



RWANDA

STRATEGY SUPPORT PROGRAM | WORKING PAPER 08

SEPTEMBER 2023

Rwanda Smallholder Agriculture Commercialization Survey: Overview using selected categorical variables

**James Warner, Gracie Rosenbach, Gilberthe Benimana, Serge Mugabo,
Josue Niyonsingiza, Emerence Mukangabo, Bertrand Dushimayezu,
Octave Nshimiyimana, Chantal Ingabire and David J. Spielman**

CONTENTS

List of Tables	3
List of Graphs	3
Introduction	5
Data and survey design.....	6
Household Demographics.....	9
Household head characteristics.....	9
Literacy and educational characteristics of household heads	10
Household infrastructure, assets, and access to services.....	11
Migration and shocks.....	13
Asset ownership	17
Farm Characteristics.....	19
Farm size	20
Use of agricultural inputs	21
Agricultural extension and agricultural programs	21
Crop production, use, and sales	23
Livestock	27
Wage Employment, Nonfarm Business and Access to Finance	30
Participation in wage employment and nonfarm business	30
Other sources of income	33
Access to financial services.....	34
Conclusion	36
Future analysis.....	38
References	40
Appendix.....	41

LIST OF TABLES

Table 1: Sample of enumeration areas (EAs) and households (by province).....	7
Table 2: Household head by province, sex, farm size and age (%'s).....	9
Table 3: Household size, age categories and dependency ratios.....	10
Table 4: Literacy and formal education of household heads (%'s).....	11
Table 5: Housing infrastructure	12
Table 6: Main mode of transport to select basic services (%'s).....	12
Table 7: Walking time spent accessing select basic services (minutes)	13
Table 8: Households that migrated and their previous reported province (%'s).....	14
Table 9: Main reason for migration (%'s)	14
Table 10: Households that experienced shocks (%'s)	15
Table 11: Asset ownership by quintiles (%'s).....	18
Table 12: Household land distribution	20
Table 13: Households who used fertilizers, pesticides, practice erosion control and irrigation (%'s)	21
Table 14: Agricultural extension services received by households (%'s).....	22
Table 15: Households who participate in agricultural programs (%'s).....	23
Table 16: Crop patterns used across plots by household (%'s)	23
Table 17: Household animal ownership by province, sex, age, and farm size	28
Table 18: Households who obtained income from wage employment or non-farm business	31
Table 19: Household participants in wage employment and nonfarm enterprise	31
Table 20: Distribution of sector wage workers by job sectors, row percentages	32
Table 21: Households engaged in nonfarm business activities, row percentages.....	33
Table 22: Households with at least one bank account (%'s).....	34
Table 23: Households with at least one bank account by banking institutions (row %'s).....	35

LIST OF GRAPHS

Figure 1: Sampled village sites (by province)	7
Figure 2: Reported causes of severe shocks	16
Figure 3: Coping responses to shocks	17
Figure 4: Agricultural landholdings by size	20
Figure 5: Household access to extension services by source (%'s).....	22
Figure 6: Households growing selected crops (%'s)	24
Figure 7: Households who harvested and sold selected major crops (%'s)	24

Figure 8: Household percentage of production sold	25
Figure 9: Household use of crop production.....	25
Figure 10: Total production sold per crop (%'s)	26
Figure 11: Household production sold across farm size (%'s)	26
Figure 12: Main buyers of select crops among households who sold selected crops	27
Figure 13: Livestock ownership, by household age and sex, and farm size.....	28
Figure 14: Median monthly wage income (in 2022 Rwf)	32
Figure 15: Households that obtained income from selected sources (%'s).....	34

The International Food Policy Research Institute (IFPRI), a CGIAR Research Center established in 1975, provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition. IFPRI's strategic research aims to foster a climate-resilient and sustainable food supply; promote healthy diets and nutrition for all; build inclusive and efficient markets, trade systems, and food industries; transform agricultural and rural economies; and strengthen institutions and governance. Gender is integrated in all the Institute's work. Partnerships, communications, capacity strengthening, and data and knowledge management are essential components to translate IFPRI's research from action to impact. The Institute's regional and country programs play a critical role in responding to demand for food policy research and in delivering holistic support for country-led development. IFPRI collaborates with partners around the world.

INTRODUCTION

This report provides a comprehensive statistical overview of agricultural household data collected by IFPRI from a smallholder commercialization survey in late 2022. Sampled to be representative to the provincial level, ten households were surveyed in 202 villages for a total of 2,020 households interviewed. The survey covers a wide range of topics including household demographics, agricultural farm holdings, input use, crop choice, levels of commercialization and other non-farm sources of income. The statistical tables are generally presented by principal categorical variables of interest which include provinces, gender and age of household head (youth/mature), as well as size of land holdings. These designations are meant to provide general insights into the current state of agricultural households in Rwanda. Building on this report, future research, on more specific topics of interest, will be performed to build a more comprehensive understanding of agricultural household economic behavior for broader understanding as well as potential policy engagement.

A central component of Rwanda's Fourth Strategic Plan for Agriculture Transformation (PSTA 4) is the commercialization of the country's smallholder production systems during the period 2018-24 and this focus will likely be continued through the next strategic plan, PSTA5. Through a range of programs and investments, PSTA 4 seeks to increase the profitability of smallholder production in the country with (1) a shift in production from food staples to higher-value crops, horticulture, livestock, and fisheries, (2) increased use of modern inputs, technologies, and management practices, and (3) increased value addition in highly dynamic and competitive value chains.

Efforts to address issues around accelerating smallholder commercialization are limited by the absence of data and analysis on returns to commercial production systems. Put simply, too little is known about smallholder agricultural decision-making as well as the costs and returns to production systems among Rwandan smallholders. Some research does exist on the impacts of past and ongoing programs with a strong commercialization element, the land tenure regularization (Bizoza and Opio-Omoding 2021), land use consolidation, and the Crop Intensification Program (Bizoza 2021; Del Prete et al. 2019).¹ However, many of these studies rely on fairly narrow or context-specific data sources, and arrive at mixed conclusions with respect to outcomes such as production, productivity, land use efficiency, consumption, and welfare outcomes. On production and yield, see Bizoza (2021), Weatherspoon et al. (2021), Muyombano and Espling (2020), and Nilsson (2019); on land use efficiency, see Bizoza and Opio-Omoding (2021), Jones et al. (2020), Ali and Deininger (2015), and Ali et al. (2014). For analysis of prices and market integration, see Nsabimana et al. (2021), and for consumption, diet, and nutrition, see Weatherspoon et al. (2019) and Del Prete et al. (2019).

Existing data and analysis—including information management systems at the Ministry of Agriculture and Animal Resources (MINAGRI) and statistical data collected by the National Institute of Statistics of Rwanda (NISR)—do a good job in monitoring progress against national goals and performance targets. However, these data are not detailed enough to estimate the returns to commercial production systems across heterogeneous farms and farmers. As a result, too little is known about whether it makes sense to cultivate crops or rear livestock for commercial purposes, whether commercialization is profitable for different types of farmers facing different conditions and with different capabilities, or whether PSTA 4 interventions are improving the prospects for commercial farming. Only with detailed high-quality data, it is possible to design appropriate policy and program interventions to address these questions.

¹ Beyond studies on the factors influencing smallholder production of commercial crops under the CIP, see Ingabire et al. (2017) on commercial bean production in Rwanda, Macchiavello and Morjaria (2021) and Gerard et al. (2021) on coffee.

Results of this study are being provided at an important time for policy. In 2022/23, the Government of Rwanda is both reviewing its progress against PSTA 4 targets and beginning to consider technical inputs into PSTA5. For these, as well as other reasons, there is a need for a deeper, more nuanced understanding of rural smallholders. While two main categories of smallholders are recognized—subsistence farmers who produce food for their own consumption and commercial farmers who produce for market—the reality is that smallholder livelihoods are more complex than this simple dichotomy suggests. Efforts to understand heterogeneity among farmers and their commercialization opportunities is essential to designing appropriate policies, investments, and programs, and require better data and analysis.

This document serves to provide a basic statistical overview of the principal components of the survey and is divided into five sections. Section Two covers the demographics of the household head and household member composition, house infrastructure, access to basic services, reasons for migration, asset ownership and both economic shocks and identified responses to those shocks. Section Three outlines farm characteristics including farm size, use of agricultural inputs, participation in extension and agricultural programs, cropping patterns, growing and sales of main crops, and livestock ownership. Section Four explores general wage employment and nonfarm business activities and wages earned. The final section concludes and offers suggestions for future research. Most of these tables are delineated into categories of interest, including variables presented by province, sex and age of household head (ie. male/female and youth/mature²) as well as by land size. This analysis is meant to provide a foundational exploration into general categories of rural household composition and economic activities.

However, future research, based in part on these preliminary results, will seek to provide a deeper understanding of commercialization and will ultimately offer (1) a more nuanced analysis of farmer typologies, (2) estimates of returns to commercial production systems across these multiple farmer typologies, and (3) commercialization drivers and recommendations to improve interventions in smallholder commercialization. Specifically, eventual findings and recommendations from this study aim to inform the design and implementation of policies, investments, and programs for smallholder production and commercialization in Rwanda under the Fourth Strategic Plan for Agriculture Transformation 2018-24 (PSTA 4) as well as inputs into the upcoming PSTA5.

Data and survey design

The data used in this study was collected from a nationally and provincially representative household sample survey. First, to ensure sufficient representation of agricultural households at the national and provincial levels, a stratified two-stage cluster sampling frame was employed. NISR's Enumeration Areas (EAs) that approximately map to villages (*umudugudu*) in Rwanda was taken as the primary sampling units, and agricultural households, within the selected EAs, as the secondary sampling units. EAs were selected using systematic sampling based on probability proportional to size, with size being the population of agricultural households in each EA, as obtained from 2012 Population and Housing Census, adjusted for subsampling effects.³ The final sample size was determined by taking into consideration the relative precision desired, as well as availability of economic resources.

² Youth headed households are defined here as the household head being between the ages of 16 – 34.

³ At the time the survey design was prepared, data collection for the 2022 Population and Housing Census had just been completed and the data required to ensure a more up-to-date sampling frame were not publicly available.

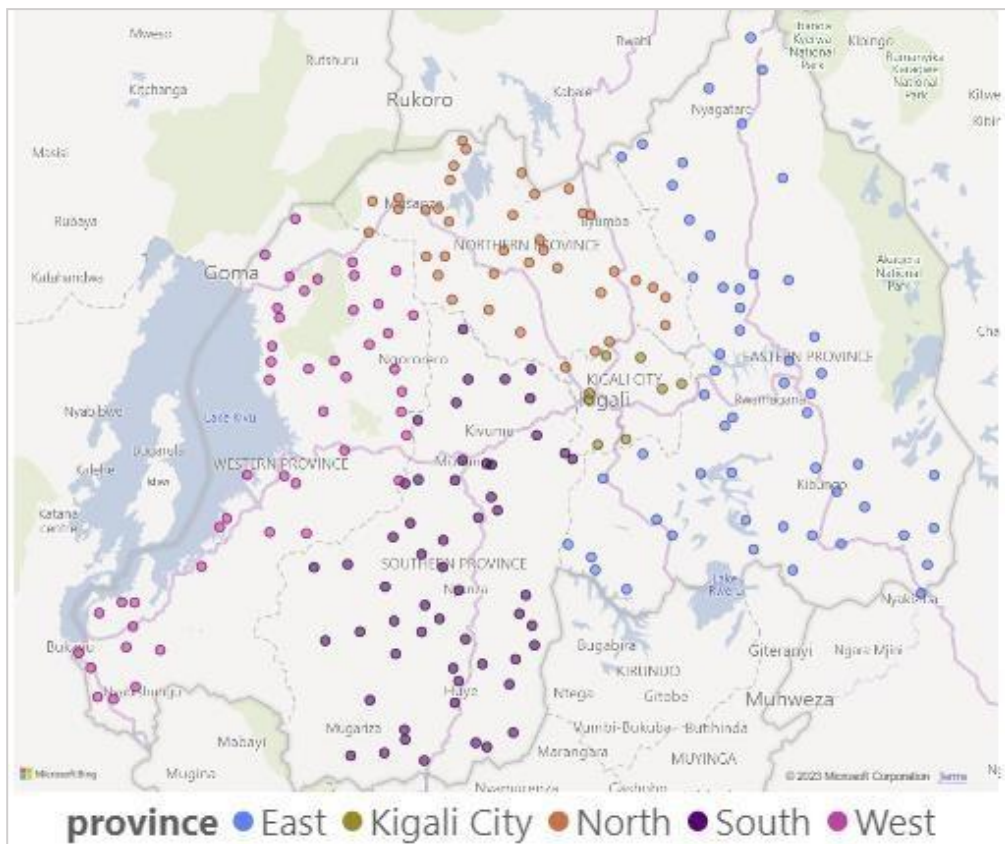
For survey purposes, the country was divided into five strata corresponding to the four provinces plus the three districts comprising Kigali City. Each stratum is considered to be a domain of estimation such that major findings can be reported for each. Power calculations conducted to calculate an efficient sample size and distribute sample EAs among the strata indicated a sample size of 2,020 agricultural households. Details of the sampling by province and by village are provided in Table 1 and Figure 1, respectively.

Households were excluded from the study if they did not meet the inclusion criteria, i.e., if they are households that were not engaged in agriculture, aquaculture, livestock, or forestry activities in the 2022 agricultural year. Exclusion from the study was determined either at the household listing exercise or at the time of the household survey interview itself.

Table 1: Sample of enumeration areas (EAs) and households (by province)

Province	No. of sampled agricultural households	No. of sampled Enumeration Areas (EAs)
Kigali City	80	8
Southern	550	55
Western	470	47
Northern	380	38
Eastern	540	54
Total (all Rwanda)	2,020	202

Figure 1: Sampled village sites (by province)



Authors' calculations

The survey instrument was constructed using standard modules commonly used for smallholder production and commercialization surveys. These modules were extracted from prior surveys conducted in Rwanda that stand out as examples of high-quality survey design, including: the 2020 AHS input use and livestock modules from NISR, and the 2016/17 EICV5 household demographic, asset ownership, and consumption expenditure modules, also from NISR. Additional modules were adapted from surveys that IFPRI and its partners in other countries have designed for similar purposes.⁴

General areas of information are presented in the following categories:

1. *Household demographic characteristics.* This includes general statistics regarding literacy, training, and education level of household head, age and sex of household head and household size.
2. *Farm characteristics.* This section includes statistics on farm- and plot-specific variables such as the type of cropping and livestock production, use of inputs, improved varieties/quality seed, inorganic fertilizer, compost, manure, irrigation, and management practices.
3. *Land.* Total landholdings, types of land use, including sharecropping or renting in/out.
4. *Non-land/non-farm household assets.* Asset ownership can be a proxy variable for agricultural decision-making, risk and potential response to shocks. Given the large range of potential asset holdings, this research used a principal component analysis to create a single asset index for statistical analysis.
5. *Access to information.* Access to agricultural extension and advisory services is important, as are other providers of market-related information.
6. *Program participation.* Participation in programs, projects, or activities that are specifically focused on market development are expected to be important for commercialization.
7. *Household migration experience.* Migration, either at the intra- or intra-province or from urban to rural areas, may be positively associated with perceived economic opportunity or may be negatively associated with migration if driven by involuntary displacement or movement due to conflict.
8. *Household shocks.* We include household's experience with negative idiosyncratic shocks. Individual and multiple shocks are reported along with the individual household's coping strategies.

The following three sections provide a relatively detailed statistical overview related to these, as well as other, questions. The next section explores various statistical differences concerning demographics, housing, access to services, migration and shocks, and asset ownership.

⁴ In addition to selected modules from the AHS and EICV surveys conducted by NISR and partners, best practice in the design and implementation of surveys on smallholder commercialization in Africa include the Africa RISING Baseline Evaluation Surveys (ARBES), conducted by IFPRI and partners in Ghana, Malawi, and Tanzania; RHoMIS, noted earlier; the 2012 Baseline Survey for the Ethiopian Agricultural Transformation Agency (ATA), conducted by the Ethiopian Institute of Agricultural Research (EIAR) and IFPRI; and the 2016 and 2019 Ethiopia Agricultural Commercialization Cluster Survey, conducted by ATA and IFPRI. Other useful surveys include the Living Standards Measurement Surveys—Integrated Surveys of Agriculture (LSMS-ISA) conducted by the World Bank, FAO, and national statistical agencies in several African countries; and the series of panel surveys conducted by IFPRI and other organizations for the U.S. Government's Feed the Future initiative in multiple countries. Modules from these surveys were carefully adapted to the Rwandan context.

HOUSEHOLD DEMOGRAPHICS

Section Two provides insights into basic household demographics derived from the survey. More specifically, the tables provide details concerning the household head characteristics per province, sex, age, and farm size categories. The section also provides household average size, age categories of household members and dependency ratios per province, sex and age of the household heads (HHH) and farm size categories. More specifically, Section 2.1 is meant to provide a general overview concerning the demographics of our sampled household heads as well as an introduction into the household composition by general categorical variables of interest used throughout the document. Section 2.2 address educational attainment, with the remaining three sub-sections exploring infrastructure, migration and idiosyncratic shocks, and asset ownership.

Household head characteristics

This section depicts household head characteristics, average household size, age categories of the household heads and members and dependency ratio across the provinces and by land size. Table 2 indicates that about 30% of the interviewed households are female headed while 21% are youth headed. Kigali city has a lower-than-average number of female headed households (25%) and higher number of youth headed households (29%) when compared to other provinces. The largest age group of household heads is between 36 – 64 (59%). Female household heads skew a bit older, with 30 percent reporting to be aged 65 and above. For land holding, most of the female and youth headed households have disproportionately smaller land sizes, typically 0.1 ha or less. The table indicates that while female headed households comprise 30% of the total sample, they comprise 39% of those households with 0.1 ha or less. These results are comparable to the youth/mature categorical designation and suggest that both women and youth headed household's landholdings are significantly below the overall sample average. Based on the sample design, the representative number of total households is provided in the far-right column for all designated categories. It should be noted that the number of agricultural households in Kigali City is relatively small compared to other provinces and care should be considered about this area's relative uniqueness.

Table 2: Household head by province, sex, farm size and age (%'s)

	Sex and Age		HHH Age				Projected Households (N)
	Female HHH	Youth HHH	16-24	25-35	36-64	65+	
All Households (%'s)	30	21	3	21	59	18	2,348,456
Kigali City	25	29	1	30	59	10	56,436
Southern	31	18	2	19	60	20	651,454
Province							
Western	29	22	3	20	59	18	522,847
Northern	33	21	2	22	56	20	417,670
Eastern	28	22	4	21	61	14	700,049
Sex of HHH							
Male	-	25	3	25	60	12	1,643,471
Female	-	11	1	11	58	30	704,985
Farm size Categories							
Less than 0.1 ha	39	31	6	28	51	15	822,547
0.1-0.3 ha	29	18	1	19	62	18	759,477
0.3-0.5 ha	20	15	1	17	64	18	301,412
0.5-1 ha	25	10	0	12	68	20	270,321
1 ha and above	19	10	0	10	68	23	190,398

Authors' calculations, HHH=Household Head

Table 3 depicts that the average size of the household is 4.4 members but is smaller in female and youth headed households (3.4 and 3.7 persons, respectively). Household size is positively related

to land size and is likely because smaller land categories are comprised of higher percentages of female and youth headed households. Household members are classified into different age groups and larger number of members are found between 6 and 15 years (1.2) than between 36 to 64 years (1.0) while the lowest average number of members are found in the age category of 65 and above (0.2).

The overall dependency ratio (the percentage number of non-working age individuals in a household divided by the number of working age individuals) is 86% across the sample. The dependency ratio is lower in Kigali city (73%) when compared to other provinces. In the case of sex of the household head, the dependency ratio is higher in the female headed households than in the male headed households, indicating relatively greater economic responsibility for female households. Additionally, the dependency ratio is lower in the households with land size between 0.5-1 ha when compared to other land size categories. The reason for this is not immediately apparent and more research is needed.

Table 3: Household size, age categories and dependency ratios

	Average HH size	Age categories of household members (avg. per HH)						Dependency Ratio*	
		0-5	6-15	16-24	25-35	36-64	65 and above		
All Households	4.4	0.7	1.2	0.8	0.6	1.0	0.2	86	
Province	Kigali City	4.3	0.7	1.0	0.8	0.7	0.9	0.1	73
	Southern	4.2	0.6	1.1	0.7	0.5	1.0	0.2	86
	Western	4.7	0.7	1.3	0.9	0.5	1.0	0.3	93
	Northern	4.1	0.6	1.0	0.8	0.6	0.9	0.3	78
	Eastern	4.5	0.7	1.3	0.8	0.6	1.0	0.2	87
Sex of HHH	Male	4.8	0.8	1.3	0.8	0.7	1.1	0.2	84
	Female	3.4	0.4	1.0	0.7	0.3	0.7	0.3	95
Age of HHH	Mature	4.6	0.5	1.3	0.9	0.3	1.2	0.3	86
	Youth	3.7	1.1	0.6	0.4	1.4	0.1	0.0	90
Farm size Categories	Less than 0.1 ha	3.9	0.7	1.0	0.6	0.6	0.8	0.2	90
	0.1-0.3 ha	4.5	0.7	1.2	0.8	0.5	1.0	0.2	90
	0.3-0.5 ha	4.8	0.6	1.4	0.9	0.5	1.2	0.2	85
	0.5-1 ha	4.9	0.6	1.3	1.1	0.5	1.2	0.3	73
	1 ha and above	5.0	0.5	1.4	1.0	0.4	1.3	0.3	81

Authors' calculations, *Dependency Ratio = $100 \times (\text{Population (0-15)} + \text{Population (65+)}) / \text{Population (16-64)}$

Literacy and educational characteristics of household heads

This section examines the literacy and education of household heads. Table 4 indicates that the literacy⁵ rate is 66 percent for all household heads, with proportionately higher numbers of literate HHHs in Kigali City (79%). Male headed households are significantly more literate at 75% as compared to female headed households with 47%. The literacy rate is 22 percentage points higher for youth headed households (84%) than mature headed households (62%). Moreover, as farm sizes increase, the literacy rate of the household heads increases as well.

When compared to other levels of education, Table 4 also shows that a significant number of household heads attended primary school (51%). Kigali city has a higher percentage of household heads who attended secondary and university when compared to other provinces (45% and 10%, respectively). Overall, female household heads have disproportionately less education, with female heads almost four times more likely to not attend any school when compared to male HHHs (22% vs. 6%, respectively). Female household heads also have lower primary and secondary

⁵ Literacy was measured by asking if the respondent had the ability to read a letter, small note or could perform a written calculation.

school attendance. Regarding the age of household heads, more youth-headed households attended primary school than mature headed households at 59% versus 49%, respectively. In terms of land size, the secondary and university attendance increases as land holdings increase. Overall, as would be expected, being male with larger land size holdings is positively related to levels of educational attainment for the household head.

Table 4: Literacy and formal education of household heads (%'s)

	HHH Literacy (%'s)	Formal Education (Highest Level Attended)				Projected Households (N)
		No Schooling	Primary	Secondary	University	
All households (%'s)	66	11	51	36	2	2,348,456
Kigali City	79	5	40	45	10	56,436
Southern	65	9	54	34	3	651,454
Western	66	13	50	36	1	522,847
Province						
Northern	64	12	53	34	1	417,670
Eastern	69	10	50	37	2	700,049
Sex of HHH						
Male	75	6	54	38	2	1,643,471
Female	47	22	46	30	2	704,985
Age of HHH						
Mature	62	12	49	36	2	1,861,690
Youth	84	4	59	35	1	486,766
Farm size Categories						
Less than 0.1 ha	59	16	56	27	1	822,547
0.1-0.3 ha	64	10	56	32	2	759,477
0.3-0.5 ha	74	6	45	46	2	301,412
0.5-1 ha	78	7	37	51	5	270,321
1 ha and above	80	4	41	49	6	190,398

Authors' calculations

Household infrastructure, assets, and access to services

This section presents the housing infrastructure characteristics, asset ownership, and information on the access to basic services of the surveyed smallholder farmers. Consistent with other sections, households are typically classified by province, sex and age of household head, as well as farm size.

Insights into housing infrastructure are provided in Table 5. Analysis provided includes sources of drinking water, sources of lighting and the quality of their access to sanitation facilities. The sources of drinking water are initially grouped into either an improved water source or an unimproved one. Within the improved water sources, further delineation includes private (piped into dwelling) or other improved water sources (public/shared improved water sources). The source of lighting was grouped into three different categories including electric, solar, or other. The various sanitation facilities reported in the survey were similarly grouped as either being improved or unimproved.

Approximately, 76 percent of surveyed households used improved drinking water sources, with 6 percent of the households having the water piped directly into their dwelling. Disaggregating by province, the City of Kigali has the highest percentage, at 24 percent of piped water, which is four times the national average. While the percentages are relatively small, farm size appears to be an important indicator of piped water into the dwelling with larger farms (> 1ha) being five times more likely than the smallest farms (< 0.1 ha) having improved water sources.

Approximately 60 percent of our sampled households reported access to either electric or solar lighting. The highest percentage is in Kigali city with 81 percent. The reported percentage of male headed households using either of these two sources of lighting is 20 percentage points higher

than female headed households. Finally, comparing age of HHHs, the difference is only four percentage points higher for mature headed households.

Seventy-five percent of smallholder farmer households surveyed use improved sanitation facilities. Kigali City, with 85 percent, has the highest percentage with the lowest percentage being the Southern Province at 66 percent. Seventy-eight percent of male headed households reported using improved sanitation facilities which is 10 percentage points higher than female headed households. The reported use of improved sanitation facilities across the five categories of farm size increased with farm size, with 88 percentage of the households in the one hectare and above farm size category reported to use improved sanitation facilities and 65 percent of the households in the 0.1ha or less category reported using improved sanitation facilities.

Table 5: Housing infrastructure

	Improved water sources (%'s)		Source of lighting (%'s)		Improved sanitation (%'s)	
	Piped into dwelling	Other improved source	Electricity	Solar		
All households (%'s)	6	70	37	23	75	
Kigali City	24	59	76	5	85	
Southern	5	71	31	24	66	
Province	Western	7	60	35	22	77
	Northern	3	78	31	26	76
	Eastern	7	71	44	23	79
Sex of HHH	Male	7	69	39	27	78
	Female	4	72	31	15	68
Age of HHH	Youth	5	68	36	21	76
	Mature	6	70	37	24	75
Farm size Categories	Less than 0.1 ha	3	69	28	16	65
	0.1-0.3 ha	5	71	37	22	78
	0.3-0.5 ha	6	76	50	28	77
	0.5-1 ha	11	68	48	30	87
	1 ha and above	15	60	35	44	88

Authors' calculations

How farmers travel to selected services, and the respective travel time, impacts the ability to use those services. This next section explores transport methods farmers use to travel to services and travel time. There were several modes of transportation used by respondents, however, as is illustrated in Table 6, the overwhelmingly most common transport mode was walking.⁶

Table 6: Main mode of transport to select basic services (%'s)

	Source of Drinking Water	Food Market	Farm Market	All Weather Roads	School	Health Facility	Savings Cooperatives	Local Gov't Office
Walking	98	96	94	97	99	95	98	94

Note: Other transport possibilities include bicycle, motorbike, bus, car, and boat.

With walking the predominate form of transportation, Table 7 explores the time spent walking to these various basic services.⁷ As might be expected, Kigali City respondents report generally lower travel times to services than other provinces. Overall, other travel times do not vary much with the small exception of the Western province which reports slightly higher than average travel times.

⁶ Further information on modes of transportation is provided in Appendix 2.

⁷ Further details on other services are available in Appendix 2.

Table 7: Walking time spent accessing select basic services (minutes)

	Source of drinking water	Food market	Farm market	All weather roads	School	Health facility	Savings coops	Local gov't office
All households	18	54	75	32	26	55	69	34
Province	Kigali City	14	37	49	29	41	51	31
	Southern	16	45	67	27	25	52	69
	Western	18	54	89	49	28	58	84
	Northern	19	62	76	34	28	53	61
Sex of HHH	Eastern	21	59	74	23	25	57	63
	Male	18	53	75	31	26	54	67
Age of HHH	Female	20	56	77	35	28	56	74
	Mature	19	54	74	32	26	54	69
Farm size Categories	Youth	17	52	79	33	28	57	70
	Less than 0.1 ha	19	51	74	37	28	55	72
	0.1-0.3 ha	19	57	77	30	27	57	70
	0.3-0.5 ha	16	53	71	28	23	50	60
	0.5-1 ha	20	56	78	28	25	54	64
	1 ha and above	15	56	77	30	24	55	70

Authors' calculations

Migration and shocks

This section provides basic statistical analysis on migration and responses to economic shocks. Tables 2.7 and 2.8 explore the migration patterns of the surveyed households and their expressed reasons for migration.⁸ Importantly, most migration patterns are intra-province with respondents who have migrated between two districts, but within the same province, being the most common. This section also provides information on the severity and coping mechanisms of these idiosyncratic shocks.

Table 8 indicates that 11 percent of all surveyed households had not always lived in the district where they currently reside. The Eastern province and Kigali City were the provinces where households migrated the most, with over 20 percent migration from outside the current district in both provinces. As migration was asked at the district level, a great deal of migration occurred within the same province, i.e., from one district to another district within the same province. Of the households that migrated, approximately half were intra-provincial migrations. The exception was the Eastern province where only 23 percent of migrating households came from within the province. Averages by sex or age of the HHH and farm size are relatively uniform across categories. However, the higher percentage of migration of households with larger landholdings in the Northern province should be noted, as well as the high percentage of immigrants coming to the Western province from outside Rwanda.

⁸ For the purposes of this survey, migration is defined as whether a respondent household had always resided in the current district.

Table 8: Households that migrated and their previous reported province (%'s)

	Households that migrated (Total HHs %'s)	Previous province of residence of households that migrated						
		Kigali City	Southern	Western	Northern	Eastern	Outside Rwanda	
All Households (%'s)	11					16	9	
Province	Kigali City	22	48	20	4	18	10	0
	Southern	6	21	60	10	3	0	7
	Western	5	0	5	57	0	0	38
	Northern	2	12	0	13	62	0	14
	Eastern	24	17	13	13	28	23	6
Sex of HHH	Female	11	16	19	15	24	17	9
	Male	11	19	18	20	20	14	10
Age of HHH	Mature	11	16	18	17	24	15	9
	Youth	10	20	22	15	14	18	11
Farm size Categories	Less than 0.1 ha	10	19	28	20	14	8	12
	0.1-0.3 ha	10	18	16	12	32	17	6
	0.3-0.5 ha	10	16	22	16	13	26	7
	0.5-1 ha	13	18	6	18	20	22	15
	1 ha and above	14	7	16	20	33	19	6

Authors' calculations

According to Table 9, a total of 65 percent of the households that migrated indicated either employment-related reasons (39%) or lack of land (25%) as the principal reason for migration. However, there is significant variation between the sub-categories making it somewhat difficult to provide general overviews using our categories of interest. For example, while Kigali City had the highest percentage of households indicating employment to be the main reason they moved to Kigali (64%), the Northern province did not indicate this as a reason. Although most households indicated employment and lack of land, the highest percentage of households that migrated into the Northern and Western provinces indicated other reasons (including returning to Rwanda post 1994 Genocide, inadequate access to public infrastructure, and marriage). Additionally, the highest percentage of mature-headed households, 58 percent, indicated disasters and conflicts to be the main reason for their migration.

Table 9: Main reason for migration (%'s)

		Primary reason for immigration (%'s)					Other Reasons
		Employment	Lack of land	HH moved or built elsewhere	Health	Disaster Conflict	
All Households (%'s)		39	25	13	7	5	12
Province	Kigali City	64	5	8	5	4	13
	Southern	31	25	10	14	10	9
	Western	5	5	17	0	14	60
	Northern	0	25	16	16	0	44
	Eastern	46	29	13	6	3	4
Sex of HHH	Male	42	26	11	4	4	13
	Female	32	23	16	14	7	8
Age of HHH	Mature	37	27	11	8	58	11
	Youth	48	14	18	21	11	16
Farm size Categories	Less than 0.1 ha	37	21	14	6	7	15
	0.1-0.3 ha	48	27	9	6	4	4
	0.3-0.5 ha	25	27	20	3	0	25
	0.5-1 ha	35	21	14	9	11	10
	1 ha and above	43	32	9	13	0	4

Authors' calculations

Rwanda, like the rest of the world, is susceptible to idiosyncratic shocks. These shocks affect the livelihoods of farmers and can end up significantly reducing crop production and livestock holdings, as well as other negative economic impacts on household welfare. Understanding these shocks is important for developing better resilience strategies. This survey asked farmers whether they had experienced one or more shocks; and provides an initial investigation into the nature and severity of these shocks (see Table 10).

A total of 58 percent of all sampled households experienced at least one shock in 2022, with 30 percent of all households experiencing more than one shock. Kigali City, at 80 percent, had the highest percentage and the Northern province reported the second highest level at 73 percent. More male-headed households reported slightly experiencing shocks than female headed households, with 59 and 55 percent reporting, respectively. However, for households that experienced multiple shocks, both male headed and female headed households reported the same levels. Mature headed households reported a 7-percentage point higher level of experiencing shocks than youth headed households. Relatively similar levels of reported shocks, and multiple shocks, are reported across all land sizes.

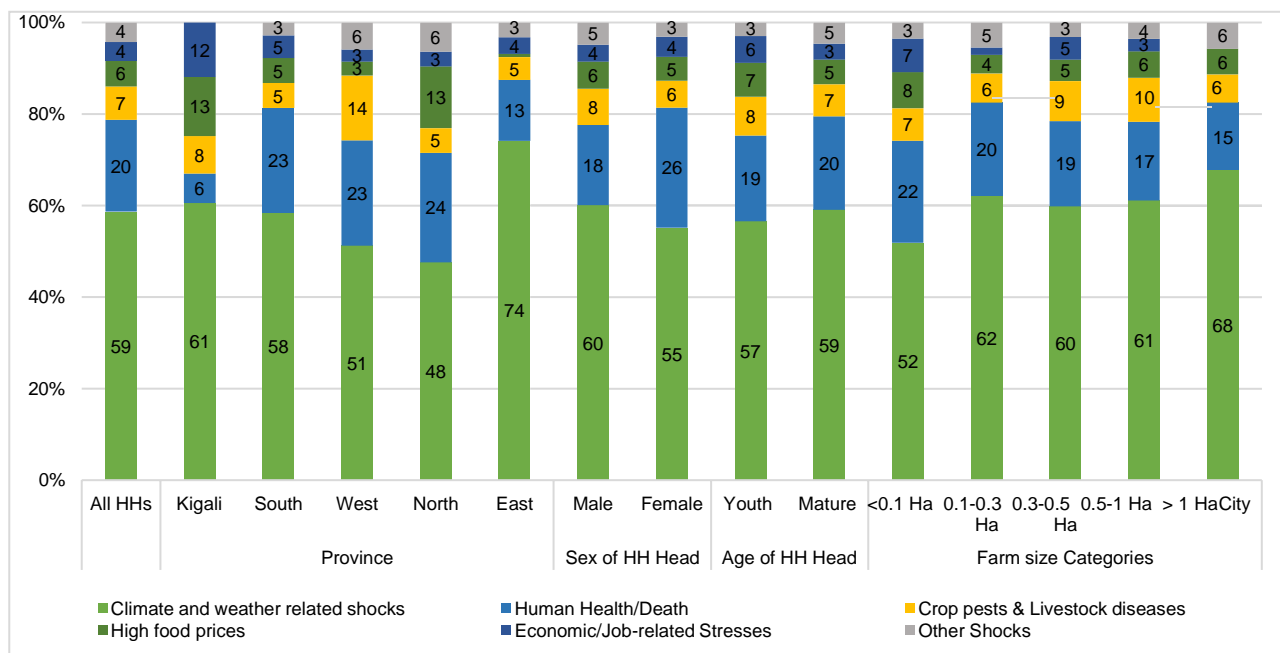
Table 10: Households that experienced shocks (%'s)

	Experienced a shock	Experienced multiple shocks
All Households	58	30
Province	Kigali City	80
	Southern	55
	Western	56
	Northern	73
	Eastern	51
Sex of HHH	Male	59
	Female	55
Age of HHH	Youth	52
	Mature	59
Farm size Categories	Less than 0.1 ha	55
	0.1-0.3 ha	60
	0.3-0.5 ha	58
	0.5-1 ha	63
	1 ha and above	55

Authors' calculations

Households that experienced shocks were asked to rank the shocks experienced by the level of severity. This information is provided in Figure 2. Climate and health related shocks were reported as the most important, with 80 percent of the households ranking either of the two as the most severe shock they experienced. More specifically, climate and weather-related severe shocks were identified by 59 percent of the households and 20 percent reported human health. Overall, the Eastern province had the highest percentage of households experiencing climatic shocks at 74 percent. Although only 6 percent of surveyed households reported high food prices as the most severe shock, Kigali City reported double the average at 13 percent. Of note, while approximately 26 percent of female headed households reported health related issues, only 18 percent of male headed households identified human health as the most severe shock.

Figure 2: Reported causes of severe shocks



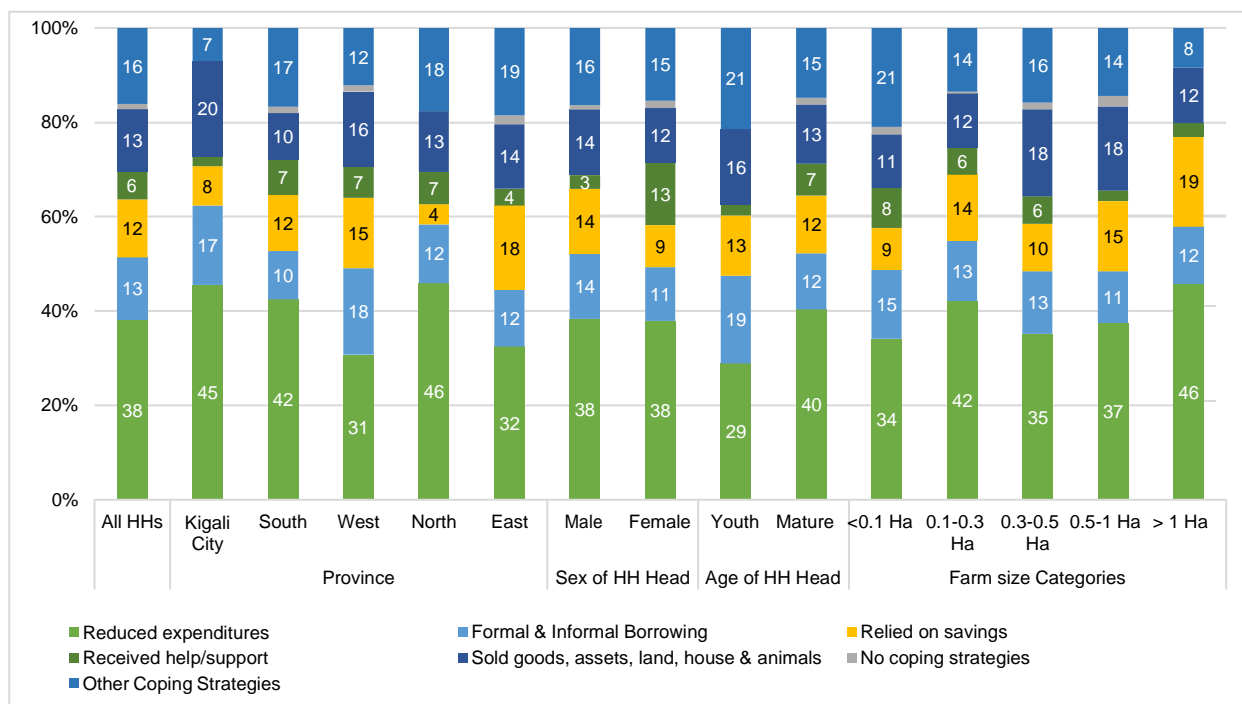
Authors' calculations

Figure 3 depicts how households cope with the reported shocks with most households either reducing their expenditures, borrowing, using their savings, receiving support from others, and/or selling goods. To mitigate the shocks experienced, the most popular response was to reduce current expenditures (38%). The second and third most common coping strategies were either borrowing money or selling household goods and assets (about 13 percent each).

Only 12 percent of the households used savings as a first response to mitigating shocks. A further exploration into the types of households that relied on savings shows that households in the Eastern province relied six percentage points more on savings, compared to other provinces. In addition, male headed households rely more on savings than female headed households. Youth headed households and adult headed households were approximately the same. Across farm size categories, there was a higher percentage of households within the 1 ha and above farm size category that responded by relying on savings as their first response. The percentages of households that responded to relying on savings generally increased with farm size, except for the 0.1-0.3 ha farm size category.

Only 6 percent of the households identified receiving support from either the government, NGOs or family and friends as their first response to the shock but the percentage more than doubles to 13 percent for female headed households. For youth headed households, only 2 percent of the households reported receiving support as their first response to mitigating shocks.

Figure 3: Coping responses to shocks



Authors' calculations

Asset ownership

A total of 17 durable household assets were surveyed at the household level.⁹ These assets were used to create an overall wealth index using a statistical aggregation methodology known as principal component analysis (PCA).¹⁰ From the PCA results, we classified the households into five wealth quintile groups in ascending order, i.e., quintile group one was the least wealthy and quintile five the wealthiest. Table 11 provides details on the distribution of the wealth index. The quintile percentages are slightly different than 20 percent, on average, due to repeated index values at quintile cut-off points causing a small variation in the categorical values.

In terms of wealth through asset ownership, Kigali City stands out as 56 percent of households, which is almost three times the expected 20 percent, are in the top quintile. At the other end of asset ownership, the Eastern province has 49 percent of households in the bottom two asset quintiles, and the Southern province has the second most with 45 percent.

Male headed households were found to be slightly skewed towards the top asset quintiles, with 47 percent of male headed households belonging in the top two quintiles. This contrasts with female headed households who have only 22 percent of households in the top two quintiles. Conversely, the percentage of female-headed households in the bottom two quintiles is approximately 1.7 times more that of the male-headed households.

In comparison to the age categories of youth and mature, the top two quintile groups were only three percentage points higher for older household heads over younger household heads and little difference exists overall.

⁹ These 17 assets include, ownership of a bench, beds, mobile telephone, dining room table, dining room sets, radio, bicycle, living room suite, cupboard, television set, water filter, video/DVD player, decoder, cooker, sewing machine, computer and accessories, and a motorcycle.

¹⁰ A PCA is a quantitative methodology, typically a single variable, that statistically captures most of the variation of several identified variables of interest. It is useful for analysis in that it reduces dimensionality (i.e., the number of variables) but attempts to represent the statistical information of the initially identified variables. In this case, we have employed PCA to capture the variation of asset ownership via a single indexed variable.

Within the farmland size categories, the wealth increased significantly with the increase in farmland size. Thirty-four percent of all households owning 0.1ha or less were in the bottom quintile and only four percent were in the top asset quintile. In other words, the smallest landowners were over eight times more likely to be in the lowest, rather than the highest, asset quintile. The figures are generally reversed in the largest landowning class, with 49 percent of households owning 1ha and more of farmland being in the top quintile, while only nine percent reported asset ownership in the lowest quintile. Alternatively, the largest landowners are about five times more likely to be in the top asset quintile over the bottom quintile. Overall, asset ownership and land size are highly negatively correlated.

Table 11: Asset ownership by quintiles (%'s)

	Quintiles (lowest Q1, to highest Q5)				
	Q1	Q2	Q3	Q4	Q5
All Households (%'s)	21	21	19	20	19
Province					
Kigali City	5	6	15	18	56
Southern	23	22	19	21	15
Western	20	18	27	18	17
Northern	15	17	20	28	19
Eastern	24	25	13	17	21
Sex of HHH					
Male	16	18	20	24	23
Female	32	27	19	13	9
Age of HHH					
Mature	21	20	18	20	20
Youth	18	21	24	21	16
Farm size Categories					
Less than 0.1 ha	34	23	19	16	9
0.1-0.3 ha	18	24	23	20	16
0.3-0.5 ha	13	18	17	28	24
0.5-1 ha	9	13	18	29	32
1 ha and above	4	13	16	18	49

Authors' calculations.

Section 2 provides a general statistical overview of the household in terms of demographics, education, infrastructure, walking time to selected basic services, migration patterns, economic shocks and responses, and asset ownership. Our survey results determined that approximately 30 percent of the household heads are female and most of the household heads age fall into the range of 36 – 64 years old. In addition, 21 percent of HHHs are in the youth category (under 36 years old). The average household size is 4.4 persons and the dependency ratio for the household is 86 percent, suggesting almost one dependent per working age household member. In terms of education, approximately 66 percent of the household heads are literate with education attainment levels being mostly at the primary and secondary level. As would be expected, female heads of households are disproportionately less educated.

In general, a higher percentage of households in the city of Kigali had better household infrastructure and needed less time to reach the most basic services. Kigali City had the second highest percentage of households that had migrated into Kigali, with employment reasons occupying a higher percentage of reasons for migration as compared to other provinces. The city also had the highest percentage of households indicating to have experienced a shock or multiple shocks. Although climatic and weather shocks were the highest across all groups of households, Kigali City had a high percentage of households indicating economic/job related stresses and high food prices as the most severe. To mitigate the effects of shocks, the most common coping strategy was to reduce expenditures across all groups, however there was a higher percentage of households in Kigali, 20 percent, that indicated the sale of assets to be the first coping mechanism. In addition, most households in Kigali belong to the wealthiest quintile of asset ownership.

Comparing the sex of the head of the household, some important differences and similarities emerge. For example, the percentage of male-headed households that use improved drinking water is about the same as that of female-headed households. A higher percentage of male-headed households use electricity and solar energy as a lighting source, and a higher percentage of households use improved sanitation as compared to female-headed households. The time spent travelling to different basic services is approximately the same for both the male-headed and female-headed households. Households experiencing shocks also does not vary across these male and female headed households, although female-headed households reported health shocks twice as frequently when compared to male heads. A higher percentage of female-headed households also rely on external support as the first response to shocks, although the percentages are relatively low. Male-headed households have significantly larger asset ownership than female-headed households where more than half of the female-headed households are in the bottom two quintiles, while almost half of the male-headed households are found in the top two quintiles.

The variation between youth and mature headed households is mixed depending on the question asked. Nearly the same percentage of these households are similar in household infrastructure and duration of traveling from their dwelling to certain basic services. Similarly, almost the same percentage of households within both groups ranked the severity of shocks in a similar way, and reported coping strategies that did not vary much across these two groups. The migration patterns, however, differed, with a higher percentage of mature-headed households having migrated mostly from the Northern province, while the younger households generally moved from the Southern province. Additionally, both mature-headed and youth-headed households migrated for employment and land reasons, although there is a high percentage of mature-headed households that migrated due to conflicts and disasters. In terms of wealth, the highest percentage of youth-headed households is in the middle quintile group. Mature-headed households have higher percentages of households in the top two quintiles.

Generally, the larger the farm size the increased percentages of households with better household infrastructure and the higher the percentage of households belonging to the top quintile asset groups. On the other hand, the duration spent travelling from dwelling to selected basic services did not vary much across farm size categories. The percentage of households that migrated increases with farm size holdings. The highest percentage of immigrants, within the 1 hectare and above farm size, migrated from the Northern province. As with all other respondents, the top two reasons for migration were employment and lack of land. There is little variation in responses across these farm size categories in terms of experiencing shocks or in the ranking of the most severe of shocks. However, the percentage of households relying on savings generally increased with farm size. Ownership of household durable goods and assets increases directly with farm size and is substantial.

FARM CHARACTERISTICS

Land is a critical factor of crop production for smallholder farmers in Rwanda. In this survey a household farm is defined as a collection of all plots/parcels operated by household, that comprise owned, rented, or communal land. Respondents were asked to report details on their three largest plots and approximately 78 percent of all households surveyed reported having three or less plots. For the remaining 22 percent of households, the three largest plots were used in this analysis. It is important to emphasize that while only the top three plots were surveyed per household, this captures most of the land used by each household and 100 percent of all land for over three-quarters

of all survey respondents. Therefore, it can be assumed that most of the crop production, for all households, is included in the following results.

Farm size

Table 12 reveals that the average land size from the sampled households is 0.35 hectares (ha), but some province level variation exists. An average high of 0.42 ha was reported in the Eastern Province and a low of 0.31 ha in the Northern Province. Importantly, both mature and male headed households have an average of greater than 50 percent more land holdings than youth and female headed households. The results also indicated that 89 percent of total land area per household was under crop production, or, measuring by plots used, an average of 2.6 plots out of 2.9 operating plots were reserved for crop production. Approximately 93 percent of all plots were used for crop production over other purposes such as (laying fallow, grazing, etc.). Regarding farm operations across provinces, the result revealed that the Eastern province has more land reserved for crop production compared to other provinces. Although the differences are relatively small, the results show that female and youth dedicated more of their land to crop production compared to male and mature household heads.

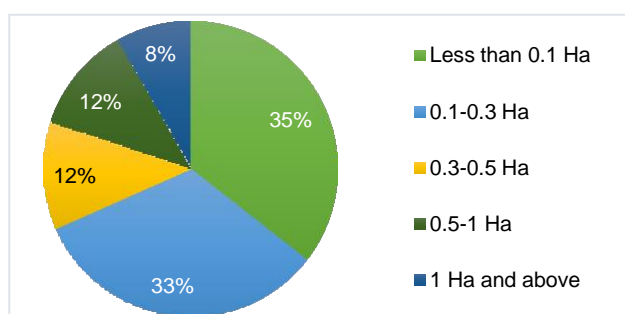
Table 12: Household land distribution

	Total average land (ha)	Average land under crop production	Average number of plots	Average number of plots under crop production	Percent of total land under crop production	Percentage of plot under crop production over total plots used	
All households	0.35	0.31	2.9	2.6	89	93	
Province	Kigali City	0.38	0.32	2.6	2.2	84	86
	Southern	0.32	0.28	3.2	3.0	89	94
	Western	0.32	0.27	3.0	2.7	85	91
	Northern	0.31	0.27	3.2	2.8	86	89
	Eastern	0.42	0.39	2.2	2.1	93	96
Sex of HHH	Male	0.39	0.35	3.1	2.8	89	93
	Female	0.25	0.23	2.4	2.1	90	92
Age of HHH	Mature	0.38	0.34	3.0	2.7	88	92
	Youth	0.21	0.20	2.5	2.3	95	96

Authors' calculations, Note: The top three self-identified largest crop plots per household were studied.

As presented in Figure 4, results show that 80 percent of surveyed households operate on a farm size of less than 0.5 hectares. Approximately one-third of respondents have less than 0.1 ha, one-third have between 0.1 and 0.3 hectares and the remaining one-third have land holdings of 0.5 hectares and above. At the higher end of land holding, only 12 percent of households have between 0.5 and 1 ha and 8 percent report 1 ha and above. Across all provinces, households operate on relatively smaller farm sizes except in the Eastern province where 15 percent operate on farms ranging from 1 ha and above.

Figure 4: Agricultural landholdings by size



Authors' calculations

Use of agricultural inputs

Table 13 provides statistical presentations regarding farm management practices with our categories of interest. More specifically, Table 13 illustrates that 94 percent of agricultural households used organic fertilizers; 55 percent applied inorganic fertilizers and 18 percent used pesticides. Households in the Northern province are the largest users of both organic fertilizers and pesticides and the Western province households were the largest, in percentage use terms, of inorganic fertilizers. The results also indicated that use of inorganic fertilizer and pesticides/fungicides generally increases with farm size. Regarding the application of fertilizer on the various types of crops, organic fertilizer was the most used fertilizer across all crops. Inorganic fertilizers and pesticides/fungicides were mostly applied to tomato, Irish potatoes, and maize production. In addition, male and youth household heads applied more inorganic fertilizer and pesticides/fungicides than female household heads and mature household heads.

The results in Table 13 also depict that 57 percent of agricultural households protected their land against erosion and anti-erosion practice did not vary significantly across household categories and provinces. However, while only an average of 9 percent of agricultural households practiced irrigation, the survey found a high of 19 percent in Kigali City and a low of 4 percent in the Western province. Male headed households were twice as likely as female headed households to use irrigation, with virtually no difference between mature and youth headed households.

Table 13: Households who used fertilizers, pesticides, practice erosion control and irrigation (%'s)

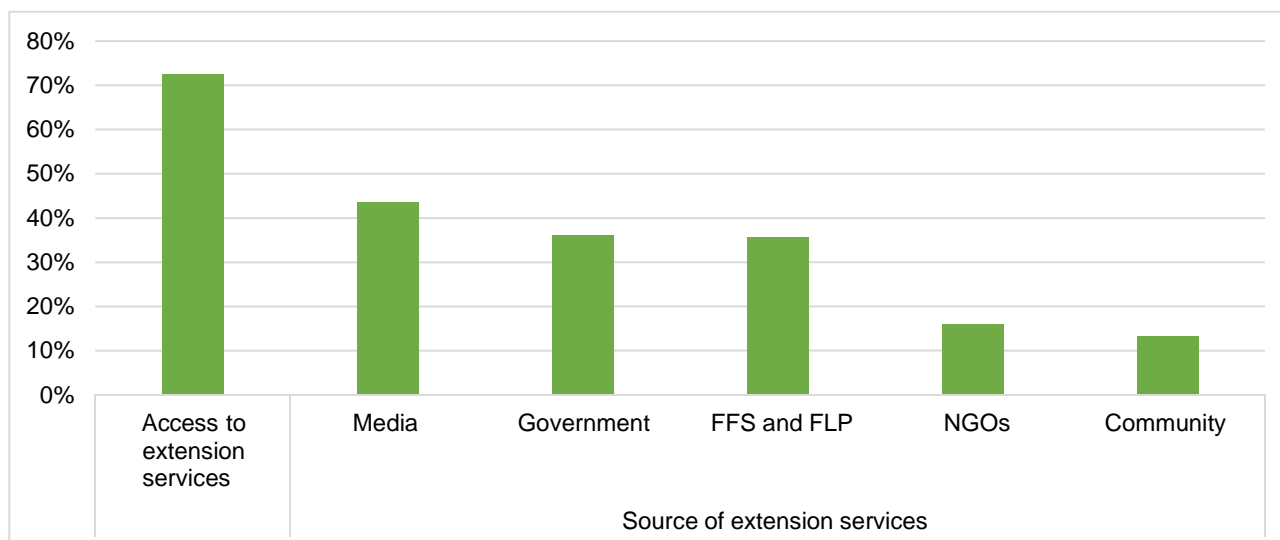
	Fertilizer and pesticides use (of total HHs)			Anti-erosion	Irrigation	
	Organic fertilizer use	Inorganic fertilizer use	Pesticide/ fungicide use			
All households (%'s)	94	55	18	57	9	
	Kigali City	95	39	22	68	19
	Southern	98	48	16	64	15
Province	Western	95	69	23	69	4
	Northern	99	52	28	61	9
	Eastern	87	54	8	40	7
Sex of HHH	Male	94	59	19	58	11
	Female	95	45	13	55	6
Age of HHH	Mature	95	55	17	56	9
	Youth	92	56	21	61	9
Farm size Categories	Less than 0.1 ha	95	42	12	54	6
	0.1-0.3 ha	95	55	17	60	10
	0.3-0.5 ha	90	71	21	56	14
	0.5-1 ha	98	62	22	64	10
	1 ha and above	89	74	32	55	12

Authors' calculations

Agricultural extension and agricultural programs

Results in Figure 5 illustrate that 72 percent of all agricultural households accessed at least one type of extension service over the 2021-2022 agricultural year. Farmers reported that the most accessed extension services were from media (Radio/TV, Newspaper), followed by government extension services and those provided through Farmer Field School facilitators and Farmer/Livestock promoters. Agricultural household access to extension services offered through NGO/companies, school and suppliers, meeting/community work, and through friend/family was low, at less than 20 percent of households surveyed.

Figure 5: Household access to extension services by source (%'s)



Authors' calculations, Media: Radio/ TV, Newspaper), Telephone (Message); FFS: Farmer Field School facilitator; FLP: Farmer /Livestock promoters; NGOs: NGO/Companies, School and Suppliers; Community: Meeting/Community work, Friend or family, and other sources

Regarding the type of extension services received (Table 14), 81 percent of all households received agricultural practices information, followed by 42 percent who received knowledge on weather and climate products, and 39 percent of households obtained information on fertilizer and improved seed use and correlated subsidies through Smart Nkunganire System (SNS). Twenty-four percent of all households surveyed accessed information on land, soil, and water management, with the remaining categories being accessed by less than 10 percent of all households.

Table 14: Agricultural extension services received by households (%'s)

Type of extension services received by the household	Household access to extension (%'s)
Agricultural production	81
Weather and climate information products/services	42
Access to fertilizer and seed through SNS	39
Land, soil, and water management	24
Household consumption, nutrition, and health	9
Credit, savings, insurance, and other financial services	9
Livestock production, health, and nutrition	9
Post-harvest loss management and storage	7
Agricultural marketing and sales and agribusiness skills	4
Agricultural processing and value addition	4

Authors' calculations

Relatively fewer agricultural households participate in agricultural community membership programs (Table 15), with eight percent of agricultural households having at least one member belonging to the Farmer Field School (FFS) and six percent belonging to Twigire Muhinzi groups. Thirteen percent of households are members of agricultural cooperatives and only three percent of households accessed agricultural insurance. Membership in FFS remains low across provinces, where, Kigali City, at 12 percent, had the highest household membership in FFS, closely followed by the Northern province at 11 percent. Female and youth household head participation in both FFS and Twigire Muhinzi groups was low compared to both male and mature headed households. Across farm size categories the participation in all programs (FFS, Twigire Muhinzi groups, agricultural cooperatives, and insurance) generally increased with farm size with a few minor exceptions.

Table 15: Households who participate in agricultural programs (%'s)

	Farmer field school	Twigire Muhinzi- Mworozzi (Farmer to farmer extension)	Member of cooperative	Insurance
All households	8	6	13	3
Province	Kigali City	12	6	0
	Southern	7	8	3
	Western	7	6	14
	Northern	11	5	11
	Eastern	8	6	13
Gender of HHH	Male	9	7	15
	Female	6	4	10
Age of HHH	Mature	9	7	15
	Youth	6	4	9
	Less than 0.1 ha	5	3	5
Farm size Categories	0.1-0.3 ha	7	5	13
	0.3-0.5 ha	12	9	23
	0.5-1 ha	11	14	19
	1 ha and above	12	11	27

Authors' calculations

Crop production, use, and sales

This section explores crop production and sales focusing on selected commercial and staple food crops identified in PSTA 4, notably food crops (which includes banana, maize, cassava, sweet and irish potatoes, and beans), traditional export commodities (tea, coffee), and selected horticulture (beans, bananas, and avocados). These selected crops are the predominantly grown crops identified in the staple, fruits and vegetable crop designations, despite the fact that vegetables are far less frequently grown by most agricultural households.

Table 16 details farmer decisions related to cropping methods. By far, the most common planting was monocropping with at least 90 percent of all respondents using this method. Various methods of intercropping at the plot level were reported by the remaining 10 percent or less responses.

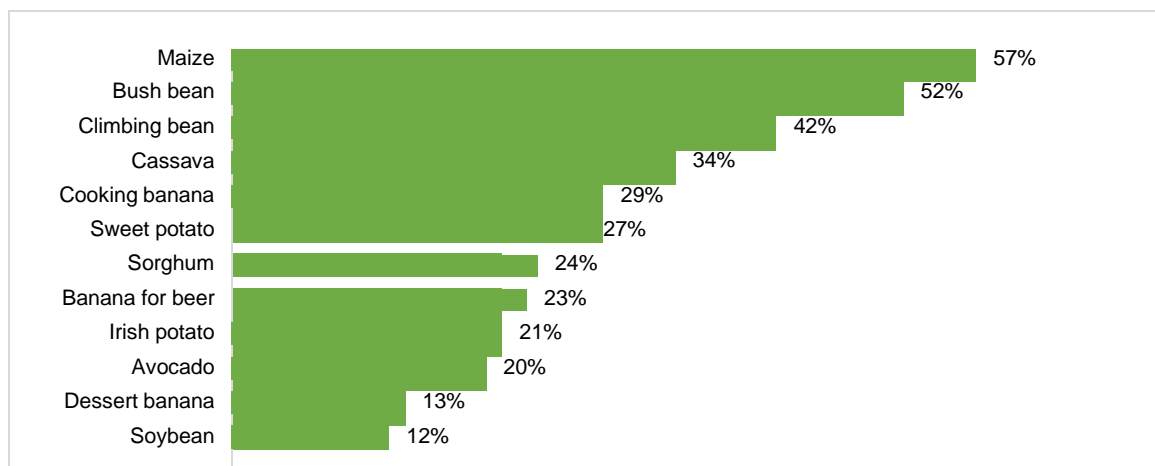
Table 16: Crop patterns used across plots by household (%'s)

	Plot monocropping	Intercropping (of those not monocropping)				
		Monocrop in their own section	Organized in rows	Random (with some spacing)	Random (with little spacing)	
All households	Season A	90	25	9	29	46
	Season B	93	27	7	29	44
	Season C	99	-	-	-	-

Authors' calculation

Figure 6 depicts the distribution of the production of staple crops grown during the agricultural year 2021/2022. Note that the crops presented here are the crops that are grown by 10 percent or more of all households, tabulated across all seasons as well (e.g., if a household grew maize in any season, it is counted). Figure 6 reveals that maize was the most grown crop with 57 percent of all surveyed households growing it. Other frequently grown crops include beans, both bush and climbing beans (52% and 42% of all farmers, respectively), cassava (34%), cooking, dessert and beer bananas (29%, 23%, and 13%, respectively), sweet potato (27%), sorghum (24%), Irish potato (21%), avocado (20%), and soybean (12%).

Figure 6: Households growing selected crops (%'s)

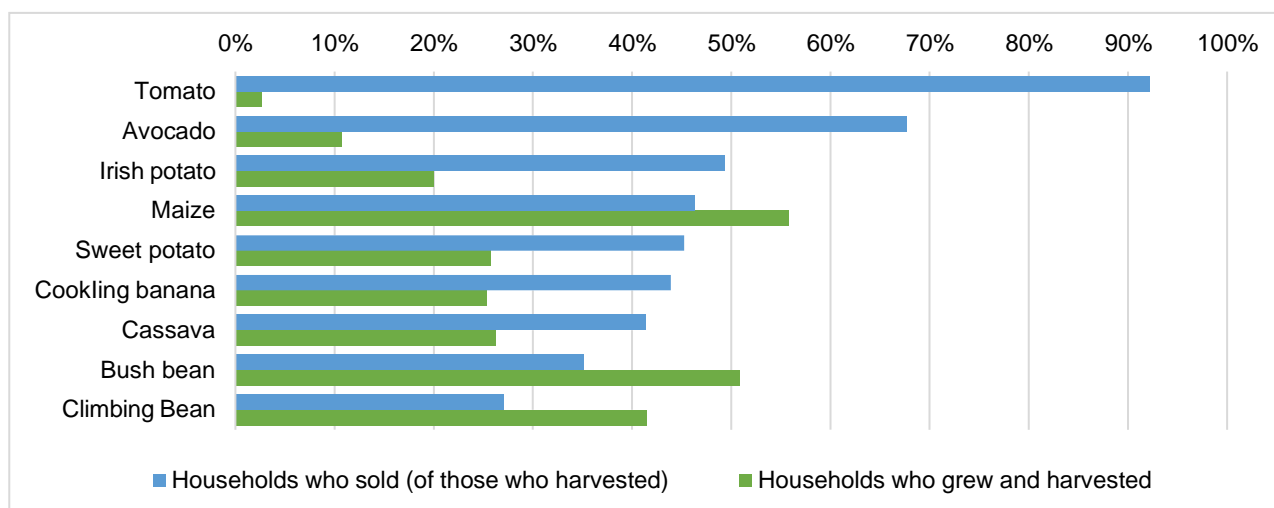


Authors' calculations

Figure 7 focuses on selected harvested and marketed crops commonly produced by most of our surveyed farmers. Staple crops include bananas, maize, cassava, sweet and irish potato, beans, and the most common fruit and vegetable grown (avocados and tomatoes, respectively). However, only three percent of all agricultural households produce tomatoes, making it relatively uncommon overall.

Among the selected crops, tomatoes (92%) and avocados (68%) are the most likely crops to be sold by households but are not commonly produced. Irish potatoes, maize, sweet potatoes, cooking banana, cassava and others identified are more commonly grown but less marketed, suggesting that these crops are largely consumed within the household.

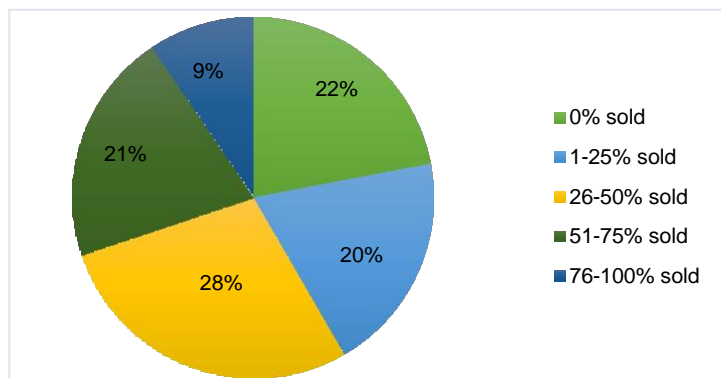
Figure 7: Households who harvested and sold selected major crops (%'s)



Authors' calculation

Figure 8 provides insight on the categories of households based on the average value of the total production sold. This represents an initial approximation of commercialization categories at the household level. The majority of households (about 70%) sell less than half of the value of their production. Future analysis will attempt to determine the relative drivers of commercialization by incorporating levels of commercialization with other variables including, land size, distance to road/market, education, number and types of crops grown and sold, and other relevant variables.

Figure 8: Household percentage of production sold

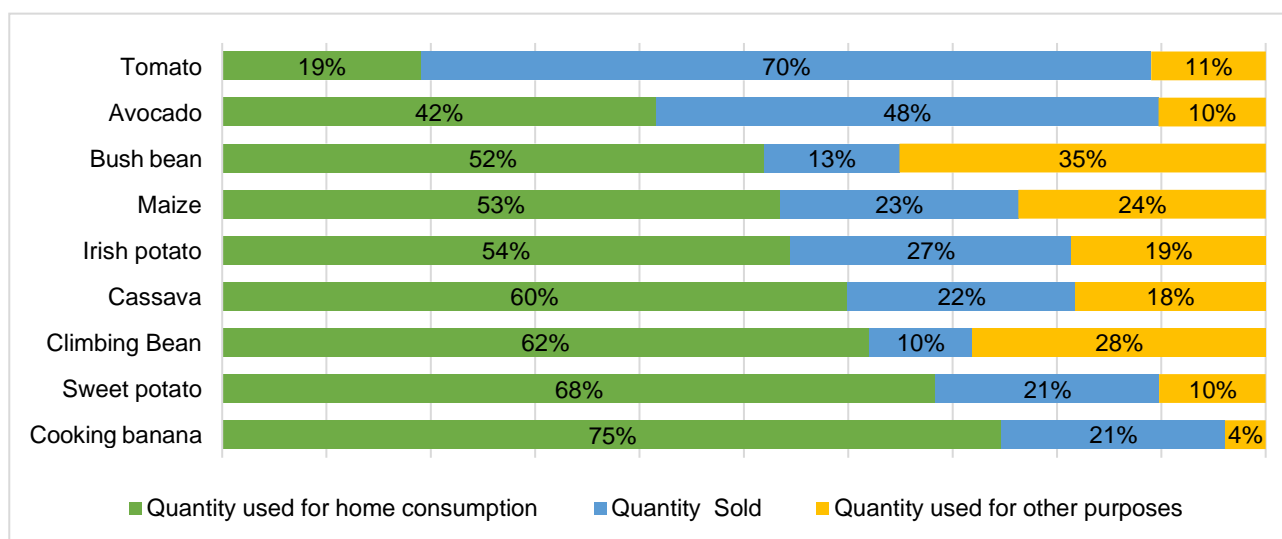


Authors' calculation, Note: This value is determined by averaging, by crop, the production sold by crop produced at the household level, and then averaging across all households

Figure 9 depicts the use of crop production by households. Cooking banana is the highest crop kept for home consumption (75%), followed by sweet potatoes, climbing beans, cassava, irish potatoes, maize, bush beans, and avocados. Tomatoes were the least used in-home consumption but were the crop most likely to be sold (70%) compared to other crops. Bush beans (35%) and climbing beans (28%) have the higher quantity used for other purposes, either used for animal feed, saved for seed, stored, given away, or for other uses by the household compared to other crops. In general, our survey indicates that a large amount of household production, particularly from the selected staple crops, has been kept for home consumption and other uses.

There are two basic methods to determine the level of commercialization as it relates to crop sales. One method is to take production and sales at the household level and average them across all households. Using this method, as depicted in Figure 8, a typical household sells about 23 percent of its maize production. However, there is a second method that aggregates all sales of maize and divides this amount by total production of maize. Unlike an average per household sold, this figure determines the total amount of maize sold. For most crops, this latter determination will be greater because larger crop producers tend to sell more of their crops. Using the example of maize, households sell an average of 23 percent of their crops, while the total amount of maize sold is nearly double that figure at 45 percent (Figure 9). These figures confirm that larger producers are, indeed, more linked to commercial sales.

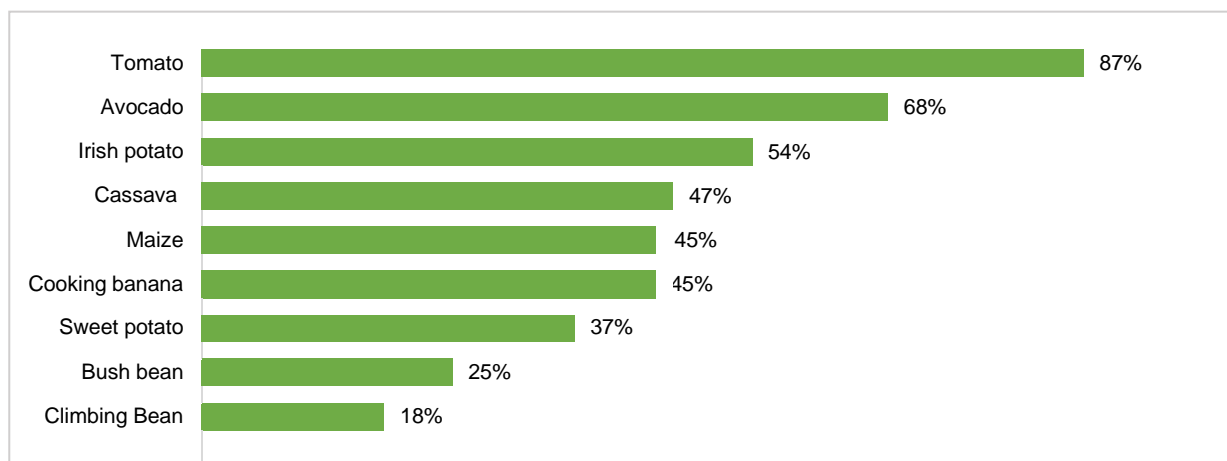
Figure 9: Household use of crop production



Authors' calculations, Note: Quantity used for other purpose include animal feed, saved for seed, stored, given away, postharvest loss, sharecropped out and crop used to pay in-kind wages

Figure 10 depicts that an average 87 percent of the total amount of produced tomatoes has been sold, which makes it the largest percentage of total crops sold. Commercialization of tomatoes is followed by avocado and irish potatoes where half of their total production was sold. This result provides some insight on crop commercialization demonstrating that fruits and vegetables (tomatoes and avocados) are typically produced mostly for commercial purposes followed by root crops (irish potatoes and cassava).

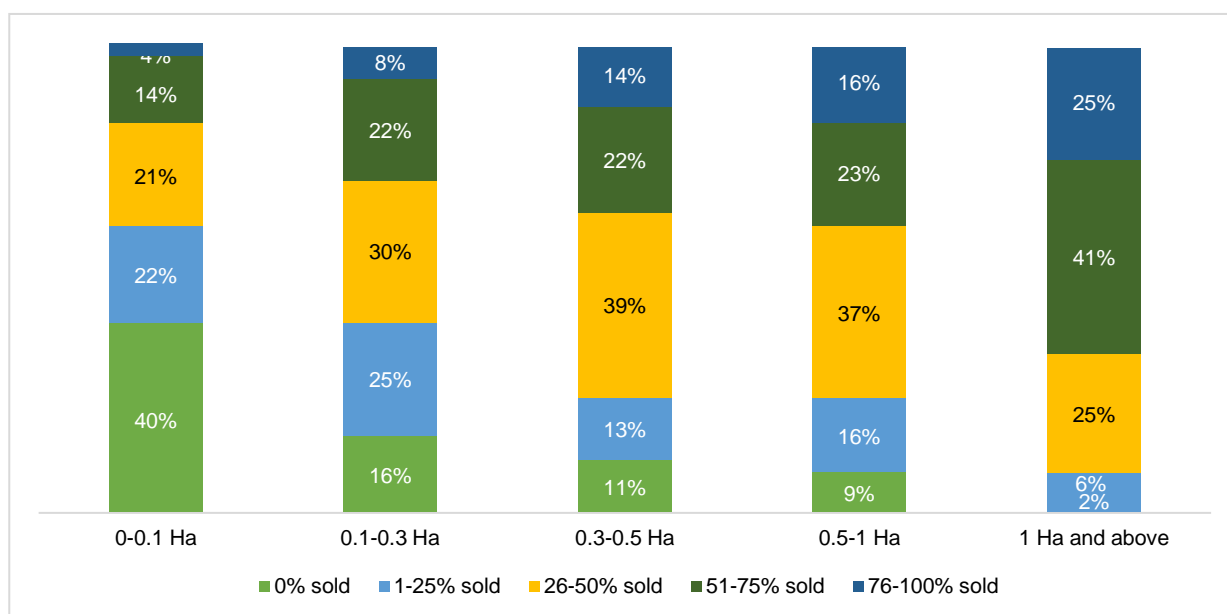
Figure 10: Total production sold per crop (%'s)



Authors' calculations, Note: This value is determined by dividing the total production sold by total crop produced at the crop level.

Regarding the share of production sold by landholding, Figure 11 demonstrates that households with more land sell a larger percentage of their production. For landowners in the lowest land ownership category (0.1ha or less), there are ten times more landowners less likely to sell any of their production than those selling more than 75% of their production (i.e. 40 percent versus 4 percent, respectively). However, it should be noted, that sales are not uniformly correlated with land size and many exceptions exist. For example, the largest land holdings (1 ha and above) have disproportionately greater number of farmers (41%) in the 51%-75% category than in the top category, where only 25 percent of large land holders sell 75%-100%.

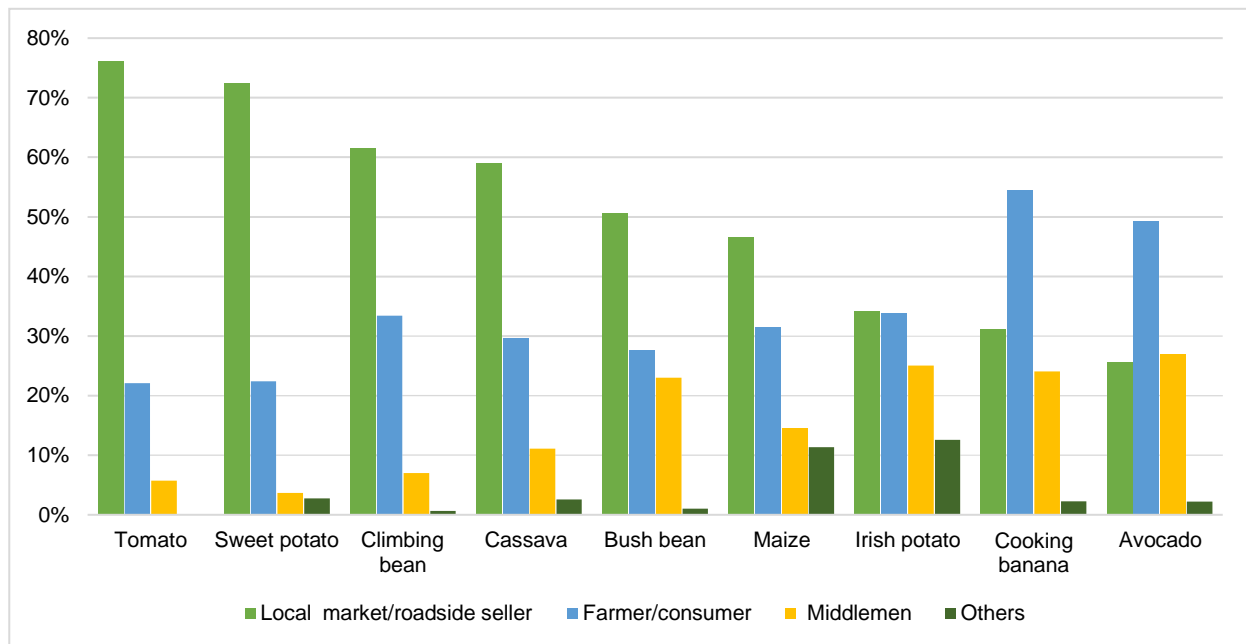
Figure 11: Household production sold across farm size (%'s)



Authors' calculations

Exploring the main buyer of crops sold, Figure 12 illustrates that, for most selected crops, production is more likely sold in the market and/or by roadside sellers. The next most common sales are to other farmers and/or consumers, followed by sales to middlemen. However, exceptions to market sales include cooking banana, irish potatoes, and avocados. The results also show that cooking banana, avocado and irish potatoes are generally locally consumed as they are mostly either sold directly to consumers or fellow farmers. On the other hand, tomatoes, sweet potatoes, climbing beans, bush beans, cassava, and maize are predominately sold to local markets and roadside sellers. In this sense, these latter crops appear to be more commercialized than irish potato, cooking banana, or avocados.

Figure 12: Main buyers of select crops among households who sold selected crops



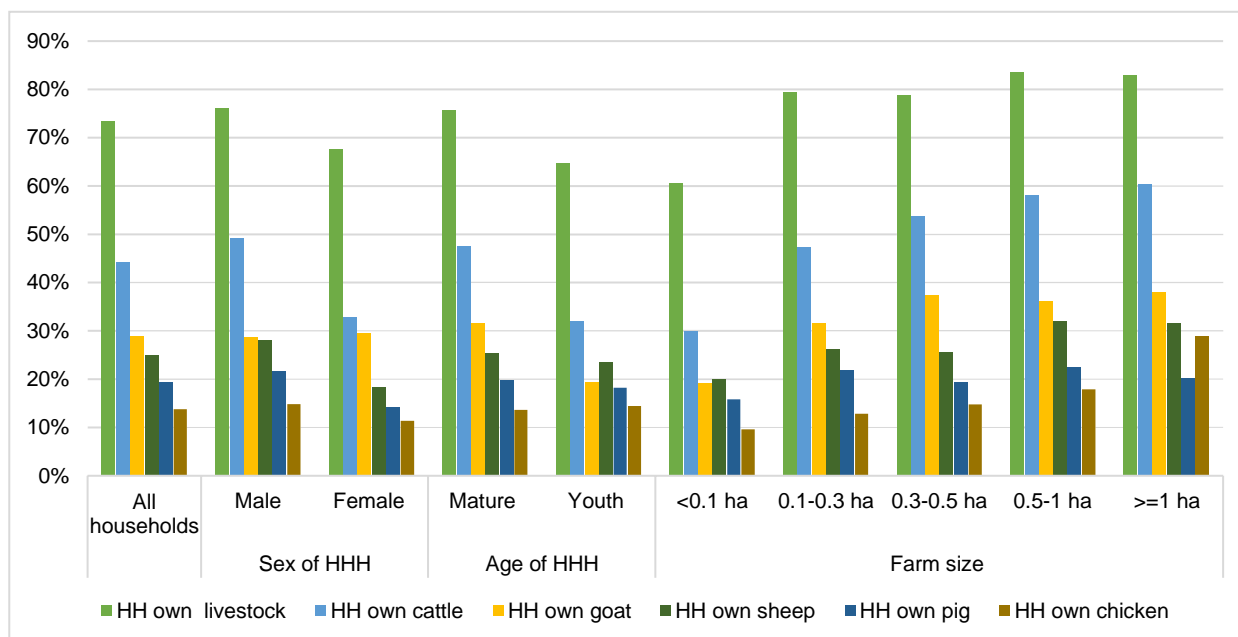
Authors' calculations; Note: Other includes government, processors and commercial companies.

Livestock

Livestock plays a major role in Rwandans' economic and traditional life. Based on goals articulated in the 4th Strategic Plan for Agricultural Transformation (PSTA4), the Government provided considerable support to the livestock sector and the overall development of the sector's animal resources. This section seeks to provide improved understanding of how livestock is distributed among rural smallholder farmers.

Preliminary results (Figure 13) demonstrate that about 73 percent of sampled households own at least one farm animal. Cattle and small ruminants (such as sheep and goats), pigs, and chickens are the most frequently reported as owned across sampled households. In addition, male and mature households are more likely to own livestock than their counterparts. Across farm size, ownership of livestock is positively correlated with farm size, but all land categories report a minimum of 60% ownership.

Figure 13: Livestock ownership, by household age and sex, and farm size



Authors' calculations

Table 17 demonstrates the average number of livestock owned among households by our categories of interest. In the far-right column, the aggregated holdings of livestock, using tropical livestock units (TLUs) is used for comparisons across households. The average ownership is 0.8 TLU across all households, with male and mature household heads having slightly larger quantities of livestock, compared to female and young household head. The number of livestock increases dramatically with farm size. Based on the previous table, this suggests that while livestock ownership is relatively common, larger landholding farmers have greater amount of livestock holdings, at least in terms of TLU measurement. Finally, livestock ownership seems relatively consistent across all provinces, except Kigali City which has approximately 50 percent more livestock ownership than most other province averages.

Table 17: Household animal ownership by province, sex, age, and farm size

	Avg. cattle	Avg. goat	Avg. sheep	Avg. pig	Avg. chicken	TLU
All households (%'s)	0.7	0.9	0.2	0.6	2.0	0.8
Province						
Kigali City	0.5	2.1	0.1	2.0	5.9	1.3
Southern	0.7	0.8	0.0	0.9	3.6	0.9
Western	0.9	0.5	0.3	0.7	0.5	0.8
Northern	0.9	0.7	0.4	0.7	0.9	0.9
Eastern	0.5	1.2	0.1	0.3	2.0	0.7
Sex of HHH						
Male	0.8	0.9	0.1	0.8	2.7	0.9
Female	0.5	0.8	0.2	0.4	0.5	0.7
Age of HHH						
Mature	0.8	1.0	0.2	0.7	2.4	0.9
Youth	0.4	0.4	0.1	0.6	0.7	0.6
Farm size Categories						
Less than 0.1 ha	0.4	0.5	0.1	0.4	0.5	0.6
0.1-0.3 ha	0.7	0.8	0.2	0.6	0.7	0.7
0.3-0.5 ha	0.8	1.2	0.1	0.8	0.8	0.9
0.5-1 ha	1.1	1.3	0.2	1.0	1.8	1.1
1 ha and above	1.3	1.7	0.2	0.9	16.3	1.4

Authors' calculations, TLU: Tropical Livestock Unit (see appendix A.3.1 for details)

Section 3 outlines general farm characteristics including land size, farm management practices, crops grown, crop sales, and livestock ownership. As often as possible, the data was presented by the designated categorical variables of interest, including province, gender and age of household head, and land size. However, some of the variables, particularly individual crop data, do not generally provide large enough sample sizes for these categorical variables and so total households and crops grown. For example, while 37 percent of farmers grow sweet potatoes, providing statistical comparisons at the province level would typically reduce samples to levels unsuitable for comparison. However, where possible, insights into the categorical designations are provided.

Landholdings in Rwanda are relatively small with an average of 0.35 ha per household. Land distribution is evenly distributed across three categories including one-third of our sample owning less than 0.1 ha, one-third owning between 0.1 and 0.3 ha and the remaining one-third with 0.5 hectares and above. Most farmers monocrop on their individual plots and typically apply organic fertilizers. About half of the farmers surveyed used inorganic fertilizers and 18 percent used pesticides. Almost three-quarters accessed at least one extension service where most received agricultural practices information.

Just over half of all farmers surveyed grew maize (57%), the most common crop grown. Other frequently grown crops include beans, both bush and climbing beans (52% and 42% of all farmers, respectively), cassava (34%), cooking, dessert, and beer bananas (29%, 23%, and 13%, respectively), sweet potato (27%), sorghum (24%), irish potato (21%), avocado (20%), and soybean (12%). Commercial crops like tomato and avocado are grown less often but are more commercialized, in terms of percentages grown.

Among the selected crops, tomato (92%) and avocado (68%) are the most likely crops to be sold by households but are not as commonly produced. This is juxtaposed with irish potatoes, maize, sweet potatoes, cooking banana, cassava and some other crops that are more commonly grown but less marketed, suggesting that these crops are largely consumed within the household. Overall, approximately 70 percent of households sell less than half the volume of their production and, while there are certainly crops that can be designated predominately cash and food crops, a more nuanced designation is needed as all crops are both sold and consumed by the household.

In terms of own consumption, cooking banana is the highest crop kept with 75 percent consumed directly. This is followed by sweet potatoes, climbing beans, cassava, irish potatoes, maize, bush beans, and avocados. On the more commercialized side, tomatoes were the least likely to be consumed. More specifically, the survey indicated that 87 percent of all tomatoes grown were sold, followed by avocado and irish potatoes where about half of their total production was sold. Crop type matters for commercialization, revealing that fruits and vegetables (tomato and avocado) are typically being produced most for commercial purposes followed by root crops (irish potatoes, cassava). Crops are generally sold in markets and by roadside sellers.

Almost three-quarters of all surveyed households' own livestock with cattle, small ruminants, pigs and chickens are the most commonly owned.

While average land size is 0.35 ha, some province level variation exists. The Eastern province has above average landholdings (0.42 ha), and consequently, is also where the highest percentage of large farms are located (1 ha and above). Input use varies by province as well. Households in the Northern province are the largest user of both organic fertilizers and pesticides and the Western province, in percentage use terms, uses the highest amounts of inorganic fertilizers. Even though an average of 9 percent of agricultural households practiced irrigation, the survey found a high of

19 percent of households in Kigali City and a low of 4 percent in the Western province. Finally, livestock ownership seems relatively consistent across all provinces, except for Kigali City which has approximately 50 percent more livestock than other provinces.

In regard to household head comparisons in this section, the most common distinction emerged along male and mature versus youth and female headed households. For example, both male and mature headed households own greater than 50 percent more land than youth and female headed households. In addition, male and youth household head applied more inorganic fertilizer and pesticides/fungicides than female and mature household heads. Livestock ownership is also greater for male and mature households. However, one difference exists with male headed households twice as likely as female headed households to use irrigation, but virtually no irrigation differences exist between mature, and youth headed households.

Some distinctions do exist based on landholdings size. For input use, inorganic fertilizer and pesticides/fungicides are positively correlated with farm size. As might be expected, greater land holders also sell a larger percentage of their production. Landowners with 1 ha or more, are ten times more likely to sell shares of production over those with 0.1 ha or less. While livestock ownership is relatively common for all households, larger landholding farmers have larger average livestock holdings.

WAGE EMPLOYMENT, NONFARM BUSINESS AND ACCESS TO FINANCE

This section explores rural households' earned wages, from a variety of sources, details of non-farm enterprises, labor composition as access to finance. The survey asked all household members, aged 16 years and above, off-farm employment and associated wages from agriculture and non-agriculture labor activities, as well as own business revenues. This includes the number of jobs undertaken by each household member engaged in wage employment, economic activities they worked on, and wage and in-kind payment received during the work period. Data was also collected regarding the nature of nonfarm enterprises (NFE) as well as the number of businesses owned by the households, NFE labor composition (household member vs. hired labor), as well as earnings from the business. Finally, responses were collated regarding access to financial services, both formal and informal.

Participation in wage employment and nonfarm business

As shown in Table 18, about 47 percent of all households reported receiving some income from farm wage employment. At the province level, farm wage activities revealed a low of 28 percent in Kigali and a high of 61 percent in the Northern province. Male and female headed households are approximately equal in terms of engagement in farm wage income, but youth headed households have 13 percentage points higher participation rates than mature households.

Related to land ownership, households with 0.1 ha or less are over five times more likely to receive income from farm wage activities as compared to the largest farm size category (62 percent versus 12.5 percent, respectively). Non-farm wages are less common but still significant, with an average of 24 percent of households engaging in non-farm wage activities, and a high of 64 percent in Kigali City. In addition, male headed households are twice as likely to engage in non-farm wage activities over female headed households. On average, among all reporting households, only 11% reported having nonfarm businesses generating income for the households. Understandably, households living in Kigali City (31%) are more business oriented and able to generate more income from these activities.

Table 18: Households who obtained income from wage employment or non-farm business

	Farm wage activities	Non-farm wage activities	Own business (NFE)	Total projected number of HHHs	
All households	1,097,387 (47%)	553,984 (24%)	252,164 (11%)	2,348,456	
Province	Kigali City	15,970 (28%)	35,872 (64%)	17,469 (31%)	56,436
	Southern	293,301 (45%)	153,427 (24%)	82,089 (13%)	651,454
	Western	233,572 (45%)	98,451 (19%)	40,941 (8%)	522,847
	Northern	254,152 (61%)	119,107 (29%)	432,99 (10%)	417,670
	Eastern	300,392 (43%)	147,126 (21%)	68,366 (10%)	700,049
Sex of HHH	Male	750,630 (46%)	458,254 (28%)	205,115 (12%)	1,643,471
	Female	346,757 (49%)	95,729 (14%)	47,050 (7%)	704,985
Age of HHH	Youth	278,400 (57%)	155,877 (32%)	65,060 (13%)	486,766
	Mature	818,987 (44%)	398,107 (21%)	187,104 (10%)	1,861,690
Farm size Categories	Less than 0.1 ha	508,937 (62%)	194,062 (24%)	67,069 (8%)	822,547
	0.1-0.3 ha	379,847 (50%)	177,466 (23%)	68,852 (9%)	759,477
	0.3-0.5 ha	110,913 (37%)	83,252 (28%)	44,337 (15%)	301,412
	0.5-1 ha	74,880 (28%)	61,247 (23%)	36,984 (14%)	270,321
	1 ha and above	22,811 (12%)	36,343 (19%)	34,922 (18%)	190,398

Authors' calculations

As shown in Table 19, households that reported having anyone who worked for wage labor, 61 percent of the jobs were done by the household head. Similar to wage labor, about half of household heads are the ones working in the household's business.

Table 19: Household participants in wage employment and nonfarm enterprise

	Head only	Spouse only	Head and others	Others only	Projected number of households
Wage employment	61%	20%	18%	0%	1,462,182
Own business (NFE)	51%	36%	13%	1%	252,164

Authors' calculations

Among smallholder farmers, the agriculture sector is the largest wage employer, with 68 percent of households engaged in agriculture, forestry, or fishing (Table 20). This is followed by construction (11%) and professional-related activities and transport and storage. In the Northern province, survey data suggest that more households are engaged in agricultural-related activities, compared to households in the Eastern and Western provinces but the differences are relatively small. Female-headed households are 16 percentage points more likely to be engaged in agricultural-related activities, as compared to male-headed households. Table 20 also depicts that, as the farm size increases, fewer household members are engaged in agricultural labor activities and are more likely to be working in professional, scientific, and technical activities.

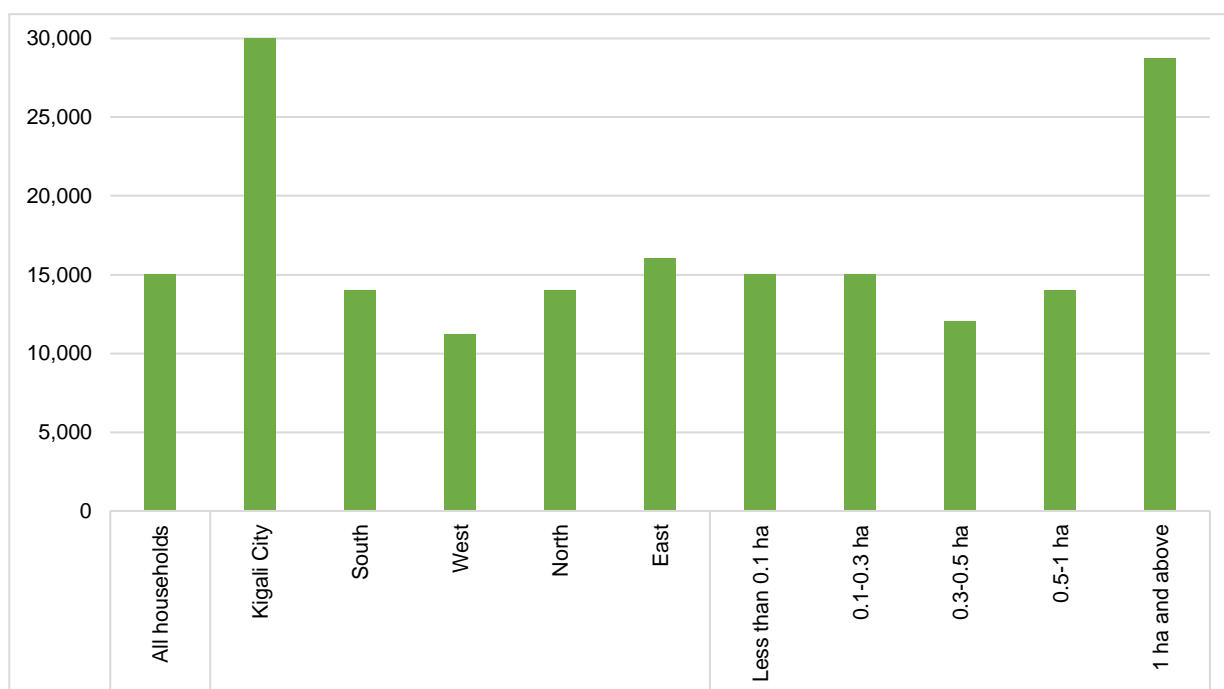
Table 20: Distribution of sector wage workers by job sectors, row percentages

	Agriculture, forestry and fishing	Construction	Professional, scientific, and technical	Transport and storage	Mining and Quarrying	Cleaners and helpers	Services and sales worker	Handcrafts	Others
All households (%)	68	11	3	3	2	2	2	1	8
Province									
Kigali City	24	22	4	10	3	6	7	2	22
Southern	66	11	5	3	2	3	1	1	8
Western	68	10	2	3	2	1	1	1	11
Northern	73	11	2	3	3	2	1	1	5
Eastern	69	11	4	1	2	1	2	1	8
Sex of HHH									
Male	63	13	4	3	3	1	2	1	9
Female	79	6	2	2	1	3	1	1	6
Age of HHH									
Youth	66	12	3	4	3	2	2	2	7
Mature	68	11	3	3	2	2	1	1	9
Farm size Categories									
Less than 0.1 ha	74	9	1	3	1	1	1	1	8
0.1-0.3 ha	70	11	3	2	2	1	1	1	8
0.3-0.5 ha	58	16	4	2	3	1	1	3	11
0.5-1 ha	55	17	7	3	2	6	3	3	4
1 ha and above	36	8	22	1	9	3	5	0	15

Authors' calculation

Figure 14 presents the median monthly wage income values of respondents who reported a non-zero income. Households in Kigali City reported earning approximately double the wage income per month as compared to other provinces. In addition, the median monthly wage income of households with less than 0.1 ha of land is approximately half that of wage earners living in households with 1 ha and above.

Figure 14: Median monthly wage income (in 2022 Rwf)



Authors' calculations

Table 21 reports household activity in non-farm enterprises. Results show that the wholesale and retail trade is the most frequent type of business reported, with 79 percent of the total reported. When comparing across provinces, overall averages of wholesale and retail trade are highest in

Kigali City and the Western province (over 90 percent for both). The remaining provinces have NFEs dedicated to a diverse set of activities including wholesale and retail trade and manufacturing-related businesses. Transportation and storage; accommodation and food service activities; and arts, entertainment and recreation are relatively uncommon among households that own NFEs.

Table 21: Households engaged in nonfarm business activities, row percentages

	Wholesale and retail trade	Manufacturing	Professional, scientific, and technical activities	Transportation and storage	Accommodation and food service activities	Arts, entertainment, and recreation	Others
All households (%'s)	79	7	4	2	2	2	3
Kigali City	93	0	4	2	0	0	0
Province							
Southern	69	10	8	5	1	6	2
Western	92	3	0	0	0	0	5
Northern	78	6	2	3	4	0	7
Eastern	80	9	4	0	5	0	2
Sex of HH Head							
Male	78	8	5	2	2	2	3
Female	83	5	1	4	2	0	5
Age of HH Head							
Youth	82	5	2	5	1	5	0
Mature	78	8	5	1	3	1	4
Farm size Categories							
Less than 0.1 ha	81	7	2	2	3	3	3
0.1-0.3 ha	81	7	6	1	0	2	3
0.3-0.5 ha	75	3	9	5	3	0	5
0.5-1 ha	81	11	3	1	0	3	0
1 ha and above	72	11	0	3	9	0	5

Authors' calculations

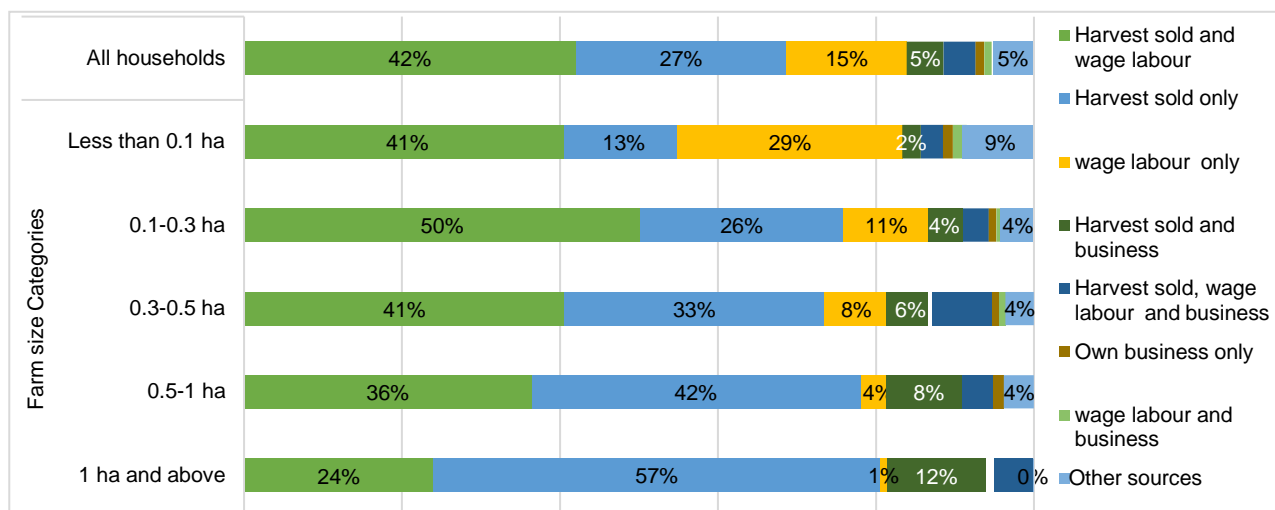
Other sources of income

The survey also asked general questions regarding the various sources of income from households, including revenue from sold harvest, wage employment and nonfarm businesses, as well as other sources such as received remittances, social protection transfers, and others.

Results in Figure 15 reveal that income mostly originates from a combination of agriculture sales and wage labor. Among all households interviewed, 42 percent reported obtaining their income from both crop sales and wage labor, followed by households deriving income solely from agriculture (27%) and wage employment (15%). Put another way, sale of crop production, wage employment, or a combination of the two, comprise 84% of sources of income for all surveyed families.

According to household farm size categories, households with more land derive their income predominantly from selling crops (57%), and less from wage labor. On the other hand, households with less land combine the income received from both crops sold and wages.

Figure 15: Households that obtained income from selected sources (%'s)



Authors' calculations

Access to financial services

Survey results (Table 22) depict that 81 percent of all households interviewed are banked either formally or informally. Results also show that female-headed households have less financial services than male-headed households (74% versus 84%, respectively). Land size also matters, as survey results indicate that households with more land are the most banked as compared to those with relatively small land holdings. Overall, however, no category had less than a 75 percent positive response to having a bank account.

Table 22: Households with at least one bank account (%'s)

	Household with at least one bank account (%'s)	Total projected number of households
All households	81	2,348,456
Province	Kigali City	56,436
	Southern	651,454
	Western	522,847
	Northern	417,670
	Eastern	700,049
Sex of HHH	Male	1,643,471
	Female	704,985
Age of HHH	Youth	486,766
	Mature	1,861,690
	Less than 0.1 ha	822,547
Farm size Categories	0.1-0.3 ha	759,477
	0.3-0.5 ha	301,412
	0.5-1 ha	270,321
	1 ha and above	190,398

Authors' calculations

Table 23 breaks down the households with bank accounts by the type of institution they use for savings. Umurenge SACCOs are the most commonly utilized banking institutions by smallholder farmers with 64 percent of those savings using this type of institution. The second most popular are cooperative banks (29%), followed a distant third are commercial banks (5%). Focusing on commercial banks, they are most used in Kigali City compared to other provinces. Similarly, a

greater share of households with more land (at least 0.5 ha) utilize commercial banking services compared to those with less than 0.5 ha.

Table 23: Households with at least one bank account by banking institutions (row %'s)

	Savings & credit Coops (SACCOs)	Coop bank	Commercial bank	Micro-finance	Tontine or community savings (Ikimina)	Projected number of HHHs with at least one bank account	
All households	64	29	5	2	0	1,901,814	
Province	Kigali City	44	31	18	5	2	51,683
	Southern	66	27	4	2	0	560,334
	Western	64	30	3	2	0	438,861
	Northern	54	39	4	2	0	331,206
	Eastern	71	22	5	1	1	519,730
Sex of HHH	Male	63	29	6	2	0	1,378,050
	Female	68	29	2	1	0	523,765
Age of HHH	Youth	68	25	4	3	0	400,792
	Mature	63	30	5	2	1	1,501,022
Farm size Categories	Less than 0.1 ha	68	27	3	2	0	622,551
	0.1-0.3 ha	67	28	3	2	0	609,091
	0.3-0.5 ha	60	31	5	3	1	263,512
	0.5-1 ha	58	31	8	1	2	235,775
	1 ha and above	56	31	8	4	0	169,272

Authors' calculations

This section explores a series of questions asked to all household members aged 16 years and above to capture various sources of income earnings, nonfarm activities and use of financial resources at the household level. More specifically, questions included the number of jobs done by each household member engaged in wage employment, economic activities they worked on, and wage and in-kind payment received during the work period. Further information regarding the number and type of nonfarm enterprises is presented as well. Table 19 provides an overview of the selected sources of income, delineated by farm size, and the final section reviews households' use of financial services.

While almost half (47%) of all households receive income from farm wage labor, wage labor is disproportionately greater at lower levels of farm holdings. Youth headed households are also more likely to engage in wage labor over their older, more mature, counterparts. While a quarter of households engage in non-farm wage activities, 64 percent do so in Kigali City. Overall, 11 percent of households own a business, with general increases in business ownership positively related to farm size. At least half of these activities are managed by the household head, with the spouse undertaking the activity as the second most common response. Most wage work (68%) is performed in the agricultural sector with construction a distant second at only 10 percent of all respondents. Reported monthly wages are nearly twice as high for Kigali City households as well as those households that own 1 ha or more. About 80 percent of non-farm business activities are primarily in the wholesale or retail trade, distributed relatively equally across all categories of analysis. In terms of sources of income, smaller land holders rely more on harvest and wage labor, while larger landholders rely more on harvested crops only. Finally, over 80 percent of households reported having at least one bank account, with two-thirds of those holding an account with a savings and credit cooperative (SACCO).

CONCLUSION

This report provides a general statistical overview of several aspects of agricultural households in Rwanda and is presented both in aggregated summaries and by several categorical variables of expressed interest. More specifically, categorical variables include provincial, gender and age of the head of household (youth/mature), as well as relative farm size, and are used to show potential relative differences between categorical. Overall, the survey reveals a great deal of information about the current economic situation and activities for smallholder farmers that can be considered for a variety of purposes, most notably to better inform evidence-based policymaking.

At the aggregate level, the data reveals that the typical household has approximately four-and-a-half members, an average of almost two members, 15 or younger, with a dependency ratio being slightly less than one child per adult. Two-thirds of all household heads are literate, and a full one-third have attended secondary school. Developed housing infrastructure is relatively good, with well over half of all households reporting access to an improved water source (76%), electricity or solar (60%) and using some form of improved sanitation (75%). The typical household is about a 30-minute walk from an all-weather road as well as a school and about one hour to markets and health facilities. According to the survey, 11 percent of all households have migrated sometime during their lives, at least at the intra-province level. Importantly, almost 60 percent of households experienced a shock over the last year and 30 percent experienced more than one shock. Most shocks were reported as being climate and weather related, and the typical coping strategy was to reduce expenditures (38%) but there were four other coping strategies that were reported by at least 10 percent of the respondents.

Generated from the survey, average land holdings amounted to 0.35 ha per household and almost 90 percent of the land was used for crop production. The overall land distribution is about one-third holding 0.1 ha or less of land, one-third holding 0.1 ha to 0.3 ha, and the remaining one-third holding 0.3 ha or more. At over 90 percent, most households reported using organic fertilizer and 55 percent used inorganic fertilizers. Irrigation was used by 9 percent of households surveyed. Over 70 percent of households accessed some form of extension, from a variety of sources. Approximately, 90 percent of farmers' plots use monocropping for planting with random intercropping being the next most planted at about 5 percent of all plots. Farmers plant many types of crops, but maize (57%) and bush beans (52%) were the most reported. In terms of commercialization, fruits and vegetables (e.g. avocado and tomato) were not commonly grown but are highly commercialized, as opposed to cassava and beans which are more widely produced but not as frequently sold. As would be expected, larger farms sell a greater share of production because average household percentages of crops sold (e.g., 23% of maize at the household level) is less than the percentage of total crop sold for the selected commodities (e.g., 45% of all maize produced is sold). Almost half of all households rely on agricultural farm wages and 11 percent have their own businesses. Finally, over 80 percent of all households in the survey reported having at least one bank account, and the bank account was most reported being held at a SACCO. Beyond averages, as many tables as possible were separated into four principal categories including province, gender and age of head of household, and size of land holdings. Highlights from these four categories are presented below.

As should likely be recognized, Kigali City varies from the rest of the provinces in terms of many of the variables presented. For example, households in Kigali City tend to be more literate as well as have a higher overall education attainment of the household head. As compared to reported overall averages, infrastructure access was higher in Kigali City with households four times more likely to have water piped into their dwelling and twice as likely to have electricity as a source for lighting.

Walking distances in Kigali City were somewhat shorter for all selected locations. Migration patterns were highest among Kigali City and Eastern province and respondents cited employment reasons as the most common reason. Asset ownership was highly skewed in favor of Kigali City agricultural households, with more than half the respondents being in the top quintile. In terms of wage employment, Kigali City was forty percentage points higher than average in terms of engaging in non-farm wage activities and three times more likely to own a business. Finally, respondents from Kigali City are ten percentage points more likely to have a bank account as compared with other provinces, although accounts are high in all provinces. Overall, farmers in Kigali City, albeit being found in rural and peri-urban locations, are somewhat of outliers likely because of their proximity to the city. For this reason, provincial differences might be more carefully considered with the other four provinces and a general acknowledgement of the relative unique characteristics existing with agricultural households living in Kigali City might be warranted.

Exploring the differences between male and female heads both confirms many differences but also indicates some similarities that exist between them. In terms of demographics, approximately 30 percent of households, in our survey, are headed by women. They have significantly less household members (3.4 versus 4.8) but a greater dependency ratio (95 versus 86). Female heads are less educated using a variety of education measures, have slightly less access to household infrastructure but have relatively similar walking access to a variety of basic services. In addition, female heads are equally likely to migrate but less likely to migrate for employment reasons, almost equally likely to experience shocks, and report relatively similar causes and responses to these shocks. Relative asset ownership is highly skewed against female household heads with 32 percent of women in the bottom quintile, a figure that is twice that of male headed households at 16 percent. Farm sizes are smaller than average, with female headed households owning about 70 percent of the overall average. Input use is generally lower for all reported inputs, irrigation access is almost half the average (6% versus 11%), and participation in agricultural programs is lower as well. Further, female heads of household equally participate in farm wage activities but are less likely to own their own businesses. Finally, female headed households are about ten percentage points lower than men in terms of owning at least one bank account. Overall, female headed households have fewer household members, are less educated, have smaller farms and are relatively poorer in terms of asset ownership.

In terms of the youth/mature comparison, some important insights emerge. Overall, approximately 21 percent of sampled households reporting being households headed by younger adults (16 to 34 years old). As would be expected, youth headed households are smaller than average with about one less member (3.7 versus 4.6) than mature households. Younger household heads are better educated and more likely to be literate as well. Interestingly, youth headed households reported experiencing more shocks and more multiple shocks than their older counterparts, but responses to shocks were similar to overall reported averages. Somewhat surprisingly, asset ownership was only slightly skewed lower in the quintile distribution (a matter of a few percentage points) for youth over mature headed households. Of significant importance is that youth headed households have the smallest average land holdings of any category at 0.21 ha, which is only 60 percent of the overall average. However, input use and irrigation use are similar between youth and mature households, but youth headed households are less likely to participate in agricultural programs. In conclusion, the current relative economic situation of youth headed households is mixed and deserving of further research.

Perhaps most revealing of household differences in this survey was the land size categories, especially when it is related to commercialization. The tables show that relative household land holding size determines significant reported differences across most sections of this analysis. For example, household size generally increases with landholding to a high of five members in households with

1 ha or more land. Education attainment also increases with landholdings and is highest in the largest landholding category. Larger land holdings are also more likely to have piped water, improved sanitation and access to solar or electricity (although solar is predominant in the highest land category). Asset ownership is highly positively correlated with land size, with only four percent of the largest land category being in the bottom asset quintile and almost 50 percent being in the top quintile. Agricultural input use is highest in the 1 ha or above land owning as well. Critically, Figure 11 demonstrates that larger land holders are significantly more likely to sell a greater percentage of their crop harvest than smaller land holdings. Following from this, Graph 4.2 depicts that larger landowners are twice as likely to generate income solely from harvest as compared to the overall average. Households with larger land holdings are also far less likely to engage in farm wage activities and more likely to own a business. Household members, with land holdings of 1 ha or larger, receive nearly twice the monthly median wage than all other land categories as well. However, migration and shocks and response to shocks are not very different across land holding categories. Overall, categorical land sizes, as identified in this document, appear to identify large differences between household responses and should be explored further.

The categorical variables used in most of the tables do highlight some important insights into agricultural household similarities and differences and suggest that additional work needs to be performed. The next section explores possible future analysis using this survey.

Future analysis

Based on the results developed in this document, further research will be done to form the basis for improved data-driven, evidence-based policy recommendations for the Government of Rwanda, and its development partners, vested in both PSTA4 and the upcoming PSTA5. As Rwanda returns to its rapid growth trajectory following the COVID-19 pandemic, it will need to consider evidence, derived from this, as well as other research, to enhance gains from the agricultural sector and food system more broadly. The overarching goal of this research is to contribute to the structural transformation of the entire economy, as set forth in Rwanda's First National Strategy for Transformation (NST 1) and beyond. Both new and changes to existing interventions require careful consideration of tradeoffs and synergies across a range of crops, commodities, farmer categories, and agro-ecologies.

The prioritization of public spending on agriculture becomes even more complex as Rwanda's structural transformation advances and new investments become critically important for the agricultural sector. The structural transformation process itself means that as agriculture becomes more integrated with the rest of the economy, public resource allocations need to address a wider range of issues across the entire food system, including inclusive value chain development, nonfarm rural enterprise growth, climate-resilient sustainable intensification of both crops and livestock, and nutrition-sensitive food production systems.

Findings from this study will help inform the prioritization of public policy through several channels.

First, this document provides new household-level evidence that should help policymakers and their advisors make more informed policy choices. This evidence is important in light of questions arising from the Government and its development partners about the rationale for continued or increased investment in a range of interventions designed to accelerate value chain development.

Second, this micro-level evidence can also be leveraged by the private sector to improve its own understanding of the commercial investment opportunities in the agriculture sector and the potential returns to different marketing arrangements, e.g., contract farming and partnerships with cooperatives. Although private sector interests in Rwanda are actively soliciting the government sector

to create new investment opportunities, there is a need for a more data-driven process that boosts investor confidence in sectors and activities where the potential to realize returns are high (and downside risks are low).

Third, future findings will provide critical inputs needed to improve the economywide models used to inform budget allocation decisions by MINAGRI and its counterparts at the Ministry of Finance and Economic Planning (see Aragie et al. 2022). Better data on coverage, costs, and other key parameters for Rwanda will enable continuous improvement of estimated impacts under alternative future scenarios. Design and exploration of alternative allocation scenarios will inform future planning efforts.

Building on the results presented here, future studies aim to (1) collect and analyze data that is required to develop more nuanced farmer typologies, (2) estimate the returns and relative drivers of commercial production systems across farmer typologies, and (3) improve the design and implementation of policies, investments, and programs for smallholder commercialization in Rwanda.

- Specific analytical questions that future studies will seek to better address include:
- What are salient characteristics of smallholder farmers in Rwanda, and what are the relevant characteristics of commercial smallholders in particular?
- What types of input, technologies, management practices, and marketing arrangements do smallholders use in their production systems?
- How do commercial farmers differ from other farmer categories, and what variables may contribute to their commercial viability?
- What are the costs and returns to the cultivation of specific commodities, and what variables might predict variation in costs/returns? Overall, how commercially viable are Rwandan farms?
- How do non-farm enterprise and employment activities contribute to smallholder livelihood strategies, including their participation in commercial farming?

The data and analysis that result from additional studies will allow the project to address the questions posed above and, ultimately, analyze the following “big-picture” issues. First, at what scale and with what resources might smallholder farmers be commercially viable? Second, where are the opportunities for, and challenges to, current efforts to commercialize smallholder agriculture? Third, where can current policies, investments, and programs under PSTA 4 and the upcoming PSTA5, be improved to accelerate smallholder commercialization?

Taken together, these efforts will enable the Government of Rwanda and its development partners to address many of the pressing questions and difficult decisions faced in prioritizing public policies, investments, and expenditures for a sustainable and inclusive agricultural transformation.

REFERENCES

- Ali, D.A., K. Deininger, and M. Goldstein. 2014. Environmental and gender impacts of land tenure regularization in Africa: Pilot Evidence from Rwanda. *Journal of Development Economics* 110: 262-275.
- Ali, D.A., and K. Deininger. 2015. Is there a farm size-productivity relationship in African agriculture? Evidence from Rwanda. *Land Economics* 91(2): 317-343.
- Aragie, E., Diao, X., Spielman, D.J., Thurlow, J., Mugabo, S., Rosenbach, G., and Benimana, G. 2022. Public Investment Prioritization for Rwanda's Inclusive Agricultural Transformation: Evidence from Rural In-vestment and Policy Analysis Modeling. IFPRI Rwanda Working Paper no. 3. Kigali/Washington, DC: IFPRI.
- Bizoza, A.R. 2021. Investigating the effectiveness of land use consolidation—a component of the crop intensification programme in Rwanda. *Journal of Rural Studies* 87: 213-225.
- Bizoza, A.R., and J. Opio-Omoding. 2021. Assessing the impacts of land tenure regularization: Evidence from Rwanda and Ethiopia. *Land Use Policy* 100: 104904.
- Chilonda, P & Otte, J .2006. Indicators to monitor trends in livestock production at national, regional and international levels. *Livestock Research for Rural Development* 18 (8).
- Del Prete, D., Ghins, L., Magrini, E. and Pauw, K. 2019. Land consolidation, specialization and household diets: evidence from Rwanda. *Food Policy*, 83, pp.139-149.
- FAO. 2003. Compendium of Agricultural – Environmental Indicators. Statistics Division, FAO, Rome.
- Gerard, A., Lopez, M.C., Kerr, J. and Bizoza, A.R. 2021. Relational contracts and value chain governance: exporter approaches to overcoming transaction costs in Rwanda's coffee sector. *Journal of Agribusiness in Developing and Emerging Economies* (available online).
- Ingabire, C., Mshenga, M.P., Langat, K., Bigler, C., Musoni, A., Butare, L. and Birachi, E. 2017. Towards commercial agriculture in Rwanda: Understanding the determinants of market participation among smallholder bean farmers. *African Journal of Food, Agriculture, Nutrition and Development* 17(4): 12492-12508.
- Jones, M., F. Kondylis, J. Loeser, and J. Magruder. 2020. *Factor Market Failures and the Adoption of Irrigation in Rwanda*. Working paper no. w26698. Cambridge, MA: National Bureau of Economic Research.
- Macchiavello, R. and Morjaria, A. 2021. Competition and relational contracts in the Rwanda coffee chain. *Quarterly Journal of Economics*, 136(2): 1089-1143.
- Muyombano, E., and M. Espling. 2020. Land use consolidation in Rwanda: The experiences of small-scale farmers in Musanze District, Northern Province. *Land Use Policy* 99: 105060.
- Nilsson, P. 2019. The role of land use consolidation in improving crop yields among farm households in Rwanda. *Journal of Development Studies* 55(8): 1726-1740.
- National Institute of Statistics of Rwanda (NISR). Various years. Rwanda – Integrated Household Living Conditions Surveys: Rounds 2010/11 (EICV3), 2013/14 (EICV4), and 2016/17 (ECIV5) [Reports and datasets]. Kigali: NISR.
- National Institute of Statistics of Rwanda (NISR). 2017. *Agricultural Household Survey (AHS) 2017*. Kigali: NISR.
- Nilsson, P. 2019. The role of land use consolidation in improving crop yields among farm households in Rwanda. *Journal of Development Studies* 55(8): 1726-1740.
- Nsabimana, A., F. Niyitanga, D.D. Weatherspoon, and A. Naseem. 2021. Land policy and food prices: Evidence from a land consolidation program in Rwanda. *Journal of Agricultural & Food Industrial Organization* 19(1): 63-73.
- Weatherspoon, D.D., S.R. Miller, F. Niyitanga, L.J. Weatherspoon, and J.F. Oehmke. 2021. Rwanda's commercialization of smallholder agriculture: Implications for rural food production and household food choices. *Journal of Agricultural & Food Industrial Organization* 19(1): 51-62.
- Weatherspoon, D.D., S. Miller, J.C. Ngabitsinze, L.J. Weatherspoon, and J.F. Oehmke. 2019. Stunting, food security, markets and food policy in Rwanda. *BMC Public Health* 19(1): 1-13.

APPENDIX

Appendix to Section 2

Additional tables related to Section Two regarding household infrastructure and demographics.

Table A.1 – Exterior Wall Construction Material (row %'s)

		Mud bricks & mud bricks with cement	Tree trunks with mud or cement	Oven-fired bricks with mud or cement	Wooden blocks	Stones with mud or cement	Cement blocks
All households		65.5	30.6	2.4	1.1	0.3	0.2
Province	Kigali City	59.9	34.4	0.0	0.0	0.0	5.7
	Southern	55.2	41.1	3.6	0.0	0.2	0.0
	Western	74.5	18.6	2.0	4.8	0.0	0.1
	Northern	70.8	25.5	2.5	0.0	1.2	0.0
	Eastern	65.6	32.4	1.8	0.0	0.1	0.0
Sex of HHH	Male	66.0	29.6	2.5	1.4	0.4	0.0
	Female	64.1	32.8	2.2	0.2	0.2	0.5
Age of HHH	Youth	69.7	27.1	1.7	1.0	0.4	0.2
	Mature	64.4	31.5	2.6	1.1	0.3	0.2
	Less than 0.1 ha	64.9	32.2	1.6	0.7	0.5	0.1
Farm size category	0.1-0.3 ha	65.4	31.5	1.4	1.2	0.3	0.2
	0.3-0.5 ha	64.9	30.3	3.4	1.1	0.3	0.0
	0.5-1 ha	63.7	31.2	1.9	2.5	0.0	0.6
	1 ha and above	72.0	19.1	8.9	0.0	0.0	0.0

Authors' calculations

Table A.2. – Type of Roofing Material (row %'s)

		Metal sheets or corrugated iron	Local clay tiles
All Households (%'s)		67	33
Province	Kigali City	93	7
	Southern	35	65
	Western	53	47
	Northern	78	22
	Eastern	99	1
Gender of HHH	Male	68	32
	Female	65	35
Maturity of HHH	Young	71	29
	Mature	66	34
	Less than 0.1 ha	61	39
Farm size category	0.1-0.3 ha	66	34
	0.3-0.5 ha	75	25
	0.5-1 ha	73	27
	1 ha and above	79	21

Authors' calculations

Table A.3 – Type of Floor Materials (row %'s)

	Beaten Earth	Hardened Dung	Clay Tiles	Cement	Bricks/Rocks
All Households (%'s)	74	1	0	24	1
Province	Kigali City	37	0	59	0
	Southern	70	1	27	2
	Western	77	0	19	4
	Northern	85	0	14	1
	Eastern	71	1	27	0
Sex of HHH	Male	71	1	26	2
	Female	81	1	17	1
Age of HHH	Young	79	1	18	2
	Mature	72	1	25	1
Farm size category	Less than 0.1 ha	84	1	14	1
	0.1-0.3 ha	76	1	20	2
	0.3-0.5 ha	67	1	30	1
	0.5-1 ha	61	0	36	2
	1 ha and above	47	1	49	1

Authors' calculations

Table A.4 – Transportation Methods (row %'s)

All households	Walk	Bicycle	Motorbike	Boat	Bus	Car	Not applicable
Source of drinking water	98.5	0.9	0.0	0.0	0.0	0.0	0.6
Food market	95.6	2.7	0.6	0.3	0.5	0.2	0.1
Farm market	94.2	3.1	1.1	0.3	0.9	0.2	0.1
All-weather roads	97.4	0.5	1.3	0.0	0.6	0.1	0.1
School	99.0	0.5	0.0	0.0	0.0	0.1	0.5
Health facility	95.5	1.8	2.1	0.0	0.4	0.2	0.0
Savings cooperative	94.3	2.3	2.1	0.1	0.5	0.1	0.7
Local gov't Office	98.4	0.8	0.4	0.0	0.3	0.1	0.0
Public transport station	92.3	2.2	5.0	0.1	0.0	0.0	0.5
Agriculture cooperative	62.3	1.0	0.5	0.0	0.2	0.1	36.0
Agro-input dealer	94.4	1.6	0.2	0.1	0.1	0.0	3.7
Farmer field schools (FFS)	38.9	0.1	0.0	0.0	0.0	0.0	61.0
MoMo* & Irembo Agents	97.7	0.7	0.2	0.0	0.0	0.1	1.4

Authors' calculations, *Mobile Money and other mobile phone transaction agents

Table A.5 – Average time spent walking to the selected basic services (minutes)

	Public transport station	Agriculture cooperative	Agro-input dealer	Farmer field schools (FFS)	MoMo* & Irembo Agents
All Households (mins.)	71	49	43	25	24
Province	Kigali City	44	51	30	14
	Southern	75	46	40	29
	Western	94	51	46	26
	Northern	68	53	44	22
	Eastern	55	50	43	30
Sex of HHH	Male	70	49	41	23
	Female	76	50	46	21
Age of HHH	Mature	71	48	42	23
	Youth	73	53	45	27
Farm size Categories	Less than 0.1 ha	77	52	44	26
	0.1-0.3 ha	73	50	44	26
	0.3-0.5 ha	62	40	36	21
	0.5-1 ha	63	47	42	23
	1 ha and above	65	54	46	31

Authors' calculations

Appendix to Section 3

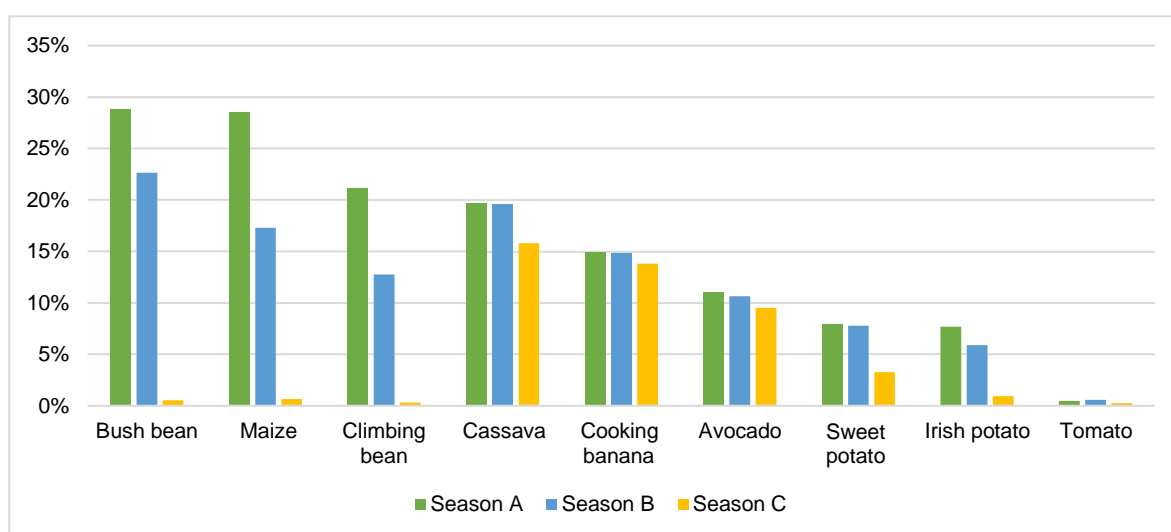
TLU conversion table and additional crop and livestock tables.

Table A.6 – TLU conversion factors for Sub Saharan Africa

Livestock	TLU (conversion factors for SSA)
Cattle	0.5
Goat/Sheep	0.1
Pig	0.2
Rabbit	0.02
Chicken	0.01
Poultry	0.03

(FAO, 2003; Chilonda & Otte, 2006; Njuki et al., 2011).

Figure A.1 – Selected crops grown by land size share and by season (%'s)



Authors' calculations

Table A.7 – Household use of livestock production (eggs & milk)

	Average number of eggs produced (of egg producers) per month				Liters of milk produced (of milk producers) per month			
	Total	Consumed	Sold	Other purpose	Total	Consumed	Sold	Other purpose
All households (number)	58	20	27	11	125	59	58	8
Kigali City	107	28	72	7	206	89	68	46
Southern	74	18	34	22	85	47	30	8
Province	30	11	15	3	115	54	50	11
Northern	35	18	14	3	181	67	110	4
Eastern	67	32	26	9	127	73	49	5
Sex of HHH	65	22	31	12	133	63	63	7
Female	34	15	13	6	94	44	38	12
Age of HHH	61	21	28	13	127	60	58	9
Youth	47	19	23	4	107	49	54	4
Less than 0.1 ha	24	9	10	5	93	49	40	4
0.1-0.3 ha	47	26	16	6	107	52	48	7
Farm size Categories	39	22	12	5	128	64	58	6
0.3-0.5 ha	39	22	12	5	128	64	58	6
0.5-1 ha	85	22	59	4	153	52	88	13
1 ha and above	129	23	61	45	171	95	65	11

Authors' calculations

Appendix to Section 4

Household sources of income, types of contracts, earnings, credit access and amount of credit received.

Table A.8 – Household by source of Income (%'s)

	Harvest sold and wage farm/non-farm	Harvest sold only	Farm and non-farm wage only	Harvest sold and business	Harvest sold, Wage farm/non-farm and business	Own business only	Wage farm/non-farm and business	Other sources	Total	
All households	986,886 (42%)	624,678 (27%)	359,054 (15%)	109,476 (5%)	94,763 (4%)	26,447 (1%)	21,478 (1%)	125,674 (5%)	2,348,456	
Province	Kigali City	21,945 (39%)	3,251 (6%)	10,537 (19%)	5,967 (11%)	5,993 (11%)	2,704 (5%)	3,234 (6%)	56,436	
	Southern	268,566 (41%)	180,541 (28%)	87,476 (13%)	32,782 (5%)	36,318 (6%)	6,385 (1%)	6,604 (1%)	32,782 (5%)	651,454
	Western	203,327 (39%)	152,743 (29%)	83,360 (16%)	17,837 (3%)	13,276 (3%)	3,246 (1%)	6,581 (1%)	42,477 (8%)	522,847
	Northern	201,326 (48%)	76,740 (18%)	79,421 (19%)	13,287 (3%)	24,407 (6%)	1,473 (0%)	4,132 (1%)	16,883 (4%)	417,670
	Eastern	291,723 (42%)	211,404 (30%)	98,259 (14%)	39,603 (6%)	14,768 (2%)	12,639 (2%)	1,356 (0%)	30,297 (4%)	700,049
	Sex of HHH	Male	719,733 (44%)	423,778 (26%)	239,957 (15%)	88,741 (5%)	78,549 (5%)	18,319 (1%)	19,507 (1%)	54,889 (3%)
	Female	267,153 (38%)	200,900 (28%)	119,097 (17%)	20,735 (3%)	16,214 (2%)	8,128 (1%)	1,972 (0%)	70,785 (10%)	704,985
Age of HHH	Young	254,155 (52%)	55,848 (11%)	99,621 (20%)	26,527 (5%)	24,301 (5%)	8,923 (2%)	5,309 (1%)	12,082 (2%)	486,766
	Mature	732,732 (39%)	568,830 (31%)	259,433 (14%)	82,949 (4%)	70,462 (4%)	17,524 (1%)	16,170 (1%)	113,591 (6%)	1,861,690
Farm size Categories	Less than 0.1 ha	340,205 (41%)	110,495 (13%)	234,698 (29%)	19,321 (2%)	23,285 (3%)	10,229 (1%)	14,234 (2%)	70,081 (9%)	822,547
	0.1-0.3 ha	380,641 (50%)	194,717 (26%)	84,157 (11%)	27,037 (4%)	29,500 (4%)	7,511 (1%)	4,804 (1%)	31,110 (4%)	759,477
	0.3-0.5 ha	122,349 (41%)	98,764 (33%)	25,021 (8%)	16,586 (6%)	22,762 (8%)	2,547 (1%)	2,441 (1%)	10,941 (4%)	301,412
	0.5-1 ha	98,181 (36%)	112,803 (42%)	12,012 (4%)	22,793 (8%)	10,524 (4%)	3,667 (1%)	0 (0%)	10,341 (4%)	270,321
	1 ha and above	45,511 (24%)	107,899 (57%)	1,553 (1%)	23,738 (12%)	8,692 (5%)	2,493 (1%)	0 (0%)	513 (0%)	190,398

Authors' calculations

Table A.9 – Distribution of workers by nature of contract (row %'s)

	Casual worker	Permanent worker	Fixed-term contract	Daily worker	Seasonal worker	
All households	81	7	5	4	3	
Province	Kigali City	59	4	18	18	1
	Southern	82	9	5	3	2
	Western	81	4	6	1	7
	Northern	82	5	2	7	4
	Eastern	81	8	5	4	2
Sex of HHH	Male	78	8	6	4	4
	Female	89	3	4	3	2
Age of HHH	Youth	81	6	6	5	3
	Mature	81	7	5	4	3
Farm size Categories	Less than 0.1 ha	87	3	4	3	3
	0.1-0.3 ha	82	6	4	5	3
	0.3-0.5 ha	75	13	4	5	3
	0.5-1 ha	74	10	10	3	3
	1 ha and above	46	28	18	6	3

Authors' calculations

Table A.10 – Median and average monthly wage income (in 2022 Rwf)

		Median Income	Average Income
All households		15,000	22,026
Province	Kigali City	30,000	46,995
	Southern	14,000	22,841
	Western	11,200	17,799
	Northern	14,000	19,921
	Eastern	16,000	23,921
Sex of HHH	Male	15,000	23,363
	Female	12,800	17,966
Age of HHH	Youth	15,000	22,880
	Mature	14,400	21,752
Farm size Categories	Less than 0.1 ha	15,000	19,641
	0.1-0.3 ha	15,000	21,606
	0.3-0.5 ha	12,000	21,491
	0.5-1 ha	14,000	23,680
	1 ha and above	28,750	50,530

Authors' calculations

Table A.11 – Households receiving credit/loan (%'s)

		(%) of Household with credit	Total projected number of households
All households		39	2,348,456
Province	Kigali City	59	56,436
	Southern	41	651,454
	Western	36	522,847
	Northern	60	417,670
	Eastern	25	700,049
Sex of HHH	Male	41	1,643,471
	Female	33	704,985
Age of HHH	Youth	45	486,766
	Mature	37	1,861,690
Farm size Categories	Less than 0.1 ha	37	822,547
	0.1-0.3 ha	40	759,477
	0.3-0.5 ha	41	301,412
	0.5-1 ha	38	270,321
	1 ha and above	39	190,398

Authors' calculations

Table A.12 – Households with credit/loan by loan source (row %'s)

	Tontine or Community savings (Ikimina)	SACCOs	Borrowed from Relative	Commercial bank	Employer loan	Others	Projected number of HHs which have borrowed in last 12 months
All households	77	9	8	2	1	4	913,965
Province							
Kigali City	74	1	16	2	2	4	33,494
Southern	77	10	5	2	0	5	265,872
Western	81	8	7	1	1	2	189,144
Northern	79	7	9	2	1	2	250,688
Eastern	70	12	11	2	0	5	174,768
Sex of HH Head							
Male	75	10	8	2	1	4	678,538
Female	82	6	9	1	0	2	235,427
Age of HH Head							
Youth	76	7	11	2	0	5	218,275
Mature	77	9	7	2	1	3	695,690
Farm size Categories							
Less than 0.1 ha	78	6	9	1	1	4	307,216
0.1-0.3 ha	81	8	7	1	1	2	303,849
0.3-0.5 ha	73	13	8	2	0	4	124,215
0.5-1 ha	71	11	9	4	0	5	103,636
1 ha and above	70	13	9	4	0	4	73,435

Authors' calculations

ABOUT THE AUTHORS

James Warner is the program leader of the Rwanda Strategy Support Program (Rwanda SSP) and a senior research fellow in the Development Strategy and Governance (DSG) Division of the International Food Policy Research Institute (IFPRI), based in Kigali, Rwanda. **Gracie Rosenbach** was, at the time this study was conducted, the Country Program Manager of Rwanda SSP, based in Kigali. **Gilberthe Benimana** is a Research Analyst with the Rwanda SSP in the DSG Division. **Emerence Mukangabo** is a Senior Research Analyst with the Rwanda SSP. **Serge Mugabo** is a Senior Research with the Rwanda SSP. **Josue Niyonsingiza** is a Senior Research Analyst with the Rwanda SSP. **Chantal Ingabire** is the Director General of Planning at the Ministry of Agriculture and Animal Resources (MINAGRI). **Bertrand Dushimayezu** is an Agricultural Statistician at MINAGRI. **Octave Nshimiyimana** is the Director General of Value Chain Management and Trade at MINAGRI. All are based in Kigali. **David J. Spielman** is the Director of the Innovation Policy and Scaling Unit at IFPRI, based in Washington, DC, and was formerly the head of Rwanda SSP and a senior research fellow in DSG Division of IFPRI, and Head of the Rwanda SSP, based in Kigali, Rwanda.

ACKNOWLEDGMENTS

This paper was prepared under the Rwanda Strategy Support Program (Rwanda SSP), a joint initiative of the Ministry of Agriculture and Animal Resources (MINAGRI) and IFPRI. The study was made possible with the generous funding of the Embassy of Netherlands, the European Union, the United States Agency for International Development, and the CGIAR Seed Equal Research Initiative, which is in turn supported by contributors to the CGIAR Fund (<https://www.cgiar.org/funders/>). We would also like to thank the High Lands Centre of Leadership for Development Limited (HLC-L4D) for their technical support.

Any opinions expressed here belong to the author(s) alone and do not necessarily reflect those of the Government of Rwanda, IFPRI, CGIAR, or the funders listed above.

INTERNATIONAL FOOD POLICY RESEARCH
INSTITUTE

1201 Eye St, NW | Washington, DC 20005 USA
T. +1-202-862-5600 | F. +1-202-862-5606
ifpri@cgiar.org
www.ifpri.org | www.ifpri.info

IFPRI-RWANDA

KG 563 Street #7, Kacyiru
P.O. Box 1269 | Kigali, Rwanda
IFPRI-Rwanda@cgiar.org
www.rwanda.ifpri.info



Kingdom of the Netherlands



The Rwanda Strategy Support Program (Rwanda SSP) is managed by the International Food Policy Research Institute (IFPRI). Funding support for Rwanda SSP is provided by the European Union (EU); the United States Agency for International Development (USAID); and the CGIAR Research Program on Policies, Institutions, and Markets. This publication has been prepared as an output of Rwanda SSP. It has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, EU, USAID, or CGIAR.

© 2023, Copyright remains with the author(s). This publication is licensed for use under a Creative Commons Attribution 4.0 International License (CC BY 4.0). To view this license, visit <https://creativecommons.org/licenses/by/4.0>.