	**322**	**763**	**584**	**543**	**588**	**819**
vegetables	182	622	236	769	581	322	763	411	446	567	782
Fruits	397	43	126	118	53	-	-	173	96	20	37
Other crops	**384**	**1,923**	**457**	**414**	**463**	**478**	**403**	**452**	**899**	**875**	**1,393**
Developed land	**5,549**	**24,029**	**5,588**	**35,599**	**44,950**	**22,120**	**25,721**	**33,067**	**40,635**	**45,945**	**50,431**
Agricultural physical land	**4,064**	**17,141**	**4,152**	**26,731**	**28,867**	**13,548**	**15,507**	**19,786**	**28,113**	**30,565**	**36,120**
Fallow land	**763**	**3,208**	**2,403**	**14,950**	**9,976**	**9,984**	**8,866**	**9,292**	**13,053**	**9,052**	**9,737**

2017 Seasonal Agricultural Survey - Season A

Season A- Cultivated area by crop type by district (ha) (cont'd)

Crop/Crop category	Karongi	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi
Cereals	3,960	7,844	4,184	3,719	4,655	5,634	3,625	5,453	9,951	7,300	10,384	5,407
Maize	3,793	7,490	4,075	2,471	3,724	5,106	3,419	5,299	9,612	4,749	6,658	5,246
Sorghum	67	77	27	716	654	88	53	-	2	1,655	3,039	8
Paddy rice	-	-	-	-	59	436	129	-	-	-	-	-
Wheat	-	265	81	532	218	-	-	154	112	896	656	123
Other cereals	101	12	-	-	-	4	24	-	225	-	31	30
Tubers and Roots	**15,561**	**10,494**	**5,686**	**9,938**	**20,432**	**19,220**	**19,518**	**11,733**	**17,695**	**7,924**	**8,663**	**12,378**
Cassava	7,814	2,847	116	447	8,393	16,185	13,557	6,919	6,988	589	634	5,456
Sweet Potatoes	5,067	3,262	1,205	2,661	7,841	938	4,111	3,380	6,917	1,953	3,804	4,297
Irish potatoes	562	2,877	4,264	6,696	1,124	210	35	553	1,515	4,869	3,897	1,953
Yams & Taro	2,118	1,508	101	134	3,074	1,887	1,816	882	2,275	514	328	671
Banana	**8,465**	**4,295**	**953**	**1,091**	**9,617**	**3,901**	**4,459**	**7,835**	**10,173**	**2,028**	**2,341**	**8,694**
Cooking banana	797	860	683	237	609	1,028	1,287	1,613	1,848	375	806	3,399
Dessert banana	875	1,075	84	147	1,434	357	344	2,040	2,853	635	218	1,939
Banana for beer	6,793	2,360	187	706	7,575	2,516	2,828	4,182	5,472	1,018	1,317	3,356
Legumes & Pulses	**6,029**	**4,739**	**4,251**	**7,041**	**7,555**	**8,205**	**8,508**	**11,167**	**11,069**	**4,828**	**11,083**	**20,216**
Beans	5,047	3,829	4,007	5,947	6,217	7,386	5,163	10,459	9,656	4,540	9,671	18,057
Bush beans	1,745	246	62	194	885	6,549	1,574	8,169	1,760	121	1,049	6,652
Climbing beans	3,302	3,583	3,945	5,753	5,333	837	3,589	2,290	7,896	4,419	8,622	11,405
Peas	370	270	141	1,069	533	5	20	313	586	164	1,303	1,250
Groundnuts	-	-	-	-	-	198	639	162	137	-	-	580
Soya beans	613	640	103	25	805	616	2,687	233	689	125	108	329
Vegetables	**1,013**	**1,252**	**1,258**	**764**	**900**	**1,161**	**661**	**631**	**1,069**	**1,278**	**798**	**1,896**

Crop/Crop category	Karongi	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi
and Fruits												
vegetables	573	398	1,155	421	794	947	441	582	667	950	670	1,565
Fruits	441	854	104	343	107	214	221	49	402	328	128	331
Other crops	**501**	**2,088**	**650**	**2,657**	**589**	**905**	**1,225**	**506**	**1,328**	**1,873**	**1,070**	**766**
Developed land	**35,531**	**30,712**	**16,983**	**25,209**	**43,749**	**39,027**	**37,997**	**37,326**	**51,285**	**25,231**	**34,339**	**49,357**
Agricultural physical land	**21,361**	**22,830**	**17,153**	**24,420**	**28,966**	**27,094**	**24,025**	**25,146**	**38,001**	**23,164**	**28,100**	**39,338**
Fallow land	**9,128**	**4,988**	**1,863**	**5,028**	**4,485**	**2,264**	**3,836**	**3,137**	**4,487**	**2,528**	**3,697**	**12,328**

2017 Seasonal Agricultural Survey - Season A

Season A- Cultivated area by crop type by district (ha) (cont'd)

Crop/Crop category	Rwamagana	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	SSF Total	LSF Total	Total 2017	Total 2016	Percentage change
Cereals	**8,955**	**42,253**	**20,625**	**16,609**	**22,070**	**16,844**	**13,853**	**252,729**	**15,133**	**267,862**	**230,806**	**16%**
Maize	8,786	29,038	16,708	12,947	20,388	15,364	9,669	207,964	2,645	210,609	170,815	23%
Sorghum	4	11,785	2,868	2,056	1,178	272	3,958	29,633	69	29,702	35,928	-17%
Paddy rice	60	352	195	408	268	405	-	4,533	12,389	16,922	17,042	-1%
Wheat	-	-	201	-	-	-	-	3,283	30	3,313	5,137	-36%
Other cereals	105	1,079	653	1,198	236	803	226	7,315	0	7,316	1,885	288%
Tubers and Roots	**12,232**	**15,291**	**12,500**	**16,603**	**15,212**	**16,483**	**20,787**	**381,084**	**159**	**381,243**	**424,818**	**-10%**
Cassava	7,445	13,180	9,666	12,841	11,975	12,822	16,012	219,786	59	219,845	288,049	-24%
Sweet Potatoes	2,489	1,489	1,287	1,920	1,088	2,031	3,716	87,715	10	87,725	65,044	35%
Irish potatoes	1,144	320	549	1,055	1,137	806	-	38,261	90	38,351	54,051	-29%
Yams & Taro	1,155	302	997	786	1,012	825	1,059	35,321	0	35,321	17,674	100%
Banana	**10,769**	**13,778**	**16,307**	**15,318**	**18,647**	**16,590**	**14,140**	**237,722**	**127**	**237,849**	**322,009**	**-26%**
Cooking banana	7,249	9,664	8,365	11,540	14,289	13,372	6,014	96,483	89	96,571	114,452	-16%
Dessert banana	1,456	1,055	2,714	1,282	416	763	2,015	35,413	17	35,430	35,647	-1%
Banana for beer	2,065	3,059	5,227	2,497	3,942	2,455	6,112	105,826	21	105,847	171,910	-38%
Legumes & Pulses	**13,834**	**25,623**	**20,143**	**17,661**	**17,112**	**13,312**	**13,597**	**324,267**	**473**	**324,740**	**323,316**	**0%**
Beans	11,942	18,231	16,974	16,015	15,376	9,940	10,265	267,799	296	268,095	274,568	-2%
Bush beans	11,629	17,207	15,841	15,918	14,379	9,418	10,143	186,975	281	187,257	181,656	3%
Climbing beans	314	1,025	1,133	97	997	522	122	80,824	15	80,838	92,912	-13%

Crop/Crop category	Rwamagana	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	SSF Total	LSF Total	Total 2017	Total 2016	Percentage change
Peas	155	243	160	325	191	-	-	9,372	1	9,373	16,012	-41%
Groundnuts	1,328	6,473	2,294	1,037	1,290	2,856	2,947	24,990	14	25,004	11,922	110%
Soya beans	408	675	716	284	255	516	385	22,107	161	22,268	20,815	7%
Vegetables and Fruits	**1,838**	**1,243**	**482**	**846**	**354**	**867**	**904**	**25,962**	**340**	**26,302**	**24,109**	**9%**
vegetables	1,573	952	348	650	294	593	639	19,894	75	19,969	15,811	26%
Fruits	265	291	135	195	60	274	265	6,068	265	6,333	8,298	-24%
Other crops	**916**	**187**	**239**	**539**	**296**	**470**	**442**	**25,387**	**673**	**26,060**	**62,801**	**-59%**
Developed land	**48,544**	**98,375**	**70,296**	**67,575**	**73,691**	**64,566**	**63,724**	**1,247,151**	**16,905**	**1,264,055**	**1,387,860**	**-9%**
Agricultural physical land	**34,692**	**66,920**	**52,860**	**48,857**	**52,722**	**42,138**	**47,400**	**889,784**	**16,749**	**906,533**	**1,247,799**	**-27%**
Fallow land	**4,565**	**3,247**	**3,333**	**10,040**	**8,063**	**6,281**	**31,271**	**215,853**	**2,440**	**218,294**	**191,349**	**14%**

2017 Seasonal Agricultural Survey - Season A

Season A- Yield of main crops by district (Kg/Ha)

	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Maize	967	1,045	1,821	1,117	1,350	1,507	1,223	1,272	1,104	1,187	1,173	1,320
Sorghum	-	-	-	859	713	-	-	1,278	550	2,578	1,471	628
Paddy rice	-	3,981	-	3,089	3,198	-	3,638	-	2,962	3,132	-	-
Wheat	-	-	-	-	-	1,074	-	-	-	-	-	-
Cassava	2,403	2,466	2,472	2,488	2,220	2,479	3,548	1,593	2,780	2,425	2,341	1,866
Sweet potatoes	3,156	5,791	11,104	4,566	3,742	12,282	2,970	9,595	5,865	6,807	6,789	6,256
Irish potatoes	1,908	8,016	5,074	2,224	3,045	7,645	2,854	4,630	2,085	12,344	3,308	6,391
Yams & Taro	1,504	2,128	2,121	2,393	1,362	4,119	1,817	3,351	4,357	2,828	4,261	11,133
Cooking Banana	3,016	2,278	1,964	1,774	1,848	3,040	2,478	3,092	2,500	3,209	4,299	2,973
Dessert banana	2,337	4,258	4,911	2,668	1,381	2,722	1,281	1,507	2,606	2,988	3,255	3,696
Banana for beer	3,716	3,142	3,186	6,100	4,018	4,403	4,210	2,711	4,811	4,085	4,239	3,295
Bush beans	738	1,018	773	858	670	625	529	689	862	669	751	842
Climbing beans	802	826	1,096	1,074	681	848	568	857	874	1,001	748	918
Peas	1,471	660	-	573	416	1,037	462	714	748	557	1,163	677
Groundnuts	473	331	219	209	182	1,347	215	-	480	-	258	-
Soya beans	318	703	483	243	224	343	264	481	356	434	446	686
Vegetables	13,458	4,900	2,080	5,637	15,875	11,343	2,252	12,183	2,652	4,391	3,689	17,723
Fruits	929	14,101	15,790	4,833	19,428	-	-	1,314	4,819	2,209	2,123	16,101

2017 Seasonal agricultural Survey- Season A

Season A- Yield of main crops by district (Kg/Ha) (cont'd)

	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Maize	1,314	1,257	1,599	1,517	1,314	1,335	1,171	1,464	1,513	1,526	1,561	1,541
Sorghum	528	939	800	1,823	1,343	724	-	1,365	2,517	2,098	-	738
Paddy rice	-	-	-	-	4,370	3,905	-	-	-	-	-	2,944
Wheat	191	148	1,028	923	-	-	787	489	1,771	1,063	250	-
Cassava	1,850	928	1,123	1,245	1,547	2,281	1,521	1,302	1,024	2,619	1,557	2,513
Sweet potatoes	6,192	8,477	4,742	5,559	5,072	4,338	3,239	4,790	9,781	9,419	10,523	6,456
Irish potatoes	10,753	18,764	15,290	3,262	4,714	5,202	4,750	7,579	9,619	8,089	7,419	6,072
Yams & Taro	3,951	8,132	3,438	3,935	3,489	3,943	1,601	3,821	6,093	3,743	2,561	2,443
Cooking Banana	3,254	2,911	2,059	4,200	3,814	3,603	2,245	3,854	2,944	5,464	2,831	4,340
Dessert banana	7,258	8,448	2,408	3,344	2,459	3,340	2,222	3,907	5,070	3,634	4,802	3,002
Banana for beer	3,583	9,192	3,247	2,912	2,859	4,251	4,175	3,265	5,516	7,744	3,869	6,642
Bush beans	1,036	686	432	786	594	840	755	782	1,465	772	1,143	965
Climbing beans	851	1,101	1,087	816	1,277	825	736	845	1,545	1,065	1,009	1,240
Peas	273	1,093	1,039	588	1,095	489	846	692	1,052	663	733	686
Groundnuts	-	-	-	-	1,232	589	1,124	607	-	-	874	544
Soya beans	815	924	1,779	369	366	608	630	613	500	218	857	500
Vegetables	4,656	-	9,561	18,300	5,229	3,647	4,276	7,236	4,638	2,513	6,177	9,843
Fruits	145	46	6,927	528	23,626	55	8,054	9,141	1,441	374	14,987	21,251

2017 Seasonal agricultural Survey- Season A

Season A- Yield of main crops by district (Kg/Ha) (cont'd)

	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	LSF	Overall 2017 Yield	Overall 2016 Yield
Maize	1,904	1,827	1,544	1,500	1,632	1,433	2,983	1,540	1,758
Sorghum	1,461	1,179	890	733	453	1,164	1,948	1,403	1,323
Paddy rice	2,964	3,199	5,630	3,419	2,690	-	3,150	3,263	2,901
Wheat	-	1,305	-	-	-	-	1,280	1,102	850
Cassava	2,284	2,201	2,623	1,460	1,888	1,513	1,277	2,053	1,409
Sweet potatoes	5,898	8,924	3,516	3,417	3,066	5,109	4,997	6,549	7,745
Irish potatoes	6,401	6,723	3,605	3,253	4,353	-	12,268	9,880	6,840
Yams & Taro	1,575	1,138	2,595	1,530	4,565	1,941	5,924	3,670	4,653
Cooking Banana	4,981	4,763	4,456	5,332	4,855	4,198	2,403	4,306	3,313
Dessert banana	4,912	1,602	3,125	1,565	5,252	2,741	3,072	3,190	2,730
Banana for beer	6,690	6,907	4,400	2,001	4,909	6,238	9,097	4,314	3,080
Bush beans	853	1,087	631	546	647	620	639	778	835
Climbing beans	957	1,782	583	529	709	931	1,061	975	1,046
Peas	558	613	442	610	-	-	158	722	729
Groundnuts	413	580	316	322	972	157	487	475	508
Soya beans	518	555	384	316	208	1,446	1,423	480	593
Vegetables	12,344	1,913	5,787	1,728	2,510	3,429	8,019	6,666	8,703
Fruits	3,776	14	11,507	11,305	18,916	37,082	2,367	8,675	4,150

2017 Seasonal agricultural Survey- Season A

Season A-Production of main crops by district (MT)

Crop	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Maize	431	3,995	1,684	5,495	7,822	3,625	1,599	4,074	3,209	2,171	6,884	5,006
Sorghum	-	-	-	546	287	-	-	20	28	38	8	42
Paddy rice	-	101	-	136	1,830	-	4,750	-	194	625	-	-
Wheat	-	-	-	-	-	48	-	-	-	-	-	-
Cassava	2,477	11,176	1,887	15,132	16,038	10,445	18,072	7,327	32,267	26,585	22,932	14,585
Sweet potato	759	5,780	3,922	11,179	6,435	52,956	4,399	69,538	12,481	27,421	22,411	31,701
Irish potatoes	21	2,409	117	657	1,537	12,051	1,064	5,207	473	1,358	497	3,591
Yams & Taro	85	1,264	351	2,950	1,702	5,962	1,063	4,714	6,038	11,259	7,563	23,580
Cooking Banana	753	4,769	957	2,333	3,966	1,846	1,484	2,488	956	5,649	8,610	2,368
Dessert banana	359	5,830	1,381	5,785	1,986	1,914	1,523	1,017	3,194	7,716	6,271	3,235
Banana for beer	3,476	2,863	1,081	18,313	24,982	6,152	14,291	10,638	25,217	36,976	32,830	22,384
Bush bean	926	6,005	950	7,623	8,186	544	3,380	1,347	8,082	2,601	8,448	1,469
Climbing bean	87	73	31	1,078	698	2,278	634	4,385	829	2,628	668	3,030
Peas	9	48	-	121	43	296	153	599	99	72	186	250
Ground nuts	22	140	12	152	106	256	53	-	673	-	355	-
Soya beans	15	186	54	234	337	194	229	482	577	1,346	821	420
Vegetables	2,451	3,046	491	4,336	9,222	3,655	1,719	5,002	1,183	2,492	2,885	10,149
Fruits	369	606	1,994	569	1,023	-	-	228	464	44	78	7,097

2017 Seasonal Agricultural Survey - Season A

Season A-Production of main crops by district (MT) (cont'd)

Crop	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Maize	9,839	5,123	3,952	5,651	6,711	4,565	6,205	14,068	7,183	10,158	8,188	13,536
Sorghum	41	26	573	1,192	119	38	-	2	4,165	6,377	-	3
Paddy rice	-	-	-	-	1,904	504	-	-	-	-	-	176
Wheat	51	12	547	201	-	-	121	55	1,587	698	31	-
Cassava	5,267	108	502	10,451	25,043	30,922	10,526	9,099	603	1,660	8,494	18,713
Sweet potato	20,199	10,215	12,618	43,593	4,760	17,832	10,947	33,136	19,100	35,828	45,222	16,068
Irish potatoes	30,939	80,007	102,379	3,666	989	182	2,628	11,483	46,837	31,524	14,491	6,945
Yams & Taro	5,959	824	462	12,096	6,583	7,159	1,412	8,691	3,132	1,226	1,718	2,821
Cooking Banana	2,800	1,987	489	2,557	3,921	4,637	3,620	7,121	1,105	4,405	9,620	31,459
Dessert banana	7,800	706	354	4,794	878	1,148	4,534	11,146	3,218	793	9,311	4,369
Banana for beer	8,455	1,721	2,293	22,054	7,193	12,024	17,459	17,865	5,615	10,196	12,987	13,714
Bush bean	255	42	84	695	3,889	1,323	6,119	1,376	177	810	7,601	11,212
Climbing bean	3,051	4,345	6,252	4,352	1,069	2,961	1,685	6,670	6,826	9,185	11,502	389
Peas	73	154	1,110	314	6	10	265	406	172	864	916	106
Ground nuts	-	-	-	-	244	376	182	83	-	-	507	722
Soya beans	522	95	45	297	226	1,634	147	423	62	24	282	204
Vegetables	1,853	-	4,024	14,524	4,953	1,607	2,489	4,826	4,407	1,684	9,669	15,482
Fruits	124	5	2,375	56	5,065	12	393	3,671	473	48	4,954	5,639

2017 Seasonal Agricultural Survey - Season A

Season A-Production of main crops by district (MT) (cont'd)

Crop	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	SSF Total	LSF Total	Total (2017 A)	Total (2016 A)	Percentage change
Maize	55,278	30,519	19,988	30,582	25,078	13,858	316,477	7,891	324,368	300,330	8%
Sorghum	17,213	3,383	1,830	864	123	4,609	41,528	135	41,662	47,522	-12%
Paddy rice	1,044	623	2,299	915	1,089	-	16,191	39,026	55,217	49,430	12%
Wheat	-	262	-	-	-	-	3,612	39	3,651	4,365	-16%
Cassava	30,099	21,277	33,685	17,488	24,204	24,223	451,287	76	451,362	405,961	11%
Sweet potato	8,780	11,489	6,751	3,719	6,226	18,987	574,451	50	574,500	503,760	14%
Irish potatoes	2,049	3,694	3,805	3,698	3,507	-	377,805	1,100	378,906	369,691	2%
Yams & Taro	476	1,135	2,039	1,547	3,764	2,056	129,630	0	129,630	82,244	58%
Cooking Banana	48,142	39,843	51,418	76,185	64,921	25,248	415,655	213	415,868	379,196	10%
Dessert banana	5,181	4,347	4,005	651	4,010	5,522	112,979	53	113,032	97,304	16%
Banana for beer	20,464	36,104	10,986	7,888	12,051	38,124	456,396	189	456,585	529,434	-14%
Bush bean	14,665	17,219	10,014	7,853	6,083	6,288	145,266	180	145,446	151,715	-4%
Climbing bean	980	2,020	57	527	370	113	78,772	16	78,787	97,230	-19%
Peas	136	98	144	117	-	-	6,768	0	6,768	11,673	-42%
Ground nuts	2,670	1,331	327	415	2,775	463	11,866	7	11,873	6,054	96%
Soya beans	350	397	109	81	107	557	10,457	229	10,686	12,346	-13%
Vegetables	11,751	665	3,764	508	1,489	2,192	132,519	599	133,118	137,608	-3%
Fruits	1,098	2	2,249	673	5,177	9,826	54,312	628	54,940	34,438	60%

2017 Seasonal Agricultural Survey - Season A

Season B- Cultivated area by crop type by district (Ha)

Crop/Crop category	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Cereals	**752**	**5,135**	**1,008**	**7,451**	**5,588**	**3,256**	**6,071**	**5,346**	**4,438**	**1,342**	**6,864**	**3,237**
Maize	340	1,466	426	1,881	1,888	191	690	398	1,567	727	1,818	1,048
Sorghum	**412**	3,644	583	5,470	3,135	2,452	4,764	4,156	2,750	404	5,039	1,638
Paddy rice	-	25	-	100	566	-	618	-	121	150	7	-
Wheat	-	-	-	-	-	568	-	693	-	-	-	213
Other cereals	-	-	-	-	-	44	-	99	-	62	-	337
Tubers and Roots	**1,419**	**3,725**	**794**	**9,473**	**7,680**	**10,627**	**7,311**	**12,569**	**18,283**	**14,981**	**13,241**	**13,148**
Cassava	995	1,943	528	6,370	4,049	3,066	4,323	4,430	14,004	8,307	7,914	7,062
Sweet potatoes	221	1,061	127	2,437	2,428	4,821	1,925	5,480	2,937	4,443	3,900	4,491
Irish potatoes	**6**	356	20	238	391	2,004	655	1,692	286	62	203	566
Yams & Taro	197	366	120	428	812	736	408	967	1,056	2,169	1,223	1,029
Bananas	**1,259**	**3,812**	**1,079**	**5,016**	**8,351**	**2,855**	**5,008**	**5,852**	**6,628**	**13,455**	**11,293**	**7,944**
Cooking banana	324	1,505	458	1,197	1,907	775	672	591	496	1,521	1,690	821
Dessert banana	145	1,225	235	1,934	812	329	1,081	642	1,432	2,538	1,756	792
Banana for beer	791	1,082	387	1,884	5,633	1,750	3,255	4,619	4,700	9,397	7,847	6,330
Legumes and Pulses	**1,310**	**5,839**	**1,544**	**13,318**	**16,665**	**5,325**	**6,933**	**7,424**	**13,949**	**11,433**	**14,338**	**8,509**
Beans	1,127	4,864	1,410	10,502	13,517	3,710	5,764	4,756	10,127	7,321	9,620	7,171
Bush beans	1,076	4,761	1,375	9,227	12,166	682	4,113	1,158	8,640	4,589	8,875	2,582
Climbing beans	50	103	35	1,275	1,350	3,028	1,651	3,598	1,488	2,732	744	4,589
Peas	12	202	3	101	95	456	235	1,622	201	161	452	462
Ground nuts	56	313	46	1,377	740	-	35	-	1,190	-	1,628	-
Soya beans	116	460	86	1,338	2,312	1,158	899	1,046	2,430	3,951	2,638	876
Vegetables and Fruits	**247**	**703**	**387**	**661**	**671**	**343**	**189**	**717**	**1,049**	**543**	**1,325**	**889**

Crop/Crop category	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
vegetables	215	451	280	569	661	317	189	356	494	524	1,125	839
Fruits	32	252	107	92	10	27	-	361	555	19	200	49
Other crops	**1,018**	**2,298**	**487**	**2,353**	**3,104**	**1,560**	**1,373**	**521**	**2,113**	**1,252**	**2,356**	**1,101**
Developed land	6,005	21,513	5,300	38,272	42,060	23,965	26,885	32,428	46,461	43,006	49,416	34,828
Agricultural physical land	4,083	16,703	4,280	29,248	29,915	14,307	16,011	19,614	30,485	29,633	37,281	21,079
Fallow land	733	4,308	1,808	12,720	8,061	7,947	6,162	9,695	9,869	9,698	7,057	9,258

2017 Seasonal Agricultural Survey - Season B

Season B- Cultivated area by crop type by district (Ha) (cont'd)

Crop/Crop category	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Cereals	**3,010**	**2,288**	**3,292**	**2,520**	**1,595**	**969**	**4,578**	**1,507**	**3,165**	**7,283**	**12,406**	**12,267**
Maize	1,859	1,376	1,942	1,470	1,350	812	779	1,129	2,831	1,291	2,955	3,603
Sorghum	12	**831**	-	-	119	54	3,758	151	-	4,837	9,328	8,567
Paddy rice	-	-	-	51	125	103	-	-	-	-	-	96
Wheat	1,139	81	1,350	998	-	-	42	227	335	1,155	124	-
Other cereals	-	-	-	-	-	-	-	-	-	-	-	-
Tubers and Roots	**9,243**	**6,055**	**11,496**	**15,185**	**18,063**	**19,316**	**8,823**	**14,103**	**6,984**	**7,639**	**11,263**	**8,441**
Cassava	2,430	146	745	5,986	15,303	13,032	4,190	5,793	131	278	3,344	3,815
Sweet potatoes	2,361	779	2,116	5,801	1,633	4,841	3,163	5,928	1,252	1,887	4,195	3,313
Irish potatoes	3,548	**4,968**	8,453	1,459	137	60	1,100	941	5,262	5,100	3,401	703
Yams & Taro	904	163	182	1,939	989	1,383	369	1,441	338	374	323	610
Bananas	**4,471**	**1,099**	**1,424**	**9,625**	**4,076**	**4,549**	**7,004**	**10,917**	**1,716**	**2,251**	**7,954**	**9,203**
Cooking banana	1,087	753	317	666	1,326	1,640	1,383	1,762	338	1,050	3,439	6,774
Dessert banana	1,271	12	395	2,622	307	471	2,009	2,884	482	140	1,926	1,146
Banana for beer	2,113	333	712	6,337	2,443	2,437	3,612	6,272	896	1,060	2,589	1,282
Legumes and Pulses	**5,209**	**3,927**	**2,347**	**6,574**	**6,729**	**7,315**	**11,282**	**13,200**	**4,598**	**12,324**	**14,938**	**11,201**
Beans	3,194	3,713	1,792	5,274	6,106	4,933	10,008	11,903	4,410	11,714	13,204	9,203
Bush beans	293	24	62	660	4,611	1,307	6,292	869	250	838	4,429	8,972
Climbing beans	2,901	3,689	1,729	4,614	1,494	3,626	3,716	11,034	4,159	10,876	8,775	231
Peas	849	146	530	499	32	98	338	458	101	580	1,231	188
Ground nuts	-	-	-	-	-	-	147	-	-	-	-	1,230
Soya beans	1,165	68	25	801	591	2,283	789	839	87	30	503	580
Vegetables and Fruits	**922**	**1,750**	**417**	**828**	**1,387**	**844**	**825**	**1,317**	**818**	**311**	**1,874**	**1,732**

Crop/Crop category	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
vegetables	661	1,732	297	733	842	687	723	686	611	278	1,502	1,234
Fruits	261	19	120	95	545	157	101	631	207	34	372	498
Other crops	**4,533**	**1,172**	**2,864**	**810**	**2,097**	**4,600**	**1,669**	**2,423**	**1,935**	**1,166**	**1,916**	**3,107**
Developed land	27,388	16,292	21,840	35,542	33,946	37,593	34,181	43,466	19,216	30,973	50,351	45,950
Agricultural physical land	21,054	15,721	22,393	23,027	27,233	25,624	23,288	35,840	19,819	28,664	44,547	36,148
Fallow land	8,443	2,393	6,468	7,844	1,955	2,481	2,616	4,249	5,228	2,909	7,317	3,750

2017 Seasonal Agricultural Survey - Season B

Season B- Cultivated area by crop type by district (Ha) (cont'd)

Crop/Crop category	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	SSF Total	LSF Total	Total 2017	Total 2016	Percentage change
Cereals	**23,690**	**16,809**	**19,097**	**17,125**	**9,908**	**16,488**	**208,486**	**15,268**	**223,754**	**220,710**	1.4%
Maize	17,879	8,842	7,578	3,420	4,230	8,468	84,252	878	85,130	66,843	27.4%
Sorghum	5,497	7,448	11,348	**13,437**	5,273	7,316	112,422	272	112,694	129,884	-13.2%
Paddy rice	315	14	150	268	405	75	3,189	14,094	17,283	16,389	5.5%
Wheat	-	505	-	-	-	-	7,430	18	7,448	6,494	14.7%
Other cereals	-	-	22	-	-	630	1,193	6	1,199	1,099	9.1%
Tubers and Roots	**7,571**	**10,087**	**11,746**	**13,457**	**14,665**	**10,084**	**317,473**	**208**	**317,680**	**422,949**	-24.9%
Cassava	4,711	6,777	7,096	10,242	10,069	7,362	164,443	86	164,529	277,804	-40.8%
Sweet potatoes	1,812	2,047	2,629	1,586	3,365	2,186	85,166	34	85,200	70,530	20.8%
Irish potatoes	896	658	971	**836**	863	-	45,836	87	45,923	52,185	-12.0%
Yams & Taro	151	604	1,050	793	368	535	22,027	0	22,028	22,429	-1.8%
Bananas	**11,862**	**16,643**	**14,073**	**17,722**	**16,675**	**12,532**	**226,347**	**125**	**226,472**	**310,756**	-27.1%
Cooking banana	8,524	9,264	11,315	12,996	13,393	5,471	93,455	93	93,549	115,038	-18.7%
Dessert banana	722	1,700	658	310	1,175	1,407	32,556	19	32,575	36,015	-9.6%
Banana for beer	2,617	5,679	2,101	4,415	2,107	5,654	100,335	13	100,348	159,703	-37.2%
Legumes and Pulses	**33,522**	**20,950**	**16,566**	**19,357**	**17,379**	**22,971**	**336,976**	**695**	**337,671**	**281,829**	19.8%
Beans	28,065	16,670	14,366	18,009	16,188	17,305	275,944	491	276,435	234,057	18.1%
Bush beans	27,453	15,895	14,020	13,886	15,518	16,842	191,470	485	191,955	159,143	20.6%
Climbing beans	611	775	346	4,123	670	463	84,475	6	84,481	74,913	12.8%
Peas	216	204	666	127	-	10	10,276	22	10,298	8,900	15.7%
Ground nuts	3,867	3,017	1,076	585	738	4,398	20,444	8	20,451	14,142	44.6%
Soya beans	1,375	1,059	458	635	454	1,258	30,311	175	30,486	24,730	23.3%
Vegetables and Fruits	**611**	**598**	**643**	**728**	**1,419**	**836**	**25,586**	**268**	**25,854**	**20,892**	23.8%
vegetables	518	391	370	527	727	394	18,934	76	19,010	12,451	52.7%
Fruits	93	207	273	201	693	442	6,652	192	6,844	8,440	-18.9%
Other crops	**981**	**2,841**	**2,182**	**2,659**	**3,633**	**536**	**60,659**	**1,701**	**62,359**	**59,810**	4.3%
Developed land	78,239	67,927	64,307	71,047	63,680	63,448	1,175,525	18,266	1,193,791	1,316,946	-9.4%
Agricultural physical land	66,321	53,228	51,590	54,244	43,098	52,549	897,029	18,097	915,126	1,193,872	-23.3%
Fallow land	7,071	2,935	6,923	2,810	4,083	22,291	189,081	2,039	191,120	220,838	-13.5%

Season B-Yield of main crops by district (Kg/Ha)

Crop	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Maize	601	762	667	1,263	713	1,423	833	769	538	1,166	447	359
Sorghum	754	1,200	1,113	1,168	724	1,249	943	1,157	982	1,394	974	1,057
Paddy rice	-	-	-	2,807	2,952	-	3,150	-	3,180	2,849	1,687	-
Wheat	-	-	-	-	-	571	-	654	-	-	-	783
Cassava	1,891	2,637	2,306	3,909	3,795	5,677	2,216	5,891	6,184	3,696	3,591	2,604
Sweet potatoes	4,951	5,064	4,231	5,969	5,217	7,325	5,941	5,295	4,999	5,981	5,054	7,922
Irish potatoes	3,763	5,255	1,267	1,670	2,780	3,905	1,302	9,621	1,797	876	4,455	6,147
Yams & Taro	1,050	3,376	3,246	5,233	2,156	3,248	1,453	6,228	3,858	6,002	2,400	6,345
Cooking Banana	3,179	3,350	7,579	4,108	2,489	3,437	1,802	4,535	3,937	3,776	2,587	5,910
Dessert banana	1,921	3,900	5,223	3,793	2,214	1,816	1,270	2,921	1,853	4,791	3,639	3,336
Banana for beer	3,915	3,210	2,913	6,035	2,352	1,976	1,384	4,049	3,055	3,306	4,989	4,503
Bush beans	809	739	809	1,030	768	503	998	754	751	618	473	508
Climbing beans	880	2,131	1,253	1,185	1,013	1,120	1,102	881	1,005	1,010	793	823
Peas	817	597	218	798	690	470	937	495	599	315	372	519
Groundnuts	305	644	484	513	436	-	487	-	570	-	351	-
Soya beans	372	589	464	324	358	445	522	492	387	397	390	424
Vegetables	11,387	8,784	7,843	15,792	5,110	5,077	3,014	18,486	6,881	1,478	2,111	11,682
Fruits	1,173	1,724	1,965	2,135	5,336	196	-	657	5,270	4,425	4,478	696

2017 Seasonal agricultural Survey- Season B

Season B-Yield of main crops by district (Kg/Ha) (cont'd)

Crop	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Maize	824	1,101	842	430	1,288	416	365	454	1,082	708	977	922
Sorghum	304	1,421	-	-	701	648	902	1,127	-	1,614	1,092	1,200
Paddy rice	-	-	-	3,532	3,598	3,521	-	-	-	-	-	3,543
Wheat	650	786	1,329	583	-	-	601	1,158	1,876	1,311	-	-
Cassava	5,245	5,053	4,512	5,713	2,922	3,599	2,901	4,413	2,993	2,239	2,525	2,138
Sweet potatoes	6,955	5,317	5,142	5,635	3,694	4,356	5,574	5,722	7,304	4,915	6,825	5,285
Irish potatoes	6,254	11,864	12,876	5,054	3,273	1,561	5,873	4,435	12,682	10,590	5,655	3,717
Yams & Taro	7,394	3,118	8,941	3,461	2,013	2,709	4,576	7,730	8,878	4,577	3,547	3,258
Cooking Banana	6,163	5,418	4,684	2,972	3,518	5,511	3,176	3,704	6,033	5,241	3,351	3,281
Dessert banana	6,125	760	2,286	1,567	3,033	2,507	3,358	4,860	5,311	6,450	4,032	3,055
Banana for beer	3,902	2,483	1,954	1,989	1,926	5,295	3,088	3,220	3,646	2,940	2,755	3,891
Bush beans	710	-	383	389	641	472	567	225	740	546	660	702
Climbing beans	560	973	1,161	703	486	822	1,082	1,044	1,496	1,297	1,024	991
Peas	304	786	779	452	444	522	517	559	798	708	720	468
Groundnuts	-	-	-	-	-	-	741	-	-	-	-	558
Soya beans	220	354	486	288	450	473	378	420	462	241	642	543
Vegetables	4,850	10,460	12,598	4,186	4,298	7,901	9,343	4,380	16,341	12,472	12,041	11,556
Fruits	636	4,428	751	4,078	874	4,448	545	3,564	775	1,800	783	2,979

2017 Seasonal agricultural Survey- Season B

Season B-Yield of main crops by district (Kg/Ha) (cont'd)

Crop	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	LSF Yield	Overall 2017 Yield	Overall 2016 Yield
Maize	1,069	1,389	728	592	524	1,684	3,152	1,009	1,106
Sorghum	965	1,179	981	843	1,098	866	915	1,050	895
Paddy rice	2,380	3,576	3,440	3,878	3,337	4,322	3,876	3,744	3,729
Wheat	-	1,272	-	-	-	-	1,526	970	856
Cassava	1,943	2,925	2,087	1,943	3,307	3,918	11,224	3,589	1,887
Sweet potatoes	4,926	6,100	4,132	4,702	5,215	5,745	4,798	5,680	5,559
Irish potatoes	4,139	3,650	2,978	2,156	3,094	-	11,889	8,687	5,922
Yams & Taro	3,849	2,525	2,369	2,444	3,000	4,045	1,008	4,228	3,103
Cooking Banana	3,216	3,684	2,956	3,384	2,673	3,200	4,006	3,372	3,407
Dessert banana	2,972	2,868	3,448	1,941	2,022	3,879	3,883	3,417	2,519
Banana for beer	2,731	2,590	3,606	3,046	2,915	2,662	4,284	3,256	2,568
Bush beans	801	841	716	756	547	731	966	726	684
Climbing beans	1,374	1,332	1,340	1,023	563	875	1,328	1,027	1,015
Peas	500	426	463	127	-	741	242	544	471
Groundnuts	401	511	299	306	301	376	692	431	368
Soya beans	617	556	443	61	505	448	1,301	424	371
Vegetables	6,912	12,834	2,851	5,827	1,619	5,513	7,566	8,179	10,023
Fruits	3,017	2,379	1,160	1,703	3,460	2,106	1,574	2,393	1,299

2017 Seasonal agricultural Survey- Season B

Season B-Production of main crops by district (MT)

Crop	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Maize	204	1,117	284	2,375	1,346	272	575	306	844	848	812	376
Sorghum	311	4,371	649	6,388	2,271	3,063	4,494	4,810	2,702	563	4,906	1,731
Paddy rice	-	-	-	281	1,670	-	1,947	-	385	427	12	-
Wheat	-	-	-	-	-	324	-	454	-	-	-	167
Cassava	1,881	5,122	1,217	24,905	15,367	17,404	9,581	26,095	86,605	30,706	28,417	18,387
Sweet potato	1,093	5,371	537	14,549	12,667	35,315	11,433	29,017	14,682	26,574	19,714	35,581
Irish potatoes	24	1,871	25	397	1,086	7,826	852	16,281	514	55	905	3,477
Yams & Taro	207	1,235	389	2,239	1,751	2,391	593	6,024	4,073	13,016	2,936	6,530
Cooking Banana	1,029	5,041	3,469	4,918	4,745	2,664	1,210	2,681	1,955	5,741	4,372	4,854
Dessert banana	278	4,777	1,227	7,336	1,797	598	1,373	1,874	2,653	12,158	6,390	2,644
Banana for beer	3,097	3,473	1,126	11,372	13,248	3,459	4,505	18,701	14,358	31,067	39,152	28,505
Bush bean	870	3,519	1,112	9,501	9,343	343	4,104	873	6,492	2,835	4,198	1,311
Climbing bean	44	220	44	1,511	1,368	3,392	1,819	3,168	1,495	2,760	590	3,776
Peas	10	121	1	81	66	214	221	803	121	51	168	239
Ground nuts	17	202	22	706	323	-	17	-	679	-	571	-
Soya beans	43	271	40	434	827	515	469	515	940	1,569	1,030	371
Vegetables	2,453	3,962	2,194	8,991	3,378	1,608	569	6,581	3,400	774	2,375	9,805
Fruits	37	435	210	197	55	5	-	237	2,924	86	894	34

2017 Seasonal Agricultural Survey - Season B

Season B-Production of main crops by district (MT) (cont'd)

Crop	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Maize	1,532	1,515	1,635	632	1,739	338	284	513	3,062	915	2,886	3,322
Sorghum	4	1,181	-	-	84	35	3,388	171	-	7,806	10,185	10,284
Paddy rice	-	-	-	181	451	362	-	-	-	-	-	342
Wheat	740	64	1,794	582	-	-	25	262	628	1,513	-	-
Cassava	12,745	735	3,362	34,202	44,710	46,905	12,158	25,566	393	624	8,443	8,156
Sweet potato	16,421	4,144	10,878	32,688	6,035	21,087	17,631	33,920	9,146	9,274	28,627	17,508
Irish potatoes	22,188	58,934	108,837	7,374	449	93	6,463	4,173	66,739	54,011	19,233	2,612
Yams & Taro	6,686	508	1,632	6,710	1,991	3,747	1,690	11,138	3,001	1,710	1,146	1,988
Cooking Banana	6,698	4,082	1,485	1,980	4,665	9,038	4,393	6,525	2,040	5,505	11,524	22,229
Dessert banana	7,784	9	902	4,109	931	1,182	6,746	14,016	2,559	902	7,767	3,501
Banana for beer	8,247	828	1,392	12,604	4,706	12,907	11,152	20,194	3,268	3,118	7,134	4,988
Bush bean	208	-	24	257	2,956	617	3,565	196	185	458	2,922	6,296
Climbing bean	1,624	3,589	2,008	3,244	727	2,982	4,022	11,519	6,223	14,109	8,983	228
Peas	259	115	413	226	14	51	175	256	80	411	887	88
Ground nuts	-	-	-	-	-	-	109	-	-	-	-	686
Soya beans	257	24	12	231	266	1,079	298	352	40	7	323	315
Vegetables	3,208	18,112	3,747	3,067	3,617	5,429	6,759	3,002	9,986	3,462	18,084	14,257
Fruits	166	84	90	388	476	700	55	2,249	160	61	292	1,485

2017 Seasonal Agricultural Survey - Season B

Season B-Production of main crops by district (MT) (cont'd)

Crop	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	SSF Total	LSF Total	Total (2017 B)	Total (2016B)	Percentage change
Maize	19,109	12,282	5,519	2,024	2,217	14,263	83,144	2,768	85,912	73,937	16%
Sorghum	5,307	8,777	11,132	11,322	5,790	6,338	118,061	249	118,310	116,310	2%
Paddy rice	749	49	515	1,038	1,352	324	10,084	54,631	64,715	61,114	6%
Wheat	-	643	-	-	-	-	7,196	28	7,224	5,558	30%
Cassava	9,154	19,825	14,807	19,897	33,300	28,847	589,515	966	590,481	524,259	13%
Sweet potato	8,928	12,489	10,862	7,457	17,551	12,557	483,734	163	483,898	392,114	23%
Irish potatoes	3,711	2,403	2,891	1,804	2,670	-	397,897	1,037	398,934	309,052	29%
Yams & Taro	583	1,524	2,488	1,937	1,103	2,165	93,131	0	93,131	69,590	34%
Cooking Banana	27,411	34,123	33,444	43,985	35,795	17,505	315,108	373	315,481	391,886	-19%
Dessert banana	2,145	4,876	2,268	602	2,376	5,459	111,239	74	111,312	90,720	23%
Banana for beer	7,145	14,710	7,577	13,448	6,143	15,049	326,673	56	326,729	410,186	-20%
Bush bean	22,002	13,363	10,031	10,504	8,482	12,307	138,874	468	139,343	108,902	28%
Climbing bean	840	1,032	463	4,217	377	405	86,781	8	86,788	76,049	14%
Peas	108	87	308	16	-	7	5,595	5	5,600	4,192	34%
Ground nuts	1,549	1,543	322	179	222	1,653	8,800	5	8,805	5,206	69%
Soya beans	849	588	203	39	229	563	12,698	228	12,925	9,183	41%
Vegetables	3,581	5,020	1,056	3,073	1,176	2,174	154,901	575	155,476	124,801	25%
Fruits	281	491	316	342	2,396	930	16,076	303	16,378	10,963	49%

2017 Seasonal Agricultural Survey - Season B

Season C-Cultivated area by crop type by district (Ha)

Crop/Crop category	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Tubers and Roots	**24**	**84**	**13**	**586**	**619**	**467**	**286**	**528**	**793**	**261**	**749**	**94**
Sweet potato	24	84	13	586	619	467	272	444	793	261	749	94
Irish potato	-	-	-	-	-	-	14	85	-	-	-	-
Legumes and Pulses	**7**	**-**	**-**	**872**	**1,099**	**143**	**31**	**86**	**21**	**155**	**43**	**-**
Beans	-	-	-	824	1,044	143	31	74	15	10	-	-
Bush bean	-	-	-	824	1,044	143	15	74	15	10	-	-
Climbing bean	-	-	-	-	-	-	15	-	-	-	-	-
Pea	-	-	-	40	-	-	-	13	7	3	16	-
Soybean	7	-	-	8	55	-	-	-	-	143	27	-
Vegetables and Fruits	**20**	**80**	**-**	**150**	**190**	**36**	**145**	**100**	**314**	**-**	**704**	**38**
Vegetables	20	80	-	150	190	36	145	100	314	-	704	38
Fruits	-	-	-	-	-	-	-	-	-	-	-	-
Developped land	50	164	13	1,608	1,908	646	461	715	1,129	416	1,496	132
Total Physical Land	18	73	4	1,324	2,323	524	204	467	936	468	1,208	74

2017 Seasonal Agriculture Survey_Season C

Season C-Cultivated area by crop type by district (Ha) (cont'd)

Crop/Crop category	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Tubers and Roots	**116**	**1,618**	**2,722**	**145**	**81**	**121**	**62**	**88**	**3,549**	**1,478**	**374**	**82**
Sweet potato	13	263	541	145	54	121	55	73	495	202	59	77
Irish potato	103	1,355	2,182	-	27	-	7	15	3,054	1,276	315	5
Legumes and Pulses	**1**	**16**	**6**	**51**	**10**	**-**	**-**	**-**	**31**	**23**	**-**	**89**
Beans	-	-	-	5	10	-	-	-	31	20	-	89
Bush bean	-	-	-	5	10	-	-	-	-	20	-	89
Climbing bean	-	-	-	-	-	-	-	-	31	-	-	-
Pea	1	16	6	-	-	-	-	-	-	2	-	-
Soybean	-	-	-	46	-	-	-	-	-	-	-	-
Vegetables and Fruits	**12**	**331**	**199**	**25**	**28**	**8**	**62**	**45**	**433**	**41**	**89**	**70**
Vegetables	12	331	199	25	28	8	62	45	433	41	89	70
Fruits	-	-	-	-	-	-	-	-	-	-	-	-
Developped land	128	1,965	2,927	221	119	129	124	133	4,013	1,542	464	241
Total Physical Land	139	2,370	3,298	120	82	96	73	76	4,096	1,789	518	204

2017 Seasonal Agriculture Survey_Season C

Season C-Cultivated area by crop type by district (Ha) (cont'd)

Crop/Crop category	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	Total 2017C	Total 2016C	Percentage change
Tubers and Roots	**98**	**209**	**6**	**130**	**-**	**753**	**16,135**	**16,442**	**-2%**
Sweet potato	98	192	6	69	-	742	7,609	7,958	-4%
Irish potato	-	18	-	61	-	11	8,526	**8,483**	**1%**
Legumes and Pulses	**-**	**4**	**-**	**307**	**-**	**670**	**3,665**	6,649	-45%
Beans	-	4	-	307	-	649	3,256	4,512	-28%
Bush bean	-	4	-	307	-	649	3,209	4,254	-25%
Climbing bean	-	-	-	-	-	-	47	258	-82%
Pea	-	-	-	-	-	-	103	1,236	-92%
Soybean	-	-	-	-	-	21	307	900	-66%
Vegetables and Fruits	**92**	**121**	**3**	**73**	**-**	**117**	**3,540**	6,478	-45%
Vegetables	92	121	3	73	-	117	3,525	6,449	-45%
Fruits	-	-	-	-	-	16	16	**30**	**-48%**
Developped land	190	334	9	511	-	1,540	23,341	29,569	-21%
Total Physical Land	110	189	2	245	-	1,373	22,404	29,569	-24%

2017 Seasonal Agriculture Survey_Season C

Season C-Yield of main 6crops by district (Kg/Ha)

Crop name	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Sweet potato	2,386	4,652	4,643	2,968	2,241	3,079	2,999	3,876	3,402	3,700	2,952	3,558
Irish potato	-	-	-	-	-	-	9,443	10,603	-	-	-	-
Beans	-	-	-	1,094	895	1,127	1,521	1,659	893	577	-	-
Bush bean	-	-	-	1,094	895	1,127	1,425	1,659	893	577	-	-
Climbing bean	-	-	-	-	-	-	1,618	-	-	-	-	-
Peas	-	-	-	424	-	-	-	762	232	300	887	-
Soya bean	922	-	-	1,085	777	-	-	-	-	403	687	-
Vegetables	18,231	16,317	-	12,579	6,022	9,607	3,572	5,308	5,491	-	5,311	5,223
Fruits	-	-	-	-	-	-	-	-	-	-	-	-

2017 Seasonal Agriculture Survey_Season C

Season C-Yield of main crops by district (Kg/Ha) (cont'd)

Crop name	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Sweet potato	1,602	1,169	3,310	3,305	4,625	3,254	4,689	4,794	2,078	3,157	3,369	5,367
Irish potato	7,340	12,412	6,121	-	6,409	-	2,350	3,629	7,488	8,408	9,651	3,369
Beans	-	-	-	1,204	696	-	-	-	1,205	2,852	-	1,567
Bush bean	-	-	-	1,204	696	-	-	-	-	2,852	-	1,567
Climbing bean	-	-	-	-	-	-	-	-	1,205	-	-	-
Peas	881	577	239	-	-	-	-	-	-	145	-	-
Soya bean	-	-	-	948	-	-	-	-	-	-	-	-
Vegetables	6,235	7,921	2,810	6,413	7,906	5,472	9,944	5,138	15,259	17,451	6,628	13,249
Fruits	-	-	-	-	-	-	-	-	-	-	-	-

2017 Seasonal Agriculture Survey_Season C

Season C-Yield of main crops by district (Kg/Ha) (cont'd)

Crop name	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	Overall Yield 2017 C	Overall Yield 2016 C	Percentage change
Sweet potato	4,517	2,605	4,964	4,500	-	3,693	3,149	2,921	8%
Irish potato	-	4,502	-	8,267	-	2,362	8,147	8,551	-5%
Beans	-	2,255	-	1,475	-	1,410	1,170	837	40%
Bush bean	-	2,255	-	1,475	-	1,410	1,168	831	41%
Climbing bean	-	-	-	-	-	-	1,341	939	43%
Peas	-	-	-	-	-	-	532	768	-31%
Soya bean	-	-	-	-	-	706	627	459	36%
Vegetables	32,047	10,059	3,702	5,549	-	5,261	8,598	12,023	-28%
Fruits	-	-	-	-	-	26,736	26,736	-	

2017 Seasonal Agriculture Survey_Season C

Season C-Production of main crops by district (MT)

Crop	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi
Tubers and Roots	56	389	62	1,740	1,387	1,437	947	2,617	2,697	965	2,210	333
Sweet potato	56	389	62	1,740	1,387	1,437	814	1,720	2,697	965	2,210	333
Irish potato	-	-	-	-	-	-	132	897	-	-	-	-
Legumes and Pulses	6	-	-	927	978	161	47	132	15	64	33	-
Beans	-	-	-	901	935	161	47	122	13	6	-	-
Bush bean	-	-	-	901	935	161	22	122	13	6	-	-
Climbing bean	-	-	-	-	-	-	25	-	-	-	-	-
Pea	-	-	-	17	-	-	-	10	2	1	14	-
Soya bean	6	-	-	8	43	-	-	-	-	57	19	-
Vegetables and Fruits	356	1,311	-	1,888	1,144	349	517	533	1,725	-	3,739	199
Vegetables	356	1,311	-	1,888	1,144	349	517	533	1,725	-	3,739	199
Fruits	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**418**	**1,700**	**62**	**4,555**	**3,509**	**1,948**	**1,510**	**3,282**	**4,438**	**1,029**	**5,982**	**532**

2017 Seasonal Agriculture Survey_Season C

Season C-Production of main crops by district (MT) (cont'd)

Crop	Rutsiro	Rubavu	Nyabihu	Ngororero	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Rwamagana
Tubers and Roots	776	17,123	15,143	480	421	393	274	405	23,898	11,367	3,243	431
Sweet potato	21	307	1,790	480	249	393	258	351	1,029	638	198	415
Irish potato	755	16,816	13,354	-	172	-	16	54	22,869	10,729	3,045	15
Legumes and Pulses	1	9	1	50	7	-	-	-	38	58	-	139
Beans	-	-	-	6	7	-	-	-	38	57	-	139
Bush bean	-	-	-	6	7	-	-	-	-	57	-	139
Climbing bean	-	-	-	-	-	-	-	-	38	-	-	-
Pea	1	9	1	-	-	-	-	-	-	0	-	-
Soya bean	-	-	-	44	-	-	-	-	-	-	-	-
Vegetables and Fruits	74	2,619	559	161	222	42	615	229	6,601	718	592	933
Vegetables	74	2,619	559	161	222	42	615	229	6,601	718	592	933
Fruits	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**851**	**19,751**	**15,703**	**690**	**650**	**435**	**889**	**634**	**30,536**	**12,143**	**3,835**	**1,502**

2017 Seasonal Agriculture Survey_Season C

Season C-Production of main crops by district (MT) (cont'd)

Crop	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	Total 2017 C	Total 2016C	Percentage change
Tubers and Roots	443	578	30	817	-	2,765	93,428	95,790	-2%
Sweet potato	443	500	30	312	-	2,740	23,966	23,249	3%
Irish potato	-	79	-	505	-	25	69,462	72,541	-4%
Legumes and Pulses	-	9	-	453	-	930	4,057	**5,140**	**-21%**
Beans	-	9	-	453	-	915	3,810	**3,778**	**1%**
Bush bean	-	9	-	453	-	915	3,748	3,535	6%
Climbing bean	-	-	-	-	-	-	62	242	-74%

Crop	Nyagatare	Gatsibo	Kayonza	Kirehe	Ngoma	Bugesera	Total 2017 C	Total 2016C	Percentage change
Pea	-	-	-	-	-	-	55	949	-94%
Soya bean	-	-	-	-	-	15	192	413	-53%
Vegetables and Fruits	2,935	1,215	11	404	-	1,029	30,720	77,528	-60%
Vegetables	2,935	1,215	11	404	-	615	30,305	**77,528**	**-61%**
Fruits	-	-	-	-	-	414	414	-	
TOTAL	**3,379**	**1,803**	**41**	**1,674**	**-**	**4,724**	**128,205**	**178,458**	**-28%**

2017 Seasonal Agriculture Survey_Season C

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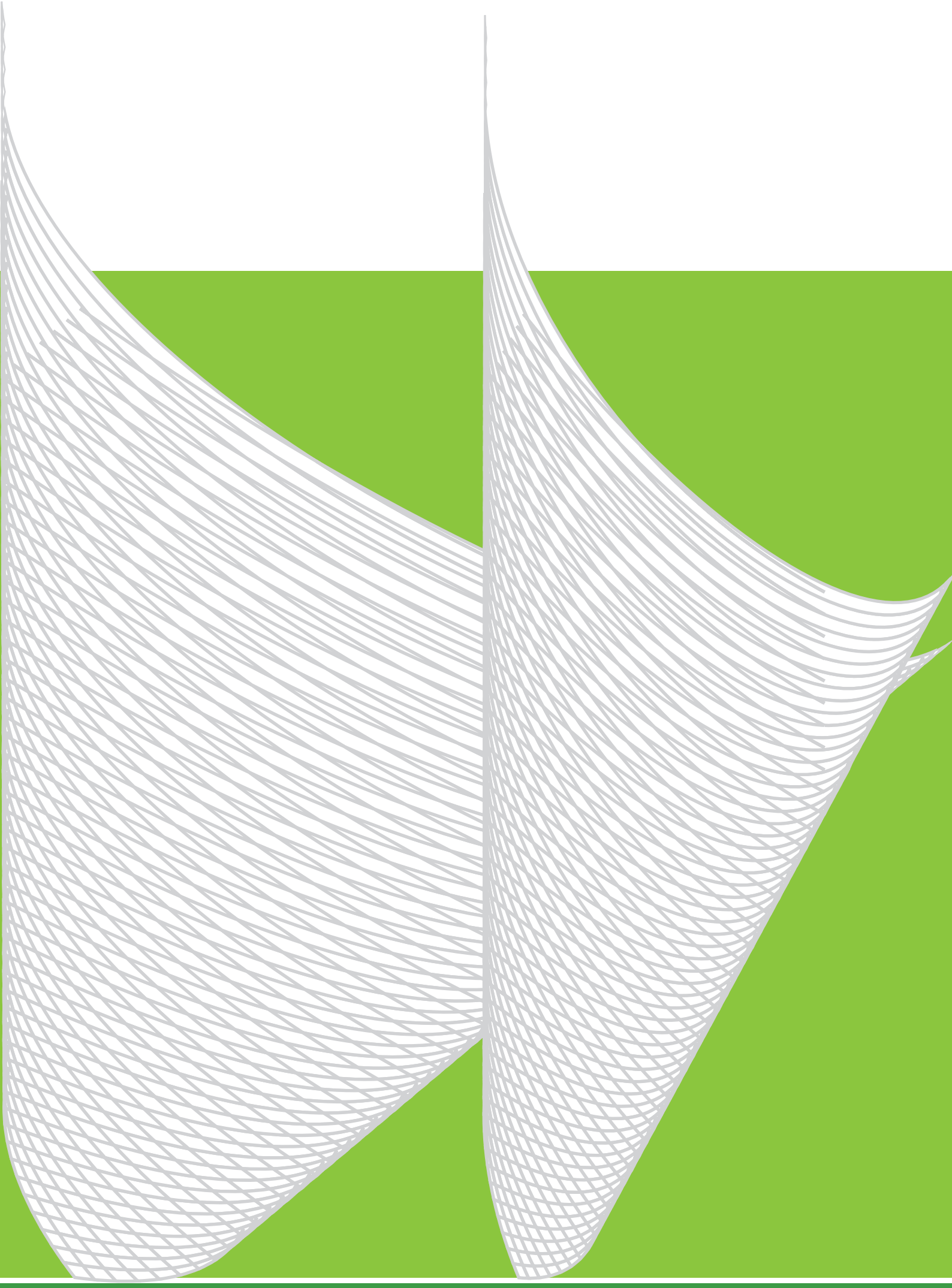

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