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Rural income diversification in Rwanda

Opportunities and challenges

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ABSTRACT

The Government of Rwanda continues to work to accelerate structural transformation to expand and diversify the country's economy. High rural population density and small agricultural landholdings are driving workers from agricultural households to seek employment outside of farming. Using representative data on agricultural production and employment for rural households in Rwanda from 2022, this research evaluates the opportunities rural households have to diversify their labor portfolios. We find that, rather than nonfarm household enterprises developing to meet greater rural service and goods demand, agriculture wage labor is the dominant source of off-own-farm employment. However, such informal agricultural wage labor is seen as low-productivity work and is among the lowest paid. Among nonfarm employment options, nonfarm businesses generate less income than nonagricultural wage labor, likely reflecting high barriers to entrepreneurship and low demand for off-farm services in rural areas.

In contrast to employment profiles from other low-income countries, we find that the probability of a worker from an agricultural household in Rwanda engaging in rural, off-farm wage labor decreases as household welfare increases. Agricultural households that have workers seeking to hire out their labor tend to have the smallest landholdings, while households that hire in labor have the largest landholdings. Additionally, households with a higher share of members who completed primary education are less likely to hire out their labor, especially for agriculture wage work. These results suggest that programs that offer support services to agricultural households, such as financial services and affordable and relevant education, may be important in incentivizing these households to engage in entrepreneurship and form their own businesses or to seek wage employment in more remunerative sectors than agriculture.

1. INTRODUCTION

Rwanda's high population density and resulting small agricultural landholdings create a daunting challenge to the economic advancement of rural smallholder agricultural households. While an extensive agricultural transformation literature promotes the development of rural nonfarm enterprises (NFEs) as a principal conduit by which such households can progress from predominantly subsistence agriculture to more specialized rural economic activities, diversification in rural livelihoods in Rwanda has veered in a different direction. Rather than growth in rural nonfarm businesses stimulating demand for further agricultural products and increased trade in goods and services in the rural economy, Rwanda's rural smallholders,[1] particularly households in the lower income quintiles, have shifted towards agricultural wage labor to obtain additional income to meet household needs since they are unable to meet those needs through their agricultural production alone. This employment pattern is common among smallholders in Eastern and Southern African countries, where shrinking agricultural landholdings become economically non-viable without diversifying household labor into off-farm activities (Dixon et al. 2001). Given smaller agricultural household landholdings in Rwanda (Kim et al. 2022), wage work and rural nonfarm businesses will grow in importance as sources of rural employment as the country transforms its agrifood systems.

Using data from a detailed, nationally representative rural household survey for Rwanda implemented in 2022, we examine the income-generating activities of agricultural households. We find that diversification away from own-farm subsistence agricultural production is now a necessity for most households in rural Rwanda and is prevalent at all welfare levels. Nonfarm (or off-farm) enterprise participation is low compared to other countries with similar development profiles to Rwanda, e.g., Ethiopia (Holden et al. 2004), Tanzania (Barasa et al. 2023), and Uganda (Amare and Shiferaw 2017), and poorer households are found to have a lower probability of engaging in an NFE. Agricultural wage labor is the dominant source of employment diversification to supplement on-farm agricultural production—workers in poorer households in rural Rwanda commonly seek wage labor opportunities so that the household can better meet its food security needs. However, rural agricultural wage labor is seen as low productivity work—the probability of a household engaging in rural wage labor decreases as household welfare increases. Thus, while wage labor on neighboring farms *could* represent an opportunity to strengthen rural-urban linkages and create a burgeoning rural goods and services sector, such employment currently is utilized as a stopgap measure for food-insecure households that are pushed into seeking any income-earning opportunities regardless of job security or wage rate.

Rwanda continues to make important investments to reduce poverty and create greater employment opportunities for rural smallholder farmers. However, our analysis suggests that a concerted effort is needed to provide secure employment for the poorest to ensure their food security. Government initiatives, such as the Vision 2020 Umurenge Program that provides to workers from eligible households wage employment on community infrastructure projects, have supplemented the incomes of some of the poorest rural households. However, these projects, being short to medium term in nature, have not provided the continuing

[1] In this paper, consistent with the definition of a 'smallholder' from the Government of Rwanda, a 'smallholder farmer' is defined as a farmer with any agricultural land less than ten hectares.

support required for sustained economic growth. Only with such long-term growth will demand for locally-produced goods and services, and labor, in rural communities accelerate.

The remainder of this paper is organized as follows: section 2 provides a theoretical background on why rural labor diversification is important for rural economic development and discusses the recent literature on rural labor patterns and opportunities in Rwanda. Section 3 describes the data and methods employed here to evaluate household employment in rural Rwanda. Section 4 describes the rural employment patterns that emerge from the household survey analysis. Section 5 describes the results from a multinomial logit analysis of household income diversification and discusses implications for rural employment growth. Section 6 concludes with a description of current policies on rural off-farm employment in Rwanda and offers recommendations for promoting greater income diversification among smallholder agricultural households.

2. RECENT LITERATURE ON INCOME DIVERSIFICATION IN RWANDA

A well-documented literature has demonstrated the importance of rural labor diversification to agricultural and rural economic development, moving from predominantly subsistence agriculture to higher-return, nonfarm activities, at the same time as rural-urban linkages are strengthened to promote greater demand for rural products and services (Diao et al. 2018; McMillan et al. 2017; Babatunde and Matin 2010; Woldenhanna & Oskam 2001). Rwandan smallholder farming households continue to pursue multiple livelihoods to meet their needs. These include both on- and off-farm labor. However, previous studies noted a distinction between poorer households, whose workers primarily depend on casual, agricultural wage labor, and less poor households, whose workers are able to develop NFEs (Bigler et al. 2018; Ansoms and McKay 2010; Rizzo and Petit 2015). Shephard et al. (2020) evaluated Rwandan household welfare profiles between 2010 and 2017. They found that rural households that were able to sustain incomes above the poverty line were more frequently able to do so with accumulated savings and diversification into *nonfarm* occupations and self-employment. Bird et al. (2022) found that household investment in asset accumulation and NFE participation were associated with greater household resilience. However, the researchers also reported that not enough households were able to exit low-paying agricultural wage labor for higher value enterprise activities. While in the aggregate, the data would suggest that rural households in Rwanda have a diversified labor structure, an important share of rural households have limited access to land, few livestock, minimal household assets, and low human capital. These constraints result in inhibited NFE development and reliance on unskilled casual labor opportunities for survival (Erlebach 2006; Howe and McKay 2007).

Recognizing that limited opportunities to accumulate assets and build savings exist in the land-scarce rural environment of Rwanda, another potential way to spur greater employment diversification could be through access to credit. The ability to invest in an NFE requires surplus income and liquidity. Ali et al. (2014) found that rural households in Rwanda that reported being credit-constrained had a lower likelihood of participating in off-farm self-employment activities and statistically were more likely to be involved in low-return farm wage labor. Similar results have been reported for northern Ethiopia (Woldenhanna and Oskam 2001) and developing countries more broadly (Reardon et al. 2000).

While credit can provide the initial investment required to pursue higher-value entrepreneurship opportunities, poor and non-poor households in Rwanda seek credit for different purposes. Bird (2022) reports that an important share of rural households seek credit to meet food security needs when confronted with a shock. This suggests that credit, particularly among the most vulnerable, may be yet another tool for securing a minimum livelihood and used instead of the household investing in livelihood diversification. As will be discussed, our analysis shows that an important share of poorer rural households in Rwanda have access to credit. However, the median loan amount they obtain is low and is predominantly used to meet food security or medical needs.

Rural women in Rwanda are more likely to work as casual agricultural wage laborers than rural men (McArthur et al. 2014). However, Bird et al. (2022) found that men from poor households have a greater likelihood of working in casual agricultural work compared to men from non-poor households. However, men are more likely than women to find higher-earning casual work opportunities in mining, construction, brick making, and other sectors outside of agriculture. Ndagijimana et al. (2018) similarly found that Rwandan women are more likely than men to work in agricultural wage labor. Previous studies have suggested that women could be better integrated into higher-value agricultural labor by promoting alternative institutional arrangements such as cooperatives or women's business organizations that will support women in overcoming the barriers to participation in premium value chains (Bhata and Bauer 2012). However, very little analysis of the economic impact of participation in such associations on women is found in the literature.

Finally, educational attainment has a mixed influence on labor diversification. Bird (2022) reported that rural households having members with secondary education was strongly associated with their being able to sustain their welfare level above the poverty line. In contrast, attaining only primary education does not have these effects. While basic education in Rwanda is free, a variety of studies have demonstrated how hidden costs, such as suggested contributions for school supplies and additional expenditures for school uniforms, have led households to draw down their assets, decrease consumption, or forego productive investments that could lead to greater income earning opportunities, all to be able to send younger household members to school (Shepherd et al. 2019; Bebbington 1999; Bird 2019). Outside of formal education, McIntosh et al. (2022) evaluated a cash-transfer and workforce training program in Rwanda that provided start-up capital and training for successful micro-enterprise development and nonagricultural self-employment. While the initial impacts of the cash transfer program showed significant growth in NFE development, the workforce training program intervention only slightly promoted labor diversification out of agriculture. In addition, business longevity was poor, with roughly one-third of businesses created through the cash transfer intervention at the start of the program no longer being in operation after three years.

We build upon these previous studies to quantify what actions or drivers may increase the probability that workers from rural households will seek off-farm employment opportunities. We then evaluate the specific type of labor that households engage in—agricultural wage work, nonagricultural wage work, NFEs, and a combination of the three—and which household characteristics are associated with engaging in these different types of rural labor.

3. SURVEY DATA AND METHODOLOGY

We use the Rwanda household survey on smallholder commercialization conducted in October and November 2022 by the International Food Policy Research Institute to assess employment profiles in rural Rwanda. The survey was designed to be representative of rural agricultural households at the national and provincial levels. A stratified two-stage cluster sampling frame was employed, whereby the primary sampling units were selected from rural Enumeration Areas (EAs) delineated by Rwanda's National Institute of Statistics. EAs were selected using systematic sampling based on probability proportional to size, with size being the population of agricultural households in each EA based on the 2012 Population and Housing Census and adjusted for subsampling effects.[2] Within the selected EAs, ten agricultural households (secondary sampling units) were randomly selected to participate in the survey. (For more information on the design of the survey, see Warner et al. (2023).

Nationally, 2,020 households were sampled from 202 enumeration areas (Table 3.1). Given the rural focus of the survey, the criterion for including a smallholder household in the survey sample was whether it was engaged in agriculture, which was defined as having been involved in any agriculture, aquaculture, livestock, or forestry activities during the 2022 agricultural year. In addition, to maintain a focus on the livelihood profiles of smallholder agricultural households, only households that owned less than 10 hectares of land were included in the survey sample.

Table 3.1 Sample of enumeration areas and households, by province

Province	Sampled agricultural households	Sampled Enumeration Areas
Kigali City	80	8
Southern	550	55
Western	470	47
Northern	380	38
Eastern	540	54
Total	**2,020**	**202**

Source: Authors' calculations

In our analysis, we employ two multinomial logit (MNL) analyses. The first is used to identify which factors contribute to the probability of an agricultural household hiring in, hiring out, or both hiring in and out labor, compared to agricultural households that do not hire in or hire out any labor. The second MNL analysis is used to identify which factors contribute to the probability of an agricultural household seeking employment in various types of wage labor or operating an NFE.

For the first MNL, we split the sample of agricultural households into four categories:

- those that hired at least one laborer to work for their household (hired-in);
- those with at least one member hired to work outside of the household (hired-out);
- those with both at least one hired-in laborer and one hired-out household member; and

[2] At the time the pre-analysis plan was prepared, data collection for the 2022 Population and Housing Census had just been completed. Hence, data to ensure a more up-to-date sampling frame were not yet available.

- those that do not engage in wage labor—that is, neither hiring in laborers nor hiring out household members.

In the second MNL, we split the sample of agricultural households into six categories:

- those that only generate income from agricultural wage labor;
- those that only generate income from nonagricultural wage labor;
- those that generate income from agricultural and nonagricultural wage labor;
- those that only generate income from owning an NFE;
- those that generate income from an NFE and wage labor; and
- those that do not engage in off-farm labor (neither wage nor NFE).[3]

Our hypotheses, motivated by previous research, seek to test whether sufficient capital (we use agricultural land size, livestock holdings, and a constructed asset index based on a principal component analysis as indicators of household capital), adequate labor resources, access to credit, or level of educational attainment significantly affects how an agricultural household participates in the labor market. Additional control variables are included in our MNL models to address unique characteristics of the socioeconomic landscape of rural Rwanda, including membership in an agricultural cooperative, whether the household experienced specific weather or food price shocks, and the travel time for a household to obtain various services. In addition, we include binary variables for the province in which the household resides.

The response probabilities for the multinomial logits, respectively, are defined as:

$$log\left(\frac{\pi_{wi}}{\pi_{ni}}\right) = \alpha_{wr} + \beta_w X_i, \quad (1)$$

where, for the first MNL, π_{wi} is the odds of different household labor profiles by labor hire type w, π_{ni} is the odds of not hiring in or hiring out household labor, and parameter α_{wr} is the baseline hazard of work in region r for the specific household labor hire type w. β_w is a vector of parameter estimates. X is a vector that denotes the factors that influence labor choice.

For the second MNL, the odds (π_{wi}) of different household labor profiles are defined by labor type, whereby at least one or more individuals within the household work in agricultural wage labor, nonagricultural wage labor, both agriculture and nonagricultural wage labor, NFE, or a combination of wage labor and NFE engagement.

4. EMPLOYMENT OPPORTUNITIES OF RURAL SMALLHOLDER FARMERS IN RWANDA

The 2022 household survey on smallholder commercialization enables an assessment to be made of the importance of agricultural production activities in the labor portfolios of rural households in Rwanda. Almost all households in the sample engage in own-farm production of crops (99 percent) or livestock (74 percent), predominantly cattle and goats (Table 4.1, Panel A). Most agricultural households also depend on other income sources. Approximately 62 percent of rural smallholder households engage in wage labor, of which 60 percent work in agriculture wage labor activities. Nonfarm business ownership represents a smaller share

[3] Descriptive statistics for each labor category are presented in Annex 2 and 3.

of household income earning in Rwanda, with only 11 percent of households reporting that they owned a business. Conversely, more than half of the household sample depends on remittances to supplement their income.

Table 4.1: Share of households by labor activity and median annual income

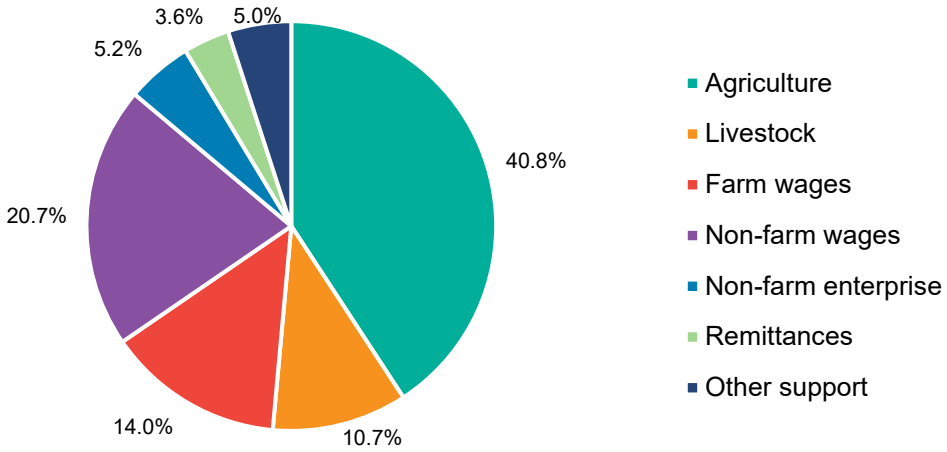
	All	Kigali city	South	West	North	East
Panel A: Share of households engaged in activity, %						
Crop production	99.3	93.6	99.8	99.8	99.3	98.9
Livestock	73.5	72.5	73.6	78.9	82.6	63.9
Wage labor, of which:	62.3	73.1	61.2	58.6	74.1	58.0
a. Only agricultural	60.2	*13.6*	*59.1*	*65.3*	*62.1*	*63.9*
b. Only nonagricultural	25.6	*59.3*	*28.2*	*24.5*	*17.5*	*24.8*
c. Both	14.2	*27.1*	*12.8*	*10.2*	*20.4*	*11.3*
Nonfarm businesses	10.7	31.0	12.6	7.8	10.4	9.8
Remittances	51.5	66.2	52.6	52.7	59.0	44.0
Other activities or sources	36.6	79.5	34.7	43.3	54.8	19.2
Panel B: Median annual household income, '000s Rwandan Francs						
Crop production	111	97	112	99	106	120
Livestock	80	112	68	83	81	72
Wage labor, of which:						
a. Only agricultural	116	*68*	*100*	*102*	*101*	*135*
b. Only nonagricultural	280	*597*	*300*	*216*	*240*	*350*
c. Both	178	*489*	*174*	*144*	*154*	*207*
Nonfarm businesses	100	144	100	50	120	100
Remittances	15	31	11	20	15	15
Other activities or sources	20	9	41	18	17	30

Source: Authors' calculations.
Note: Crop production and livestock refer to production on plots operated by the household (owned or rented-in). Livestock includes aquaculture. Value of crop production and value of livestock production includes own consumption of produced goods, valued at their market equivalent, to account for agricultural production for subsistence. 'Other activities or sources' refer to income received from the Vision 2020 Umurenge Program or income support from other government or NGO programs.

The survey asked households to report the income they earned from each labor activity type. While the most common off-farm employment activity is agricultural wage labor, it is also one of the lowest-paid activities with median annual income earnings of RWF 116,000 (USD 111) (Table 4.1, Panel B). Nonagricultural wage labor is the most lucrative income-generating activity, with a median annual income of RWF 280,000 (USD 267). Nonfarm businesses are less common and generate less income than nonagricultural wage labor, likely due to high barriers to entry and low demand for off-farm services in rural areas.

Rural households generate approximately 41 percent of their total household earnings from agricultural production (Figure 4.1). This encompasses the estimated values of sales, own-consumption (at market prices), use of crops for seed and livestock feed, and other uses of production. Another 11 percent of rural household income is derived from livestock production, which is comprised of the estimated values of sales and own-consumption (at market prices). Agricultural wage labor is the lowest off-farm paid activity; however, it contributes 14 percent to overall rural household income because it is one of the most common income diversification strategies. Given the higher income earning potential of nonagricultural wage activities, such earnings, on average, contribute 21 percent of rural household incomes, despite fewer households engaging in these activities.

Figure 4.1 Distribution of income sources in rural Rwanda

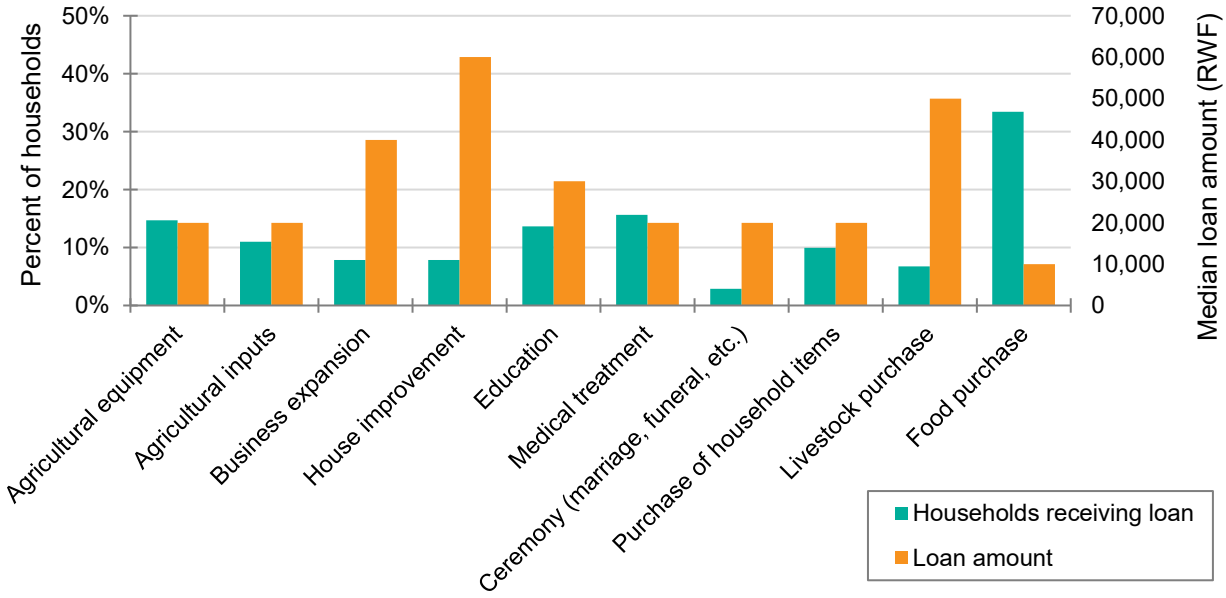


Source: Authors' calculations.

Only 11 percent of smallholder households are engaged in nonfarm businesses, which provide about 5 percent of rural income in Rwanda. More than three-quarters of households that reported owning an NFE described their business activity as focusing on wholesale or retail trade of agricultural products. This suggests that there is quite limited demand for non-agricultural products and services that NFEs might supply.

Credit is not included as an income source in Table 4.1, but the use of credit is common among rural households. Nearly half of rural households reported receiving a loan from any source other than the Vision 2020 Umurenge Program during the 2022 agricultural year. The majority (78 percent) of loans were received through tontines—informal community groups of friends, family, or colleagues that lend small amounts to one another. The most common purpose of a loan was for the purchase of food. However, these loans tended to be among the smallest amounts obtained (Figure 4.2).

Figure 4.2: Percent of households who received loans, by loan purpose, and corresponding median size of loans



Source: Authors' calculations.

After food purchases, the second most common reason to seek credit was for agricultural costs, including for inputs and agricultural equipment, comprising 26 percent of total loan requests. Recognizing that only half of the sample requested a loan, this amounts to approximately 13 percent of rural smallholders requesting about RWF 20,000 (USD 19) per year for agricultural inputs. This suggests that little credit is requested or extended with the goal of amplifying agricultural productivity or value-added output. Similarly, less than 10 percent of households received loans for business start-up or expansion costs, which may contribute to the low frequency of households who own a nonfarm business. The lack of credit used for investment in expanding production or diversifying labor may also be due to the informal modes through which smallholder agricultural households access credit, predominantly via small informal lending groups.

While the structural transformation literature underlines the importance of labor diversification out of subsistence agriculture, current opportunities for workers in Rwanda's rural labor market to transition out of agriculture into higher paying, less risky off- or nonfarm jobs are limited. Of the 62 percent of households that engage in wage labor, whether agricultural or otherwise, almost 85 percent are paid on a casual worker basis. Casual laborers earn the least income from their work (Table 4.2). Moreover, their labor activities tend to be short-term and as needed, without specified contract terms. This is common across the country, even in rural areas near Kigali city, if less so. This pattern suggests little labor demand for longer term contract labor for rural smallholders aiming to diversify their labor portfolio.

Table 4.2: Share of wage laborers and income by contract type

Panel A: Distribution of workers by nature of contract, %					
	Permanent worker	Fixed-term contract	Casual worker	Seasonal worker	Daily worker
All households	5.8	4.3	84.4	3.2	4.1
Kigali city	3.8	17.7	69.5	2.0	17.9
South	8.1	4.7	84.4	1.7	2.6
West	3.5	4.5	85.3	6.2	1.3
North	4.0	2.4	85.6	3.8	7.0
East	7.0	4.3	83.9	1.9	3.8
Panel B: Median monthly income from paid employment, by nature of contract, '000s Rwandan Francs					
All households	62.3	25.0	12.0	20.8	24.0
Kigali city	62.5	52.1	20.8	34.4	50.6
South	55.0	20.0	12.0	12.0	30.0
West	56.3	28.8	10.0	18.8	36.0
North	81.3	34.7	12.0	21.7	22.5
East	58.3	25.0	15.6	21.7	20.8

Source: Authors' calculations.
Note: Row percentages may exceed 100 percent, given that an individual may hold more than one job.

5. RESULTS

The first set of results looks at the estimated risk ratios produced by the multinomial logit analysis to understand what distinguishes households that hire in, hire out, or hire in *and* hire out labor compared to households that neither hire in nor hire out labor. We then evaluate the estimated risk ratios to distinguish households that earn income from agricultural wages, nonagricultural wages, both agricultural and nonagricultural wages, NFEs, or NFEs and

wages, as compared to households that do not engage in wage labor or own an NFE. (Annex Tables 1, 2, and 3 provide descriptive statistics of MNL covariates by household labor hiring status and labor portfolio status.) When estimating risk ratios, a ratio greater than 1.0 denotes a positive association between the independent variable and the outcome, whereas a ratio less than 1.0 denotes a negative association.

Households that have a larger number of working-age individuals of either gender have a higher probability of hiring out some of their labor (Table 5.1). However, as the number of female adults in a household increases, the household is both less likely to hire in labor and more likely to hire out labor. In contrast, as the number of male adults in a household increases, a household is more likely to hire out labor, but there is no significant effect on hiring in labor. This result suggests that households may elect to have female adults work on their own plots, while male adults are more likely to seek outside employment rather than reduce the need for hiring in workers for their own plots. Similarly, the results suggest that households with an NFE are less likely to hire out labor, likely because they require their household labor to manage the NFE.

Focusing on how household composition shapes the likelihood of employment activity type, as the number of working-age individuals of either sex increases, households are more likely to engage in agricultural wage labor (Table 5.2). Additionally, as the number of working-age males increases, the household is more likely to have its workers engage in nonagricultural labor. However, this is not the case for working-age females. These results suggest that female adults will most likely work in agriculture, whether on the plots of their own household or as wage laborers for other agricultural households, while male adults can more easily engage in both agricultural and nonagricultural wage labor.

We find that households that have a higher share of individuals that have finished primary school have a significantly lower probability of hiring out labor (Table 5.1). While, in other country contexts, hiring out labor would be seen as a positive labor portfolio diversification strategy, our descriptive analysis has demonstrated that demand for agriculture wage labor in rural Rwanda is largely casual, low-paying, and involves low skills. Table 5.2, which reports results for labor engagement by labor activity type, also demonstrates that households with a higher share of primary-educated members have a significantly lesser probability of entering into agriculture wage activity. These results also show that when a household has a higher share of members who completed primary education, the household is less likely to hire out labor, especially agriculture labor.

We use three household welfare indicators—livestock owned as measured in Tropical Livestock Units, total landholding area, and a wealth index—to evaluate the probability that households engage in various income-generating activities. Households that have greater livestock holdings have a greater probability of hiring in labor.

Table 5.1: Multinomial logit predicting whether a household hired in or hired out labor, relative risk ratios

	Household hired in labor only		Household hired out labor only		Household both hired in and hired out labor	
	Relative risk ratio	Standard error	Relative risk ratio	Standard error	Relative risk ratio	Standard error
Male-headed household, 0/1	0.70*	0.140	1.05	0.208	0.91	0.202
Age of household head, years	1.00	0.005	0.96***	0.005	0.95***	0.006
Male adults in household, no.	1.01	0.102	1.32***	0.136	1.11	0.117
Female adults in household, no.	0.78**	0.077	1.38***	0.134	0.99	0.100
Household members age 15+ who completed primary, share	1.32	0.345	0.55**	0.141	1.29	0.343
Household reported education expenses, 0/1	0.96	0.212	1.40	0.288	1.24	0.270
Total landholding, ha	2.58***	0.616	0.34**	0.147	1.60*	0.392
Household received a loan, 0/1	1.37	0.290	3.16***	0.619	3.55***	0.738
Household owns a non-farm enterprise, 0/1	1.19	0.305	0.34***	0.096	0.38***	0.112
Weather shock experienced by household, 0/1	1.17	0.220	1.30	0.234	1.52**	0.291
High food price shock experienced by household, 0/1	0.47**	0.169	0.44**	0.143	0.32***	0.121
Livestock owned, tropical livestock units (TLU)	1.43***	0.185	0.97	0.132	1.37**	0.183
Wealth Index – Quintile 1, 0/1	0.21***	0.067	3.56***	1.183	0.56*	0.190
Wealth Index – Quintile 2, 0/1	0.35***	0.104	2.67***	0.837	0.64	0.199
Wealth Index – Quintile 3, 0/1	0.43***	0.125	1.80*	0.560	0.66	0.199
Wealth Index – Quintile 4, 0/1	0.69	0.191	1.48	0.461	0.73	0.214
Current cooperative member, 0/1	1.69**	0.423	0.72	0.192	1.60*	0.412
Travel time to food market or shop, hours	0.88	0.088	0.69***	0.070	0.70***	0.081
Travel time to public transport stage / stop, hours	1.01	0.105	1.21**	0.113	0.98	0.104
Travel time to administrative / local government office, hours	0.72**	0.116	0.69**	0.122	0.48***	0.095
Southern Province, 0/1	4.02**	2.173	0.63	0.285	1.33	0.613
Western Province, 0/1	3.69**	2.003	0.49	0.223	1.20	0.553
Northern Province, 0/1	3.60**	2.037	1.75	0.838	1.81	0.889
Eastern Province, 0/1	4.81***	2.632	0.78	0.362	1.43	0.667

Source: Authors' calculations
Note: * significant at 10%, ** significant at 5%, *** significant at 1%; Wealth index quintiles are compared to quintile 5; living in a province is compared to living in Kigali city.

Table 5.2: Multinomial logit predicting a household's income generating activity, relative risk ratios

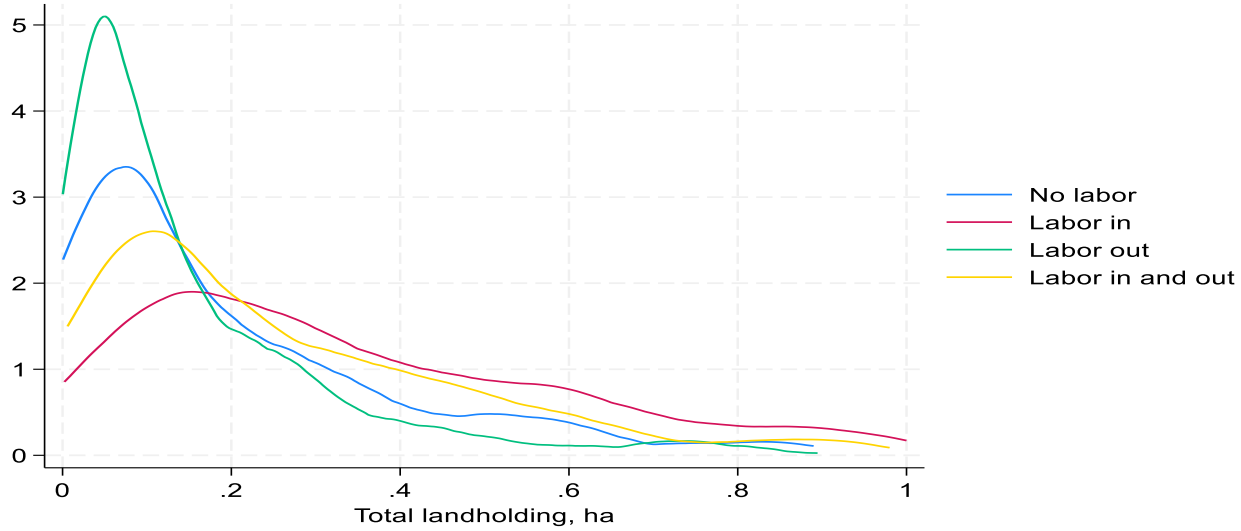
	Agriculture wage labor only		Non-agriculture wage labor only		Agriculture and non-agriculture wage labor only		Non-farm enterprise only		Non-farm enterprise and wage labor	
	RRR	St. err.	RRR	St. err.	RRR	St. err.	RRR	St. err.	RRR	St. err.
Male-headed HH, 0/1	1.06	0.167	1.25	0.266	1.51	0.448	0.84	0.247	2.31**	0.763
Age of HH head, years	0.95***	0.005	0.95***	0.006	0.95***	0.008	0.95***	0.009	0.96***	0.009
Male adults in HH, no.	1.17*	0.096	1.24**	0.115	1.70***	0.193	1.20	0.152	1.06	0.151
Female adults in HH, no.	1.58***	0.131	1.01	0.108	1.70***	0.226	1.15	0.155	1.45**	0.211
HH members age 15+ completed primary, share	0.45***	0.091	1.20	0.283	0.25***	0.087	0.52*	0.176	1.17	0.404
HH reported educ. expenses, 0/1	1.11	0.180	1.34	0.245	2.07***	0.483	1.49	0.378	2.82***	0.696
Total landholding, ha	0.28***	0.073	0.70**	0.112	0.18***	0.092	0.97	0.150	0.69	0.165
HH received a loan, 0/1	2.72***	0.404	2.35***	0.416	3.55***	0.841	1.71**	0.409	5.97***	1.703
Weather shock for HH, 0/1	1.35**	0.193	1.17	0.204	1.53*	0.351	1.56*	0.371	1.46	0.372
High food price shock for HH, 0/1	0.59*	0.185	0.57	0.208	0.48	0.246	0.88	0.445	0.40*	0.213
Livestock owned, TLU	0.83*	0.085	1.02	0.091	0.73*	0.130	0.96	0.079	0.75	0.137
WI – Quintile 1, 0/1	9.67***	2.724	0.64	0.207	2.41**	1.080	0.19***	0.095	2.54**	1.083
WI – Quintile 2, 0/1	6.16***	1.596	0.58*	0.162	2.44**	0.968	0.10***	0.054	0.85	0.349
WI – Quintile 3, 0/1	3.75***	0.972	0.71	0.173	2.84***	1.059	0.39***	0.122	0.92	0.343
WI – Quintile 4, 0/1	2.30***	0.592	0.57**	0.130	1.40	0.528	0.43***	0.121	1.01	0.316
Current cooperative member, 0/1	0.93	0.181	0.72	0.169	0.56	0.211	1.16	0.328	0.75	0.265
Travel time to food market/shop, hrs	0.80**	0.076	0.69***	0.079	0.65***	0.092	0.66**	0.117	0.50***	0.109
Travel time public transport stage, hr	1.18**	0.093	0.93	0.095	1.06	0.157	0.83	0.133	1.03	0.143
Travel time admin. / loc. govt. office, hr	0.63***	0.096	0.77	0.162	0.84	0.202	0.74	0.214	0.80	0.276
Southern Prov., 0/1	1.08	0.692	0.26***	0.135	0.14***	0.087	0.33**	0.178	0.19***	0.107
Western Prov., 0/1	1.04	0.672	0.20***	0.105	0.11***	0.070	0.18***	0.102	0.11***	0.064
Northern Prov., 0/1	2.90	1.883	0.36*	0.189	0.50	0.319	0.26**	0.160	0.35*	0.198
Eastern Prov., 0/1	1.45	0.937	0.22***	0.112	0.16***	0.104	0.27**	0.146	0.08***	0.049

Source: Authors' calculations
Note: * significant at 10%, ** significant at 5%, *** significant at 1%. RRR = "Relative risk ratio". St. err. = "Standard error". HH = "Household". TLU = "Tropical Livestock Unit". WI = "Wealth index". Wealth index (WI) quintiles are compared to quintile 5; living in a province is compared to living in Kigali city.

Similarly, the results suggest that households with larger landholdings are significantly more likely to hire in household labor (Table 5.1). Given the high rural population density in Rwanda, we further evaluate the trend in labor market participation by graphing landholding size and labor market participation. Figure 5.1 shows a stark difference in total landholdings between households that hire out labor and households that hire in labor—households that hire out labor have the smallest landholdings of the sample, while households that hire in

labor have the largest. Although 92 percent of households in the sample have total landholdings of less than one hectare, the clear variation in the distribution of landholding sizes, even under one hectare, between households that hire in or hire out labor suggests that this is a key driving factor in their decision to engage in the labor market. Households with less land have less need to hire in labor to work on the land and have more need to obtain income in addition to that of their agricultural production, thereby seeking labor opportunities off their own farms.

Figure 5.1: Distribution of total landholding by a household's participation in the labor market



Source: Authors' calculations
Note: Only households with less than one hectare of total landholding are included in this figure.

The third welfare indicator to evaluate labor market participation using the MNL is a household wealth index constructed using a principal component analysis of each household's assets and access to utilities—water, electricity, toilet, wall material, floor material, and roof material. We then disaggregate households by wealth index quintiles. Households that are in the bottom two (poorer) quintiles are significantly less likely to hire in labor than households in the wealthiest quintile and more than two times more likely to hire out their labor (Table 5.1). For the bottom two quintiles, the type of labor that they engage in is overwhelmingly agriculture wage labor (Table 5.2). These results suggest that agricultural wage labor opportunities in rural areas serve principally as a stopgap measure for poor households to gain additional income when own-farm crop production is not sufficient to meet household consumption and expenditure needs.

While one could hypothesize that households with greater access to credit are more equipped to use borrowed capital to avoid working in casual labor activities, this is not the case for rural Rwandans. Households that received a loan in the 2022 agricultural year were more than three times more likely to hire out some of their labor (Table 5.1). As discussed (Figure 4.2), the majority of households that received credit reported that the loans were to fulfill food security needs or for medical assistance. While households that received a loan were somewhat more likely to have an NFE, there is a higher probability that households that received a loan engaged in agricultural or nonagricultural wage labor (Table 5.2).

Finally, economic shocks are another potential conditioning factor that may push households to seek supplemental income to that provided by their agricultural production in the event that production does not meet household demands. The most common shocks that households cited were weather, i.e., experienced flood or drought, and food price increases. We include a binomial variable for each of these shocks in both MNL models. Climate-related shocks do not uniformly influence whether households hire in or hire out labor (Table 5.1). Households that reported experiencing high food prices are half as likely to hire in or hire out labor, respectively. This may be that, given concerns about ongoing high food prices, households that would have normally hired in labor are cautious amid the uncertainty of market price fluctuations, leading to a thin labor market that also affects households aiming to hire out labor to supplement their overall income. Given that we do not have panel level data, we are unable to attribute causation to changes in the labor market.

6. POLICY RECOMMENDATIONS

The findings from this research complement the findings from the 2022 National Census and 2023 Labor Force Survey for Rwanda in showing that most of the rural population works in agriculture as their primary and possibly even secondary income-generating activity. While non agriculture wage labor provides higher incomes to households than either crop production or agricultural wage labor, few opportunities exist for rural smallholders to work in nonfarm employment.

As the Government of Rwanda continues to formulate policies to consolidate land to avoid additional land fragmentation and to introduce labor-saving technologies for crop and livestock production, rural households will be encouraged to seek off-farm sources of income (MINAGRI 2018). To support the Government of Rwanda's strategic goals of producing high-value export crops and achieving domestically-supplied food security, many of these off-farm sources of income will likely remain important within the Rwanda's agrifood systems (Dusingizimana et al., 2022). Support services and infrastructure, such as access to credit and banking services and affordable education will be important to incentivize entrepreneurship and labor diversification among workers in agricultural households. The results from this paper provide insights into which factors increase the probability of households obtaining off-farm income and, as such, can guide the design of future policies to promote greater labor diversification and structural transformation.

The creation of new special economic zones for manufacturing and processing outside of Kigali may increase nonagricultural labor demand, but it will be critical to provide rural workers with tailored skills training to match labor demand among the nascent companies in these special economic zones. To engage rural households that are farther from secondary cities to diversify out of agriculture, other innovative solutions will be needed. In these areas, reducing financial barriers to entry for small entrepreneurs may encourage more to offer nonfarm services and bolster off-farm employment opportunities.

This analysis suggests that lack of household income and access to credit are significant barriers to agricultural households seeking higher earning nonfarm employment or investing in nonfarm business opportunities. Approximately one-third of households that received a loan reported that the money they received was used for household food purchases, while only 8 percent of households reported that they used the loan money for household business expenditures. The recent rise in food prices coupled with the decline in the average size of

agricultural landholdings may put sufficient pressure on household incomes to render small business creation secondary to that of household food purchases in the expenditure priorities of agricultural households. These households have many competing needs, including purchasing food, acquiring basic non-food necessities, and healthcare, such that any marginal additional income they obtain is likely to go toward covering these needs rather than investing in additional education or training to better enable household workers to obtain a nonagricultural job or to invest in an NFE.

To encourage households to seek nonagricultural employment, these results suggest that education is a key factor. Individuals with more education are less likely to engage in agricultural wage labor. However, they may encounter difficulties in finding nonagricultural wage labor work that matches their skillsets. As new jobs are created in Rwanda's agrifood systems, it will be necessary to ensure that individuals participating in the labor market meet the skillsets required for these jobs. Expanding and promoting vocational schools or encouraging companies to provide technical training programs may be needed to encourage greater development of nonfarm activities. Specifically, allocating at least half of the spots in these schools or training programs for women could help to overcome the gender-specific differences seen in the results here. As women are more likely than men to remain working in agriculture, they could benefit from further training and mentorship opportunities.

In all, this paper examines how to promote the movement of workers from the farm to the rural nonfarm economy—a key objective of the Government of Rwanda as the country seeks to accelerate structural transformation and to expand and diversify the economy. With the development of the Fifth Strategic Plan for Agriculture Transformation now underway, the findings and recommendations from this paper should be considered in designing this new strategic document to increase rural agricultural household incomes, lower the barriers to nonfarm business creation, and ensure that the skills of rural jobseekers match the skills required in the rural nonfarm economy.

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ANNEXES

Annex Table 1 Descriptive statistics of covariates used in multinomial logits

	Minimum	Maximum	Mean	Median	Standard deviation
Male-headed household, 0/1	0	1	0.70	1	0.46
Age of household head, years	19	101	48.54	46	15.71
Male adults in household, no.	0	7	1.13	1	0.95
Female adults in household, no.	0	6	1.33	1	0.87
Household members age 15+ who completed primary, share	0	1	0.41	0.5	0.37
Household reported education expenses, 0/1	0	1	0.28	0	0.45
Total landholding, ha	0.0003	6.6	0.35	0.2	0.56
Household received a loan, 0/1	0	1	0.40	0	0.49
Weather shock experienced by household, 0/1	0	1	0.33	0	0.47
High food price shock experienced by household, 0/1	0	1	0.05	0	0.22
Livestock owned, tropical livestock units (TLU)	0	17.6	0.63	0.5	0.89
Wealth Index – Quintile 1, 0/1	0	1	0.19	0	0.40
Wealth Index – Quintile 2, 0/1	0	1	0.20	0	0.40
Wealth Index – Quintile 3, 0/1	0	1	0.20	0	0.40
Wealth Index – Quintile 4, 0/1	0	1	0.20	0	0.40
Wealth Index – Quintile 5, 0/1	0	1	0.20	0	0.40
Current cooperative member, 0/1	0	1	0.14	0	0.34
Travel time to food market or shop, hours	0	6.0	0.88	0.7	0.78
Travel time to public transport stage / stop, hours	0	5.0	1.15	1.0	0.92
Travel time to administrative / local government office, hours	0	3.5	0.56	0.5	0.45
Kigali city, 0/1	0	1	0.04	0	0.20
Southern Province, 0/1	0	1	0.27	0	0.45
Western Province, 0/1	0	1	0.23	0	0.42
Northern Province, 0/1	0	1	0.19	0	0.39
Eastern Province, 0/1	0	1	0.27	0	0.44

Source: Authors' calculations

Annex Table 2 Descriptive statistics of covariates by household hire status

	Household does not hire in or hire out labor	Household hired in labor only	Household hired out labor only	Household both hired in and hired out labor
Male-headed household, 0/1	0.60	0.68	0.69	0.77
Age of household head, years	56	54	45	44
Male adults in household, no.	0.9	1.1	1.2	1.2
Female adults in household, no.	1.2	1.3	1.4	1.4
Household members age 15+ who completed primary, share	0.34	0.47	0.33	0.53
Household reported education expenses, 0/1	0.19	0.25	0.31	0.32
Total landholding, ha	0.3	0.6	0.2	0.4
Household received a loan, 0/1	0.19	0.31	0.45	0.54
Household owns a non-farm enterprise, 0/1	0.19	0.07	0.12	0.11
Weather shock experienced by household, 0/1	0.26	0.32	0.33	0.38
High food price shock experienced by household, 0/1	0.08	0.04	0.06	0.04
Livestock owned, tropical livestock units (TLU)	0.5	0.9	0.5	0.7
Wealth Index – Quintile 1, 0/1	0.26	0.08	0.30	0.09
Wealth Index – Quintile 2, 0/1	0.22	0.13	0.26	0.16
Wealth Index – Quintile 3, 0/1	0.21	0.18	0.20	0.21
Wealth Index – Quintile 4, 0/1	0.19	0.27	0.15	0.22
Wealth Index – Quintile 5, 0/1	0.13	0.34	0.08	0.31
Current cooperative member, 0/1	0.10	0.22	0.07	0.19
Travel time to food market or shop, hours	1.1	0.9	0.9	0.8
Travel time to public transport stage / stop, hours	1.2	1.1	1.3	1.0
Travel time to administrative / local government office, hours	0.7	0.5	0.6	0.5
Kigali city, 0/1	0.04	0.02	0.04	0.06
Southern Province, 0/1	0.29	0.28	0.26	0.28
Western Province, 0/1	0.27	0.25	0.21	0.24
Northern Province, 0/1	0.13	0.13	0.25	0.17
Eastern Province, 0/1	0.27	0.32	0.24	0.26
Households, no.	279	481	776	484

Source: Authors' calculations

Annex Table 3 Descriptive statistics of covariates by labor portfolio

	No wage labor or NFE	Agriculture wage labor only	Non-agriculture wage labor only	Agriculture and non-agriculture wage labor only	Non-farm enterprise only	Non-farm enterprise and wage labor
Male-headed household, 0/1	0.63	0.65	0.81	0.81	0.77	0.83
Age of household head, years	57	45	43	44	45	46
Male adults in household, no.	1.0	1.1	1.3	1.5	1.4	1.3
Female adults in household, no.	1.2	1.4	1.3	1.5	1.5	1.6
Household members age 15+ who completed primary, share	0.40	0.33	0.57	0.34	0.54	0.55
Household reported education expenses, 0/1	0.20	0.25	0.32	0.45	0.34	0.54
Total landholding, ha	0.5	0.2	0.4	0.2	0.6	0.4
Household received a loan, 0/1	0.24	0.42	0.50	0.59	0.45	0.74
Weather shock experienced by household, 0/1	0.28	0.34	0.34	0.39	0.38	0.38
High food price shock experienced by household, 0/1	0.05	0.05	0.05	0.05	0.05	0.06
Livestock owned, tropical livestock units (TLU)	0.7	0.5	0.8	0.6	0.9	0.6
Wealth Index – Quintile 1, 0/1	0.16	0.31	0.08	0.15	0.05	0.15
Wealth Index – Quintile 2, 0/1	0.19	0.28	0.12	0.23	0.03	0.11
Wealth Index – Quintile 3, 0/1	0.20	0.20	0.19	0.29	0.14	0.17
Wealth Index – Quintile 4, 0/1	0.24	0.15	0.20	0.21	0.21	0.26
Wealth Index – Quintile 5, 0/1	0.20	0.05	0.41	0.13	0.57	0.32
Current cooperative member, 0/1	0.17	0.11	0.12	0.07	0.21	0.13
Travel time to food market or shop, hours	1.0	0.9	0.7	0.8	0.6	0.7
Travel time to public transport stage / stop, hours	1.2	1.3	0.9	1.1	0.8	1.0
Travel time to administrative / local government office, hours	0.6	0.6	0.5	0.6	0.5	0.5
Kigali city, 0/1	0.02	0.01	0.10	0.07	0.09	0.12
Southern Province, 0/1	0.28	0.26	0.29	0.21	0.29	0.35
Western Province, 0/1	0.28	0.24	0.21	0.18	0.16	0.17
Northern Province, 0/1	0.14	0.23	0.17	0.31	0.11	0.24
Eastern Province, 0/1	0.29	0.27	0.24	0.22	0.35	0.12
Households, no.	638	710	305	136	122	109

Source: Authors' calculations

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