

Rural development in Haiti:

Challenges and opportunities



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The World Bank
Agriculture Global Practice
September 2014

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Acknowledgement

The authors would like to thank Federica Marzo, Diego Arias and Michael Morris for their guidance and advice during the elaboration of this paper.

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EXECUTIVE SUMMARY

Haiti is one of the least developed countries in the world and has faced many challenges in its development process due to its vulnerability to natural disasters and fragility. The frequent natural disasters are particularly devastating because they directly affect the large share of the population that lives in rural areas and depends on agriculture as a primary livelihood source. Approximately 50 percent of Haiti's population of 10 million currently reside in rural areas, and according to recent figures about 70.7 and 53.9 percent of rural households are poor (income of less than \$1.98 per day) or extremely poor (income of less than \$1.00 per day). Haiti's rural population remains one of the most food insecure in the world. Ecological challenges, rapid population growth, and high import dependency, combined with the devastating effects of the 2010 earthquake, have exacerbated an already dire food insecurity situation, and revitalization of the agricultural sector has become a foremost priority of the Haitian government. The nonfarm sector in Haiti is also important for the rural economy and contributes to improved livelihoods of rural households.

The objective of this report is to examine the linkages between rural economic activity, food insecurity and poverty in Haiti as a means of determining the barriers to rural development. The analysis draws on a newly available set of household-level living standards measurement data collected in 2012 (ECVMAS). About 70.7 percent of all rural households are poor, and education levels are low with an average of 2.8 years of education for the household head. Agriculture dominates economic activity (78 percent of all households are involved in agricultural activities), although almost 25 percent of the agricultural households supplement their agricultural income by engaging also in some type of nonfarm activity. Overall nonfarm activity participation (including households that engage in agricultural activities and households that do not) is reported at 46 percent. Nonfarm activities can be related to agriculture upstream (input supply) or downstream (value-adding and processing), or they can be unrelated to the sector (retailing). This report identifies the main factors of production that correlate with increased productivity in the agricultural sector and examines the determinants of nonfarm participation, poverty and food security within rural Haiti.

Key Findings and Recommendations

The information and analysis presented in this report point to two priority areas for rural development interventions in Haiti: (i) promoting diversification of livelihoods sources among rural households, and (ii) improving the performance of rural markets for inputs and outputs. Focusing on these areas could increase agricultural productivity, boost rural incomes, improve food security, thereby potentially reducing constraints to rural development.

I. Promoting Diversification of Livelihoods Sources among Rural Households

Findings

- Diversifying agricultural production activities is correlated with higher productivity and could reduce vulnerability to shocks.
- Remittances are positively associated with higher incomes, increased agricultural productivity, and improved food security, but the causal relationships are difficult to discern.
- Nonfarm activities in rural areas seem to provide a pathway to escape from poverty and food insecurity.
- Female headed households have reduced access to farming inputs, which could explain the observed gender gap in input use and agricultural productivity. In the nonfarm enterprise sector, female headed households similarly have reduced access to inputs and use lower quantities of inputs.

Recommendations

- **Promote diversification of agricultural production activities as a way to increase income and improve food security.** Activities that could be undertaken to promote diversification include educational campaigns to increase awareness of the benefits of diversification, research to identify crops and livestock species suited for particular locations or production environments, extension activities to disseminate locally appropriate management methods, and programs to improve the availability and accessibility of key inputs. Nevertheless, farmers might also be able to expand productivity / increase income on a single crop, if they select to invest in crops that provide higher profits.
- **Help poor rural households take advantage of non-farm employment opportunities as a way of generating additional revenue and managing risk.** Special consideration should be given to interventions that will help the poorest households overcome entry barriers (lack of key assets and access to basic services, and distance to markets and labor), including not only interventions designed to improve the quality of the rural labor force (e.g., basic education, vocational training), but also interventions designed to generate increased rural non-farm employment opportunities (e.g., programs to encourage expansion of rural enterprises, support to rural financial institutions).
- **Encourage poor rural households to invest remittances in improving the productivity of their agricultural activities.** Poor rural households receiving remittances often use those remittances to purchase food, and as a result they miss an opportunity to build the base of productive assets needed to generate an enhanced stream of income over the longer term. Interventions are needed to encourage poor rural households invest a portion of the remittances they may receive in productive assets that can ensure a longer term stream of future income.

- **Invest in soil and water management technologies to improve the productivity of the natural resource base on which agriculture depends.** Over the longer term, the welfare of rural households in Haiti will depend crucially on the quality of the natural resource base on which agriculture depends. Efforts are needed to compensate for decades of mismanagement, with the goal of reversing land degradation, restoring soil fertility, re-establishing vegetative cover, and conserving and protecting increasingly scarce water resources. A place to begin would be through the promotion of more environmentally friendly agricultural production practices, combined with introduction of regulations to restrict the uncontrolled exploitation of common-pool resources especially including trees. These could be complemented in time with schemes to promote payments for environmental services (PES), which led to good results in some countries and could provide opportunities for rural households to generate additional income by preserving the environment.

II. Improving the Performance of Rural Markets for Inputs and Outputs

Findings

- Agricultural productivity in Haiti is severely constrained by the limited availability and high cost of purchased inputs.
- For many rural households, incentives to invest in improved agricultural productivity are undermined by lack of access to reliable markets for outputs.

Recommendations

- **Strengthen private sector-led input distribution systems to help ensure timely availability of improved inputs.**
 - a. For seeds, modern varieties hold the potential to deliver significant yield increases in virtually all of the major staples. Seed production and marketing are by nature commercial activities, but newly established private seed companies face many obstacles and may require public support during an initial phase. This support should come in two forms: (i) public investments that lower R&D costs of private companies (e.g., investments in public plant breeding research and public production of foundation seed), and (ii) enactment of policies that favor the emergence of a pluralistic and competitive seed industry.
 - b. For fertilizer, stimulating the development of an efficient, profitable, and competitive fertilizer industry would require a two-pronged approach to strengthen demand for fertilizer on the one hand and improve the supply of fertilizer on the other. Possible interventions include measures that would improve the ability of farmers to access credit needed to purchase fertilizer, as well as scale up the use of fertilizer vouchers to make fertilizer more affordable

to the poorest farmers. It is important that these programs be time-bound, however, to ensure that subsidies can be phased out as the quantities used of fertilizer increase and commercial distribution becomes profitable. Efforts to strengthen demand for fertilizer must be accompanied by parallel efforts to improve supply. Fertilizer market development efforts should be aimed at creating viable private production and distribution systems. As with seed, public support may be needed during an initial phase to allow emerging private fertilizer companies to become established and expand their operations to a commercially viable scale, but this support should be time-bound. Haiti lacks the raw materials needed to produce fertilizer, so the domestic fertilizer industry will rely for the foreseeable future on imported components. The government should promote private investment in the industry, but it should avoid directly participating in importing and distributing fertilizer.

- **Improve access of rural households to output markets.** Many rural households in Haiti have little incentive to invest in expanding their agricultural enterprises because of the difficulty of selling surplus production. Efforts are needed to reduce the transactions costs incurred by rural households in identifying and accessing remunerative markets for outputs. An initial set of interventions could focus on different types of mobile phone- and internet-based market information systems that speed flows of market information and help connect buyers and sellers. Such efforts will have to be complemented with investments in infrastructure—especially rural roads—that can allow households located in remote areas to access inputs and evacuate outputs quickly and at lower cost.
- **Exploit immediate opportunities to match supply and demand.** Development of efficient markets for agricultural commodities in Haiti will take time. In the short run, however, opportunities exist to link selected producers with remunerative markets, such as food aid programs, school feeding initiatives, and other institutional feeding schemes that can systematically source products from local producers. One promising approach that has been used successfully in many other countries to tackle this multi-pronged agenda is the Productive Alliances model that links producer groups to markets.
- **Strengthen food safety through regulations and implementing institutions.** As Haiti's food system transitions from its current subsistence orientation to become more market-oriented, food quality and safety will become increasingly important for public health and competitiveness. A comprehensive food safety strategy covering the entire supply chain “from farm to fork” would help to ensure that investments in improving food quality and nutritional content are sustained over time. Such a strategy should raise awareness about food safety and nutrition issues, provide production and market incentives, and develop the appropriate policy and institutional framework needed to ensure the availability of the necessary infrastructure and supporting services.



1. **Haiti, one of the poorest countries in the world, faces many development challenges due to its fragile resource base, vulnerability to natural disasters, and political instability.** The economic challenges Haiti faces today are similar in many respects to those highlighted 15 years ago in the 1999 World Bank Haiti Poverty Assessment. The 1999 report indicated that among the two-thirds of the population classified as rural, as many as 80 percent lived in poverty, including more than 65 percent who lived in extreme poverty. Haiti also suffered from high rates of child malnutrition and low educational achievements¹ (World Bank 1998). Today, very little has changed: about 50² percent of the Haitian population of almost 10 million people resides in rural areas where development indicators are lagging and poverty is more widespread. The most recent figures³ indicate that about 70.7 percent of rural households fall into the “poor” category (based on the moderate poverty line of \$1.98 per day), and about 53.9 percent fall into the “extreme poor” category (based on a poverty line of \$1.00 per day⁴). The main economic activities of rural households also remain relatively unchanged. Although households in rural Haiti engage in multiple income generating activities, as in many developing countries, the agriculture sector employs more than 70⁵ percent of the rural population and contributes about 28 percent to GDP (World Bank 2008). As is becoming more common in many developing countries, households in rural areas often diversify outside agriculture, and the importance of the nonfarm sector continues to grow (Barrett et al. 2001). This is also the case in Haiti, where about 45 percent of rural households engage in the nonfarm sector.
2. **Haiti’s rural population remains extremely poor and food insecure.** In rural Haiti, 7 out of 10 people live in poverty, a rate that is higher than the rate found in any other country in the region (World Bank Data). While countries such as Honduras, Guatemala, Nicaragua, and Bolivia also experience rural poverty rates over 50 percent, most other Latin American and Caribbean countries experience rates below 50 percent. In comparison, the rate of rural poverty stands at about 56 percent in Malawi and Mozambique and at about 30 percent in Ethiopia. The high levels of rural poverty in Haiti are reflected in widespread food insecurity: about 36 percent of the rural population suffers from food insecurity. According to the Global Food Security Index, Haiti ranks near the bottom of the table in food

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- 1 Adult literacy rates were at about 55 percent and 35 percent of children under 5 suffered from malnutrition.
 - 2 In contrast the 2003 census showed that about 60 percent of the population was classified as rural (WB 2005)
 - 3 See Chapter 1: Poverty profile and trends, Haiti Poverty Assessment 2014
 - 4 Both the moderate and extreme poverty rates are based on exchange rate of 41.58 HTG to the US dollar (2012).
 - 5 Except when indicated, all statistics are from the *Enquête sur les Conditions de Vie de Ménage Après le Séisme* (ECVMAS 1), conducted in 2012-2013 by the National Bureau of Statistics of Haiti, *l’Institut Haïtien de Statistique et d’Informatique* (IHSI), see paragraph 5 below for more details

security⁶ (The Economist, 2014). It ranks dead last within the Latin American region, and it is one of the worst performers even when compared to other low income countries such as Niger, Bangladesh, and Uganda.

3. **The agriculture sector in Haiti is adversely affected by high rates of population growth and harsh environmental conditions.** Agriculture remains the mainstay of the rural economy in Haiti. The main food crops are rice, maize, bananas, yams, cassava, green beans, and millet, while important export crops include coffee and mangoes. Production is highly dependent on unreliable rainfall, as fewer than 1 percent of farmers use irrigation (Jadotte 2007). Most farmers have poor access to tools, machinery, and purchased inputs including improved seeds and fertilizer. Many have difficulty connecting to markets due to transportation constraints and poor infrastructure (WB 2005). In a country that is already densely populated, steady population growth continues to put pressure on the natural resource base, and farm sizes have declined over time and become less productive (WB 2005). To compound matters, Haiti's exposure to frequent hurricanes and tropical storms, combined with high rates of soil erosion that have reduced soil fertility and adversely affected crop output, cause annual productivity losses in agriculture ranging from 0.5 to 1.2 percent (WB 2005). Extensive deforestation⁷ in many parts of the country has worsened the erosion problem and led to the loss of enormous quantities of fertile topsoil (Verner 2008; WB 2005).
4. **Haiti is highly dependent on international markets for its food security, importing more than 50 percent of its food including 80 percent of the main staple, rice** (USAID 2014, WB 2014 and figure A1). The 2008 global food price crisis caused food prices in Haiti to spike sharply. Higher food prices were particularly harmful to the poor, more than 50 percent of whose expenses are dedicated to food. Food supply shortages are believed to have caused irreversible effects on human health, even though these effects are difficult to quantify. The 2008 experience highlighted the dependence of Haiti on food imports and its vulnerability to fluctuations in international prices.⁸ The 2008 food price crisis was followed by a series of severe storms in 2008 and widespread devastation to the nation's capital caused by the earthquake in 2010. The large quantities of emergency food aid that were imported in response to these crises had unintended negative impacts on Haitian agriculture, as food prices fell precipitously in local markets. These events discouraged investment in Haitian farming,⁹ but at the same time they also led to some urban-to-

6 Haiti ranks 103 out of 109 countries included in the index. The index considers three dimensions: affordability, availability, quality and safety.

7 Haiti forest cover less than 2 percent of the country (Country profile, Library of congress federal research division)

8 Former President Bill Clinton apologize in the Senate Foreign Relations Committee about the consequences of US rice subsidies inducing a loss of capacity for Haitian farmers to continue producing rice (March 10, 2010)

9 John Holmes (U.N. humanitarian chief) in The Associated Press and former Director-General of UN Food and Agriculture Organization (FAO) Jacques Diouf

rural migration as people abandoned Port-au-Prince. This confluence of reduced food supply and increased rural demand created an incentive for the government to attribute increased importance to rural development as a national development objective (Shamsie 2012). Today, rebuilding the nation's agricultural production base ranks among the top priorities of the government¹⁰ (Arias et al., 2013). Promoting development of the rural nonfarm sector is also considered important, as an expanding nonfarm sector could absorb surplus unproductive labor as it exits from the agricultural sector, slowing rural-to-urban migration while at the same time creating opportunities to increase household income (Lewis 1954 and Verner 2008).

5. **The Ministry of Agricultural Resources and Rural Development (MARNDR) has implemented important agriculture policy reforms.** In 2010, the Government implemented a short- to medium-term strategy and investment plan for the period 2013-16. The plan identifies four main objectives for the agricultural sector: (i) modernize the ministry of agriculture to enable better governance; (ii) increase agricultural productivity to improve food security and increase revenue; (iii) develop agricultural value chains, with particular emphasis on increasing exports; and (vi) adopt and promote ecological agriculture to preserve natural resources. Other major agricultural policy reforms have started to change the way direct support to farmers is handled. For the first time, subsidies to agricultural inputs are being provided through voucher schemes, which are less distortionary than traditional subsidies applied across the board to input prices. The use of vouchers has encouraged increased participation by the private sector in the provision of inputs, allowing for a general positive spillover effect on non-beneficiaries. Finally, ongoing efforts have been made in strengthening the capacity of key institutions charged with the provision of agricultural public goods and services, in particular in the areas of animal and plant health, but also in the areas of research and development (R&D) and extension.

10 The objectives of the National Plan of Agricultural Investments (2011-2016) includes (a) increasing the productivity and competitiveness of the agricultural sector, (b) increase by 25 percent the contribution of agriculture productivity to national food availability, (c) Reduce by 50 percent the number of individuals in food insecurity, (d) Increase agricultural income for at least 500,000 households, (e) Increase resilience of the population to natural hazard.



6. **This report on the linkages between rural economic activities, food security, and poverty in Haiti takes advantage of a new and unique data set¹¹.** The analysis presented below is based on data from the first wave of the panel survey, *Enquête sur les Conditions de Vie de Ménage Après le Séisme* (ECVMAS 1), conducted in 2012-13 by the National Bureau of Statistics of Haiti, *l'Institut Haïtien de Statistique et d'Informatique (IHSI)* in collaboration with the World Bank and the French research institution, *Développement, Institutions et Mondialisation (DIAL)*. The survey follows the typical Living Standards Measurement Study (LSMS) framework. The survey sample was designed to be representative at the national, departmental and rural/urban levels. The full ECVMAS sample includes 4,960 households, both urban and rural, drawn from 500 enumeration areas. For the purpose of this chapter, the analysis has been restricted to the rural sub-sample, which includes 2,296 households from 287 enumeration areas.
7. **One of the main objectives of ECVMAS 1 is to capture key socio-demographic and socio-economic characteristics of the population.** ECVMAS 1 contains comprehensive data on employment and unemployment, agricultural and non-agricultural economic activities of the household, primary and secondary economic activities of the individuals, housing conditions, consumption spending, migration, shocks as well as coping mechanisms. The ECVMAS data enables a closer look at crop, livestock and other agricultural activities of the 80 percent of rural households engaged in agriculture. Detailed information was also gathered on the nonfarm sector, focusing on areas such as industry of activity, size of enterprise, ownership, and destination of products.¹²
8. **The availability of such comprehensive data on post-earthquake Haiti allows us to gauge with greater accuracy the current living conditions and socio-economic profiles of rural Haiti** and to help determine some of the potential barriers to rural development. Section 2 presents a detailed profile of rural households in Haiti and their food security status. Section 3 examines the economic activities of rural household both in the farm and nonfarm sectors. Section 4 presents analysis on the determinants of rural income generating activities in Haiti and explores the role of remittances. The analysis also examines the factors that matter for poverty and food security of rural household in general and agricultural households in particular. Section 5 concludes by summarizing key findings and policy implications.

11 The analysis in this report is carried out within the availability of data collected in the first wave of the ECVMAS survey.

12 The ECVMAS has some limitation on the quality and accuracy of the data, which would have been useful for this study, such as data on soil, productivity, access to irrigation, credit or localization.



9. **This section presents descriptive statistics on rural households in Haiti, reports on the economic activities of these households, and examines the correlates to poverty.** For present purposes, Haiti's 10 departments are grouped into four regions:¹³ Nord, Sud, Transversale, and Ouest.

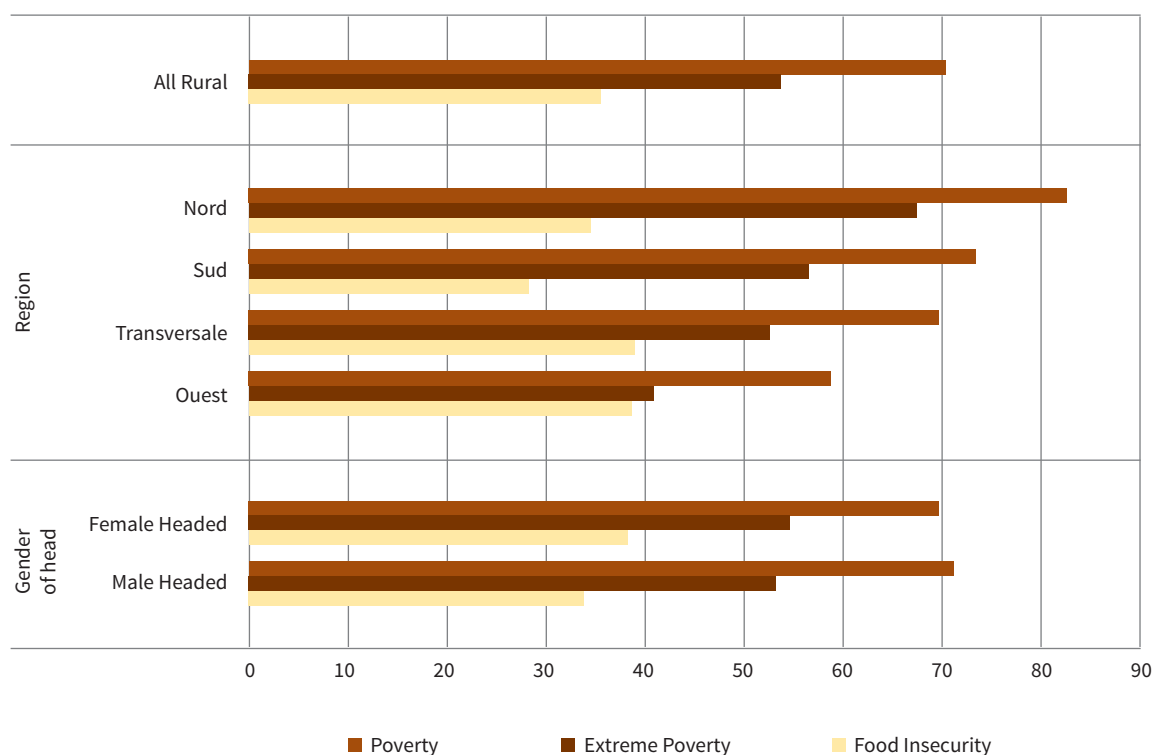
3.1 Characteristics of Rural Households

10. **Rural households in Haiti suffer from higher rates of poverty than urban households, for example those found in the Port-au-Prince (PAP) region.** Using a poverty line of \$1.98/day, 70.7 percent¹⁴ of all rural households are categorized as poor (Figure 2.1). The rural poverty rate ranges from a low of 59.8 percent in Ouest region to a high of 82.8 percent in Nord region. These variations are likely due in part to the regions' respective physical proximities to urban centers such as PAP, the Ouest being the closest and the Nord the most remote. About 53 percent of the rural population lives in extreme poverty, surviving on less than \$1.00/day. The rate of extreme rural poverty is highest in Nord region, where over 67 of the population lives in extreme poverty. Female-headed households experience marginally higher rates of extreme poverty and food insecurity than male-headed households.
11. **Education levels are low in rural Haiti, with an average of 2.8 years of education for the household head.** Education levels are slightly higher in Ouest region compared with the other regions, where household heads have 3.5 years of education on average and about 51 percent are literate (Table A1). This is not unexpected as the Ouest region has the highest share of non-poor rural households. Education levels reflect a gender gap: male household heads report more years of schooling compared to female household heads (3.4 vs 1.9).

13 Haiti is divided into 10 departments: Artibonite, Centre, Grand'Anse, Nippes, Nord, Nord-Est, Nord-Ouest, Ouest, Sud-Est, and Sud. The department with the highest share of rural households is Sud-Est with 85.1 percent of households classified as rural. This is followed by the Nippes department with 82.2 percent rural households, the Centre department with 80.6 percent, the Sud department with 78.5, and the Grand'Anse department with 77.8 percent rural. The Ouest department, home to the nation's capital Port-au-Prince, has the lowest share of rural households by far with just 20.6 percent of households classified as rural. Although, Ouest has the lowest share of rural households, due to its high population it has the highest number of rural households. The departments are grouped in 4 regions as follows: 1. Nord: Nord, Nord-Est and Nord-Ouest; 2. Sud: Grand'Anse, Nippes and Sud; 3. Transversale: Artibonite and Centre and 4. Ouest: Ouest and Sud-Est. The 5th region, Aire Metropolitaine, is not relevant to rural analysis and therefore not represented in this chapter.

14 The poverty rate of 70.7 percent is based on the rural sub-sample used in the analysis in this chapter.

Figure 2.1: Poverty and Food Insecurity Status of Rural Households



12. In rural Haiti, the very high of economic dependency ratio¹⁵ found in rural Haiti (94.3 percent) translates to an almost 1:1 person pressure on the productive population. While the dependency ratio provides some insight into the household composition, it can be misleading. In the case of Haiti especially, the dependency ratio as conventionally defined does not necessarily reflect the labor dynamics of rural households, where individuals past the age of retirement (65 years) often continue to engage in economic activities. In Haiti, 58 percent of individuals past the age of 65 still contribute actively to the household economy. Households with high dependency ratios are frequently poor, which is supported by the data from Ouest region, which has the lowest dependency ratio (87.6 percent) (Table A1).

15 The dependency ratio is defined as the number of individuals outside the working age group of 15-64 divided by the number of individuals in the working age group. The dependency ratio is different from the 'economic dependency ratio,' which takes into account the entire working population regardless of age.

Table 2.1a.: Household Characteristics (Percentage unless otherwise noted)

	All Rural
Household Head is male	61.5
Age of household head	49.4
Household Head Edu (years)	2.8
Household Head is literate	45.9
Household head in committed relationship	65.5
Household size	4.9
Number of children under 5yrs old	0.6
Dependency Ratio ¹	94.3
Per capita Annual Consumption (HTG) ²	30695.5
Observations	2261

1. Dependency ratio is based on 2154 hhs, since 107 hhs reported no adults of working age.

2. The computed annual consumption is based on Oct 2012 prices and is also geographically deflated.

- 13. Rural households in Haiti have poor access to infrastructure, such as electricity, safe water sources, and adequate waste disposal systems (Table 2.1b).** Although most rural households own their dwelling, the dwellings tend to be constructed using inferior materials, and many are considered precarious¹⁶. Access to electricity in rural Haiti is very limited, with the highest levels of home electrification (22.2 percent) occurring in Ouest region. The region with the greatest access to clean water needed for drinking and for use in household activities such as cooking and cleaning is the Ouest, with about 65.3 percent and 41.3 percent of households reporting access to safe water sources for these two categories. Low penetration of key infrastructure in rural Haiti is a direct constraint on the country's ability to reach its Millennium Development Goals.
- 14. Non-poor households are better educated, smaller in size, and characterized by lower dependency ratios.** Among households classified as non-poor, per capita annual consumption expenditures (HTG 62,319) are more than three times higher than per capita annual consumption expenditures in poor households (HTG 17,624) (Table 2.2a). A greater proportion of non-poor households (40.9 percent) reported experiencing earthquake-related damage to their dwellings than poor households (33 percent), which could be due to the closer proximity of many non-poor households to the hard-hit urban centers. Poor households tend to live in lower quality dwellings, with less access to infrastructure and public services (Table 2.2b).

¹⁶ Dwellings are defined as precarious if the structure is made from cheap materials such as homes with thatch roofs, mud walls, palm leave doors and usually with minimal open air cooking facilities, or if it is assembled from discarded construction materials, in tents or temporary shelters.

Table 2.1b.: Housing Characteristics (Percentages unless otherwise noted)

	All Rural
Ownership of dwelling	84.3
Dwelling is considered precarious	18.0
Number of rooms	2.7
Walls are mostly made of bricks/stone or cement	49.0
Roof is mainly cement	5.6
Flooring is mainly cement or ceramic/mosaic	46.0
Main source of cooking fuel is wood	81.8
Main source of lighting is electricity	12.1
Main drinking water source is from a protected or safe source ¹	56.9
No toilet system (nature)	36.5
Observations	2261

The safe source includes any treated water source or naturally safe such as artesian wells.

Table 2.2a.: Household Characteristics by Poverty Status (Percentages unless otherwise noted)

	All Rural	Non Poor	Poor	Difference ttest ⁴
Household Head is male	61.5	60.4	61.9	1.5
Age of household head	49.4	48.8	49.7	0.9
Household Head Edu (years)	2.8	4.5	2.1	-2.4***
Household Head is literate	45.9	60.7	39.8	-20.8***
Household head in committed relationship	65.5	55.0	69.8	14.7***
Household size	4.9	3.5	5.5	2.0***
Number of children under 5yrs old	0.6	0.3	0.8	0.5***
Dependency Ratio ¹	94.3	58.5	108.8	50.3***
Per capita Annual Consumption (HTG) ²	30,695	62,272	17,621	-44,651.6***
House was damaged in earthquake	35.4	40.9	33.0	-7.9***
Observations ³	2261	707	1554	

1. Dependency ratio is based on 2154 hhs. 107 hhs reported no adults of working age.

2. The computed annual consumption is based on Oct 2012 prices and is also geographically deflated.

3. The number of observations of poor and non-poor is unweighted

4. Note: Significance levels are *** p<0.01, ** p<0.05, * p<0.1

Table 2.2b.: Housing Characteristics by Poverty Status (percentages unless otherwise noted)

	All Rural	Non Poor	Poor	Difference ttest ³
Ownership of dwelling	84.3	77.3	87.1	9.8***
Dwelling is considered precarious	18.0	13.4	19.9	6.5***
Number of rooms	2.7	2.8	2.6	-0.2**
Walls are mostly made of bricks/stone or cement	49.0	63.7	42.8	-20.9***
Roof is mainly cement	5.6	13.6	2.3	-11.2***
Flooring is mainly cement or ceramic/mosaic	46.0	67.8	36.9	-30.9***
Main source of cooking fuel is wood	81.8	60.9	90.4	29.5***
Main source of lighting is electricity	12.1	25.1	6.7	-18.4***
Main drinking water source is from a protected or safe source ¹	56.9	69.6	51.7	-17.9***
No toilet system (nature)	36.5	21.1	42.9	21.8***
Observations ²	2261	707	1554	

1. The safe source includes any treated water source or naturally safe such as artesian wells.

2. The number of observations of poor and non-poor is unweighted

3. Note: *** p<0.01, ** p<0.05, * p<0.1

15. Food insecurity is more pronounced among the poorest of the poor. The lowest consumption quintile experiences the highest levels of food insecurity, suggesting that the poor are caught in a food security trap. If this is the case, any intervention that helps households trapped at the bottom of the distribution to move closer to the poverty line (while still being poor) could translate to considerable increases in food security. Using both the objective measure (FAO index)¹⁷ and the self-reported measures of food security, we observe wider gaps between households in the lowest quintile and in the 20-40 quintile than between the other quintiles (Table 2.3). Furthermore, the share of food insecure households decreases along the consumption quintile using either measure (Table A8). As expected, we also find that within the food secure rural population, non-poor households enjoy a higher food security index score than poor households (Table 2.4)

17 The FAO dietary diversity score (HDDS) is constructed by grouping food consumption in questionnaire into 16 food groups designated by FAO guidelines. The 16 food groups (cereals, white roots and tubers, vitamin A rich fruit, flesh meat etc.) are then aggregated into 12 dietary groups. Each household ends up with a HDDS score between 0-12. The cut-off point chosen was 8 whereby a household is considered food insecure with a HDDS score of 8 or lower.

Table 2.3. Food Security Index

	Food Security Index (FAO) Score ¹		Food Security Index (Self-Reported) ²
	Mean Score	%	%
All rural	8.9	35.7	32.6
Consumption quintiles			
Lowest	7.4	68.9	54.1
20-40%	8.5	43.7	38.0
40-60%	9.2	33.1	30.9
60-80%	9.4	24.5	22.7
Highest	9.9	13.5	20.6

1. FAO security Index is based on Household Dietary Diversity Index score ranging between 0-12, (see Swindale and Ohri-Vachaspati, 2005). The cutoff point chosen was 8, based on Crush et al. (2012) findings on link between food security and FAO hdds score.

2. The self-reported food security score takes on a 0-1 value based on 3 questions about consumption (no access to food, spent a day without eating or went to bed hungry). Household were classified as food insecure if they suffered at least one of the three conditions listed above for at least 10 days within the last 4 weeks.

Table 2.4. Food Security Score

	Food Security Index (FAO) Score		
	Poor	Non-poor	T-Test
Food Secure	9.9	10.4	-0.5***
Food Insecure	6.8	6.6	0.3

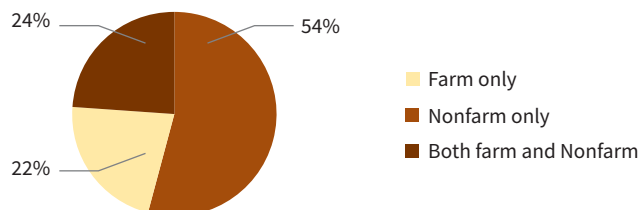
3.2 Economic Activities of Rural Households

- 16. About 54 percent of households in rural Haiti engage in farm activities only, while 22 percent of households engage in nonfarm activities only.¹⁸** Even though agriculture is the dominant activity in rural Haiti, with about 78 percent of households engaging in agricultural activities, there is some degree of diversification, as almost 25 percent of agricultural households also

¹⁸ Farm only category is defined as households where all economically active members are engaged in a farm activity. This includes households where all members are only engaged in agricultural wage activities. The nonfarm only category refers to households where all economically active members are engaged in nonfarm activities whether household enterprise or nonfarm wage/salary. Both Farm and Nonfarm category refers to households where economically active members are engaged in a combination of farm and nonfarm activities. Some examples of nonfarm activity include selling pre-made products such as shoes, soap and packaged food such as rice and candy.

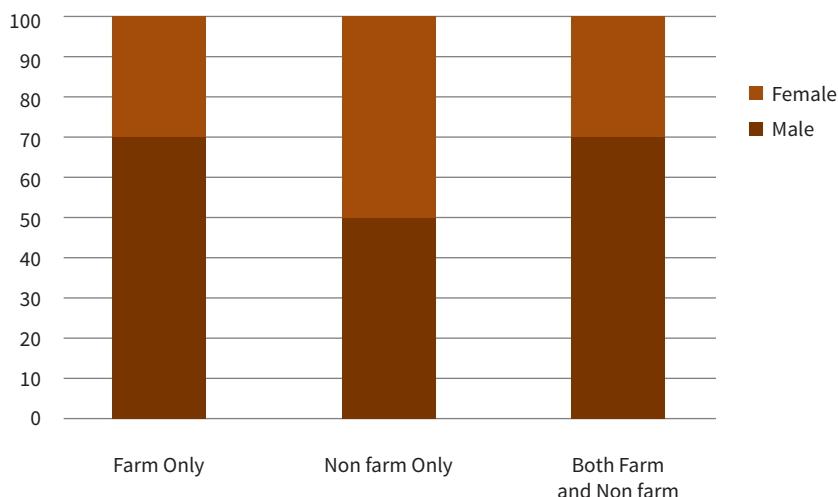
engage in at least one nonfarm activity (Figure 2.2). Overall, 46 percent of rural households engage in the nonfarm sector, which can be related to agriculture on the upstream (input suppliers) or on the downstream (value-adding and processing) or be separate to the sector (such as small retail).

Figure 2.2: Participation of Rural Households in Farm and Nonfarm Activities



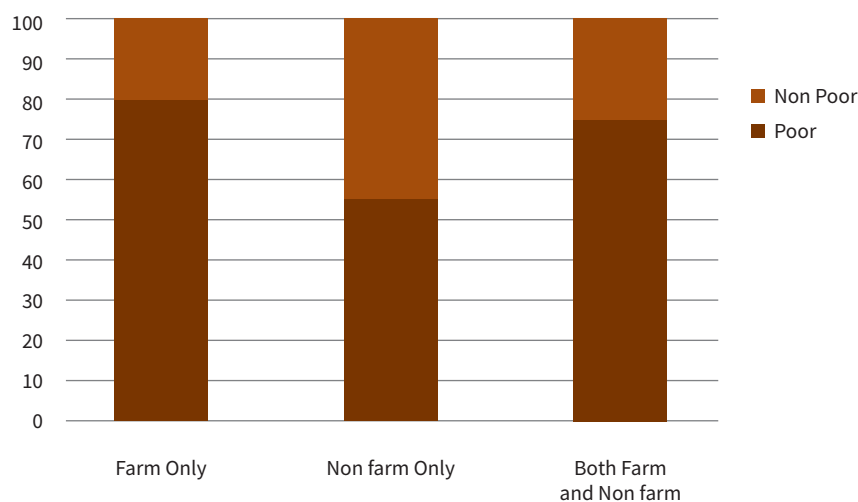
17. **Participation in nonfarm activities is highest in Ouest region** (Table A2a), where 32.4 percent of all households are involved in nonfarm activities. This is not surprising, given that Ouest region has the highest education levels and literacy rates, which are important factors for participation in nonfarm activities. Ouest region is also located close to the capital, PAP, so many more households have better access to infrastructure such as electricity and safe water sources, which are especially relevant for nonfarm activity.
18. **Female-headed households are twice as likely to be engaged in a nonfarm household enterprise only** (Table A2a). A much higher proportion of female-headed households is engaged in nonfarm household enterprises only, compared to male-headed households (31.7 percent compared to 16.4 percent). Female-headed households also make up over 51 percent of nonfarm enterprises only, highlighting the economic role of this sector for female-headed households (Figure 2.3).

Figure 2.3: Economic Activities, by Gender of Household Head



19. **Households that depend on agriculture are poorer than households that depend on nonfarm activities.** Among agricultural¹⁹ households, a much higher proportion (80.6 percent) are poor compared with households involved in nonfarm activities only (54.7 percent) (Figure 2.4 and Table A2b). Gender differences in poverty are also higher among households engaged in agricultural activities only. Diversification of livelihood into the nonfarm sector appears to be beneficial to rural households in Haiti, as we find a positive correlation between participation in the nonfarm sector and lower levels of poverty. Households with both farm and nonfarm income sources are less likely to be poor than those engaged in farming alone.

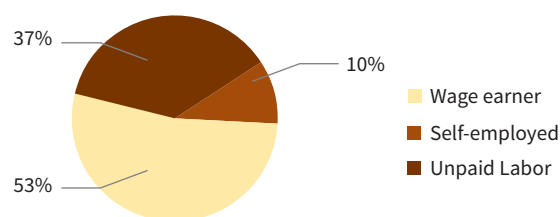
Figure 2.4: Economic Activities, by Poverty Level



20. **The majority of the employed in rural Haiti (90 percent) are engaged in a household-owned economic activity.** Most of these individuals work on a household farm or in a household-run non-farm enterprise, either as the owner or as an unpaid worker. Income from these activities is generally taken as household income. Wage employment is limited in rural Haiti, with only a small percentage of individuals (10 percent) employed as wage laborers (Figure 2.5).

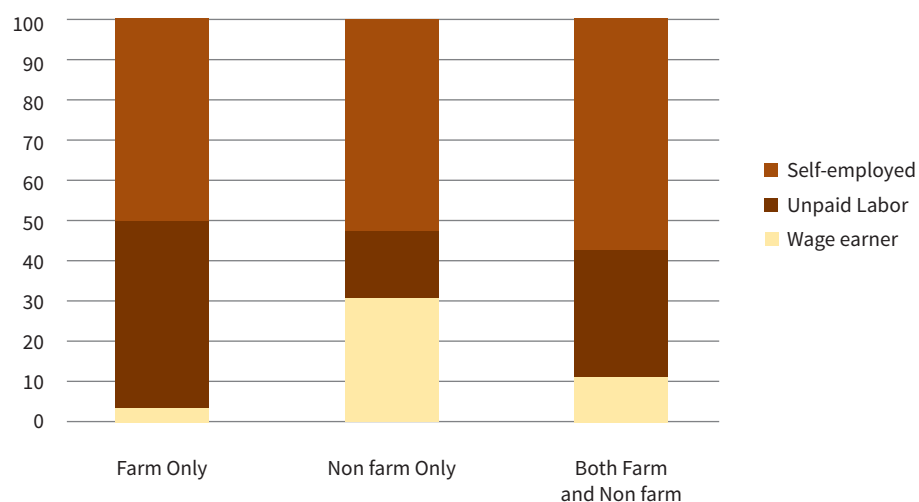
19 Agriculture households are defined as households that have crop, livestock, and/or agriculture wage activity. Some of these households also have nonfarm activities.

Figure 2.5: Participation of Individuals, by Type of Employment



21. **Within farm-only²⁰ households, the share of self-employed individuals and the share of unpaid household labor are roughly equal.** By comparison, in the nonfarm sector the shares of self-employed individuals and wage earners are much higher than the shares of unpaid household labor. The majority of the individuals in the sample of farm-only households are self-employed, with female-headed households having a higher share of self-employed individuals compared with Male-headed households (Table A3). Regionally, self-employment is the most common type of work in all four regions.

Figure 2.6: Employment by Farm and Nonfarm Participation



22. **The agricultural sector employs the largest percentage (70 percent) of individuals in rural Haiti (Table 2.5).** The trade sector trails far behind, employing only 17 percent of the population. Transversale region has the highest share of individuals engaged in agricultural employment. Female-headed households participate more in trade activities than Male-headed households, with participation rates of 20.9 percent and 14.7 percent, respectively. Female-headed households make up less than 35 percent of workforce. About 65 percent of female-headed households have at least one person working in agriculture,

20 Farm only category includes all rural households that engage only in agricultural economic activities.

a figure that is only slightly lower than the equivalent figure in male-headed households (see Table 2.5 below).

Table 2.5: Industry of employment

	Agriculture	Industry	Trade	Transport	Education	Other
All rural	70.8	3.6	16.7	1.5	2.0	5.4
Gender of Head						
Female	64.7	4.9	20.9	1.4	2.1	6.0
Male	73.6	3.0	14.7	1.5	2.0	5.2
Poverty Status						
Poor	75.2	3.5	13.6	0.9	1.4	5.4
Non-poor	57.4	4.0	26.2	3.1	3.8	5.5
Food Security						
Food Insecure	75.0	3.9	12.6	1.4	1.2	6.0
Food Secure	68.8	3.5	18.7	1.5	2.4	5.2

3.2.1 Agriculture

Factors of production

23. **Agricultural households in Haiti tend to cultivate relatively small areas, with average landholdings of 1.3 ha (Table 2.6)²¹.** This is similar to Sub-Saharan African countries such as Burundi, Rwanda, and Malawi, where over 80 percent of landholdings also tend to be smaller than 1.5ha. Female-headed households cultivate slightly smaller plots compared with male-headed households. Female-headed households are also less likely to lease in and lease out land compared with male-headed households. The areas leased in or leased out by households are small relative to the size of owned landholdings (see appendix Table A4). Many farmers engage in practices designed to improve soil fertility, as evidenced by the substantial share of households that regularly leave some land fallow. The cost of cultivating infertile land may also be high relative to the benefits, making it rational to leave infertile land fallow.

21 Available survey data does not allow us to identify rural community land practices specific to Haiti such as any potential pooling of resources and land among farmers for better water access.

Table 2.6: Land Acquisition (Percentages unless otherwise noted)

	All rural	Female	Male	T-Test	Poor	Non-Poor	T-Test
Own Land	89.7	89.8	89.6	-0.2	90.1	88.3	1.7
Land size (Owned, ha)	1.0	0.9	1.1	0.1*	0.9	1.2	-0.3
Leased in land	31.7	23.3	35.4	12.1***	30.2	36.6	-6.4*
Leased out land	16.4	12.8	17.9	5.1**	14.9	21.0	-6.1**
Left land fallow	34.5	31.4	35.9	0.0	34.7	33.9	0.9
Land Size (cultivated, ha)	1.3	1.2	1.4	0.2*	1.2	1.6	-0.4**

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 2.7. Agriculture Inputs (Percentages unless otherwise noted)

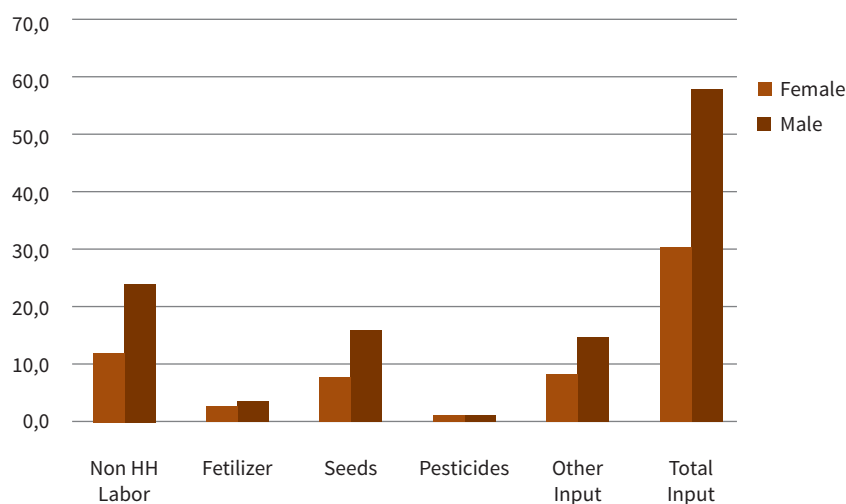
	All rural	Female	Male	ttest	Poor	Non-Poor	ttest
Labor input							
Used non-household labor	67.3	59.4	70.7	11.3***	65.1	74.3	-9.3**
Non hh labor (number)	5.7	5.0	6.1	1.1	5.1	7.7	-2.5**
Value of non hh labor (HTG)	2068.7	1414.8	2355.2	940.4**	1663.5	3347.7	-1,684.1***
Hh labor (number, incl. owner)	2.6	2.4	2.6	0.2	2.7	2.2	0.5***
Non labor input							
Fertilizer incidence	21.1	21.3	21.0	-0.3	17.8	31.5	-13.6***
Fertilizer amount spent (HTG)	650.1	413.4	753.9	340.5	363.5	1555.1	-1,191.6**
Seeds incidence	53.8	48.8	56.0	7.2**	52.2	58.7	-6.5*
Seeds amount spent (HTG)	960.2	642.4	1099.4	457.0***	821.0	1399.5	-578.6***
Pesticides incidence	20.1	16.4	21.7	5.4	19.6	21.6	-2.0
Pesticides amount spent (HTG)	95.6	77.3	103.6	26.4	73.1	166.7	-93.6*
Share of total input cost/ total value of production	49.7	30.4	58.2	27.8***	50.5	47.4	3.1

- 24. Male-headed households have better access to productive factors, both labor and non-labor inputs.** Given the high demand for labor during the planting and harvest periods, it is not surprising that households resort to hired labor to supplement their own family labor (Table 2.7). Male-headed households are not only more likely to rely on non-household²² labor; they also use higher numbers of hired workers than female-headed households. Similar patterns also are evident in the case of purchased inputs such as fertilizer, improved

22 Unfortunately, the non-household labor cannot be separated into paid and unpaid labor (e.g., exchange labor) because this information is not available in the survey.

seed,²³ and pesticides: male-headed households are more likely to use purchased inputs (except for fertilizer), and they tend to spend more on purchased inputs. As a share of total production value, male-headed households spend more on both labor and physical inputs than female-headed households, except in the case of pesticides, where female-headed households spend marginally more (Figure 2.7).

Figure 2.7: Share of Input Cost in Total Production Value



Types of agricultural activities

25. As mentioned earlier, agriculture is a core economic activity in rural Haiti, with the majority of farm households growing food crops, and nearly 50 percent growing at least one cash crop. About 71.4 percent of all rural households engage in at least one agricultural activity, although a greater proportion of male-headed households (81.4 percent) participate in agricultural activities than female-headed households (57.6 percent) (See appendix Table A5). It is also worth noting that 84.3 percent of households growing food crops sell part of what they grow.²⁴ In addition to growing crops, 74.8 percent of households raise cattle and other livestock, and 30.4 are engaged in forestry activities. Households that grow cash crops are more likely to be non-poor and more likely to be food secure (Table 2.8). Food secure household are more likely to raise livestock than food insecure households.

23 The survey does not have adequate information to distinguish between those that purchased improved seeds and those that bought regular seeds.

24 The agricultural module unfortunately does not provide us with quantities produced, sold or consumed but provide values instead. This limits the ability to analyze the share of production sold, consumed or otherwise.

Figure 2.8: Percentage of Households Engaging in Different Farming Activities

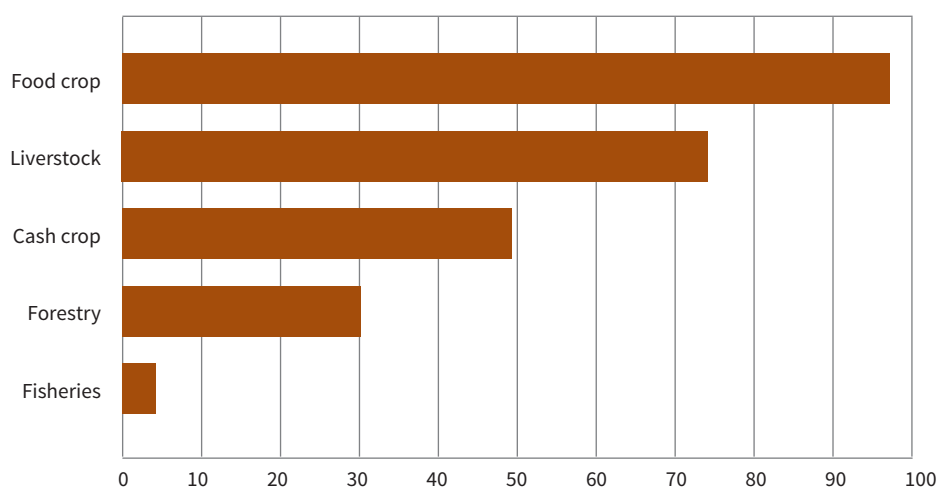


Table 2.8. Activities of Agricultural Households (Percentages)

		Cash Crop ¹	Food Crop	Livestock	Fisheries	Forestry
All rural		49.7	97.7	74.8	4.2	30.4
Gender of Head						
	Female	46.9	96.9	69.8	4.7	21.6
	Male	51.0	98.1	77.0	3.9	34.3
Poverty Status						
	Poor	47.8	97.6	74.1	3.2	30.8
	Non Poor	55.7	98.2	77.0	7.1	29.0
Food Security Status						
	Food secure	53.5	97.5	77.0	5.9	30.8
	Food Insecure	42.7	98.0	70.7	1.0	29.7

Cash crops include mangoes and coffee

26. **Diversification within agriculture is common in rural Haiti, with male-headed households more likely to diversify than female-headed households (Figure 2.9)²⁵.** The most commonly combined activities are crop and livestock, followed by crop, livestock and forestry or fishery. Mangoes are the most common cash crop, with over 40 percent of households growing mangoes compared with about 17 percent growing coffee (Figure 2.10). The three most commonly cultivated crops are maize, bananas, and cassava/yams. The average farm household cultivates about 5 crops (Table 2.9).

25 Available survey data does not allow us to capture information on crop rotation practices of rural farm households.

Figure 2.9: Diversification of Farm Activity, by Gender

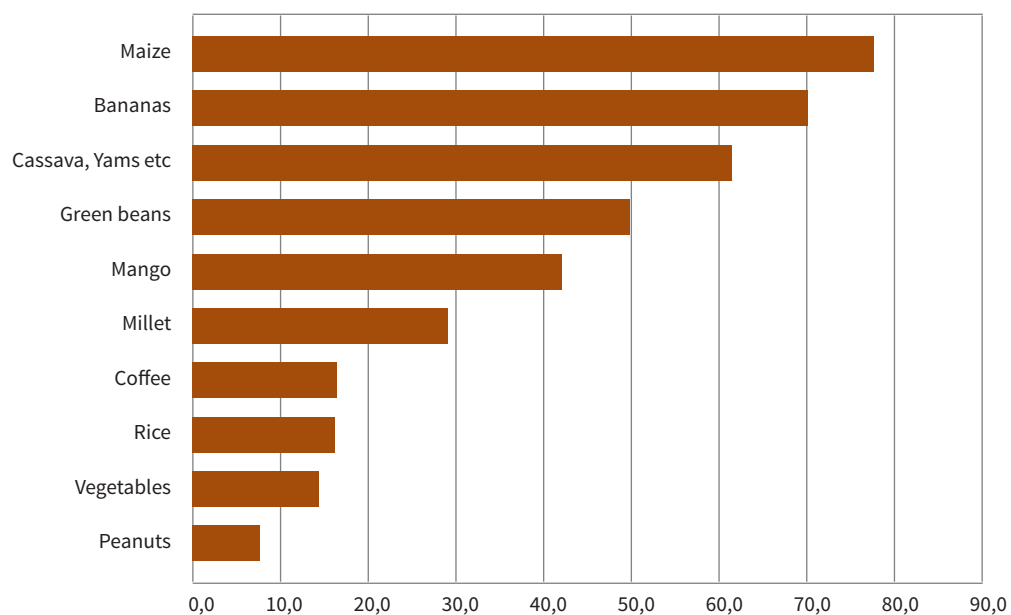


Figure 2.10: Principal Crops, by Frequency of Cultivation

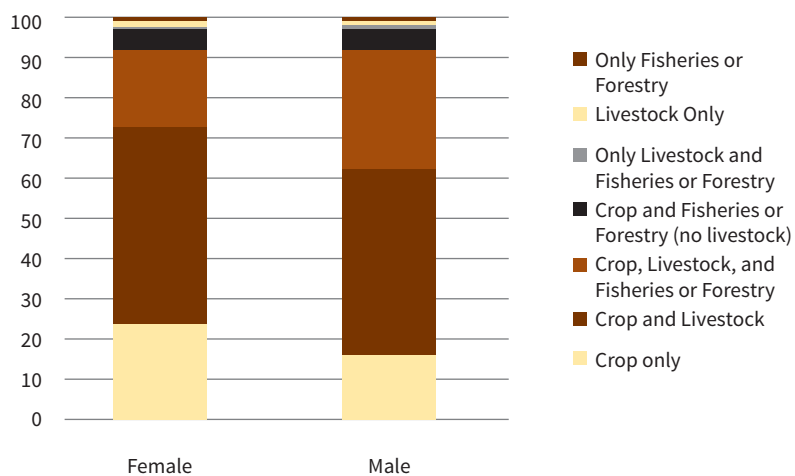


Table 2.9: Diversity in cropping patterns, by Region and Household Characteristics

		Average number of crops grown	Share of farms that grow 4 or more (%)
All rural		4.7	72.5
Region			
	Nord	4.6	74.6
	Sud	4.9	78.6
	Transversale	4.5	66.1
	Ouest	4.7	73.4
Gender of Head			
	Female	4.4	68.6
	Male	4.8	74.2
Poverty Status			
	Poor	4.6	73.0
	Non Poor	4.7	70.8
Food Security Status			
	Food secure	4.8	74.4
	Food Insecure	4.4	69.0

27. The livestock sector in Haiti is dominated by poultry and small ruminants.

The livestock sector is a small scale sector and is most commonly exercised as a joint activity alongside other crop production. Relatively few households raise cattle or pigs. Poultry are the most common type of livestock raised in rural Haiti and regionally. It is also the most common livestock among poor farm households, followed by goats. Male-headed households are more likely to raise livestock, but female-headed households are more likely to use non-household labor in their livestock activities (Table 2.10).

Figure 2.11: Type of Livestock Kept by Rural Households

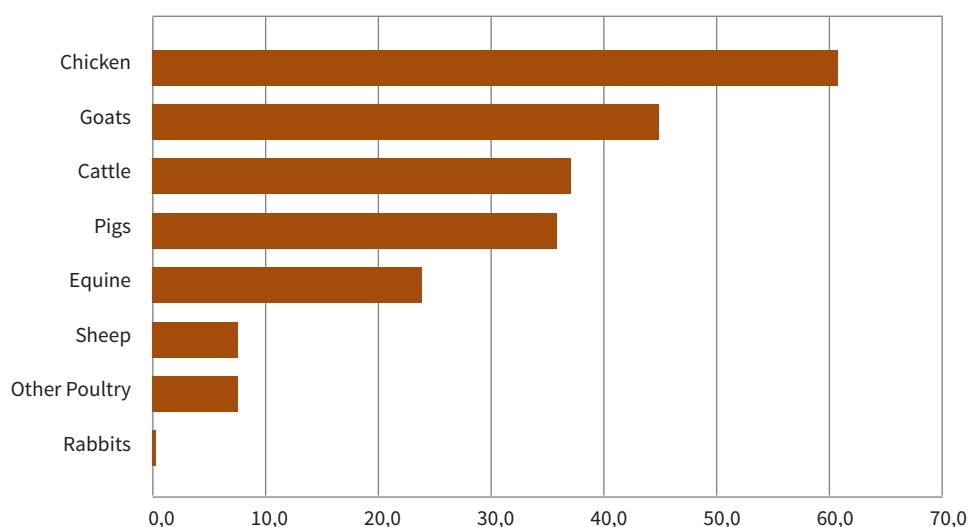


Table 2.10: Livestock Inputs (Percentages)

	All rural	Female	Male	ttest	Poor	NonPoor	ttest
Incidence of owning livestock	74.8	69.8	77.0	7.2**	74.1	77.0	-2.9
Labor input:							
Incidence of labor	33.5	34.1	33.2	-0.9	32.8	35.7	-2.9
Non labor input (vet and other):							
Incidence of nonlabor	71.1	65.4	73.7	8.3***	69.6	76.1	-6.5**

3.2.2 Nonfarm Activities²⁶

Types of nonfarm activities

28. In Haiti as in many other countries, the nonfarm sector can provide an important source of household income for the rural poor and eventually serve as a pathway out of poverty. Having a nonfarm enterprise (NFE) in Haiti is positively correlated with not being poor and being food secure. The differences in participation between poor and non-poor and food secure and food insecure are statistically significant. We also find statistically significant differences in NFE participation between male and female headed-headed

²⁶ The term 'Nonfarm Activities' is defined as all economic activities that are not classified as a farm activity, (see footnote 18). They include the sale of goods that have been manufactured (transformed), goods sold without transformation and services. The main type of nonfarm activity is the resale of goods without transformation, in particular sale of rice and of soap products.

households with the latter having higher participation. In the nonfarm sector, the majority of activities are in the trade industry, where female-headed households are more likely to be involved than male headed households. Such activities can be related to agriculture on the upstream (input suppliers) or on the downstream (value-adding and processing) or be separate to the sector (such as small retail). The non-poor participate more in higher skilled industries, such as education and health.

Table 2.11: Nonfarm Activity, by Type of Household (Percentages)

		Household enterprises %	Salaried/Wage Nonfarm %	Other Nonfarm ¹ %
All Rural		31.5	13.8	6.6
Gender of Head				
	Female	34.6**	13.3	6.9
	Male	29.6**	14.1	6.4
Poverty Status				
	Poor	27.8***	12.9	5.7**
	Non Poor	40.4***	15.9	8.7**
Food Security Status				
	Food secure	36.2***	14.1	7.5**
	Food insecure	23.1***	13.2	5.0**

Other nonfarm employment includes unpaid apprenticeship and hh labor.

Note: * indicate statistically significant differences within category.

*** p<0.01, ** p<0.05, * p<0.1

Table 2.12: Households Participation in Nonfarm Activities by Industry (Percentages)

		Industry and Construction	Trade and Commerce	Transportation	Education and Health	Other Services
All Rural		15.6	63.9	6.2	8.9	24.0
Gender of Head						
	Female	16.3	66.5	5.6	7.7	21.0
	Male	15.1	62.1	6.6	9.7	26.1
Poverty Status						
	Poor	16.9	62.2	4.9	7.8	28.5
	Non Poor	13.4	66.6	8.4	10.7	16.5
Food Security Status						
	Food secure	14.1	66.5	6.4	9.9	21.9
	Food insecure	19.2	57.5	5.9	6.2	29.4

Profile of nonfarm household enterprises

29. In the nonfarm sector, as in the farm sector, male-headed households have greater access to productive factors than female-headed households. A greater proportion of male-headed households reported having access to labor, both hired and household labor (Table 2.13). Similar to households in other developing countries, households in Haiti diversify their economic activities to decrease their income dependence to a sector such as agriculture that is frequently affected by weather shocks and very vulnerable to international market price variability. Participation in the nonfarm sector thus can be viewed as a risk diversification strategy designed to minimize effects of exogenous shocks on income. The most common reasons provided by households for starting nonfarm enterprises include increasing income and compensating for the unavailability of wage employment (Table A6). Most nonfarm enterprises in rural Haiti operate on a small scale in the informal sector, for example selling pre-fabricated products (Table A7). Many are extremely small micro-enterprises averaging 1-2 workers including the owner, and the biggest market they serve consists of other households.

Table 2.13. Household Enterprise Profile

		Size	Workforce			Type of Business
		(workers)	Hired-in Workers ¹		Household Workers (excl. owner) ²	Informal
		Mean	%	Mean.	Mean.	%
All Rural		1.6	5.4	2.8	1.7	100.0
Region						
	Nord	1.5	6.6	2.1	1.4	100.0
	Sud	1.9	6.8	4.2	1.9	100.0
	Transversale	1.3	2.7	2.8	1.7	100.0
	Ouest	1.5	5.5	1.9	1.8	100.0
Gender of Head						
	Female	1.3	1.3	3.1	1.6	100.0
	Male	1.8	8.4	2.8	1.7	100.0
Poverty Status						
	Poor	1.5	4.6	2.3	1.6	100.0
	Nonpoor	1.7	6.7	3.4	1.7	100.0

1. Conditional on using hired labor;

2. Conditional on having other household members working for enterprise besides the owner.

3.2.3 Other Income and Remittances

30. **Household composition of income in rural Haiti shows labor income is strongly supplemented by private transfers and consumption from own production (auto-consumption)** (see Figure 2.12). Private transfers play an important role in household income, contributing nearly as much as nonagricultural income. Private transfers are especially important for female-headed households, where they contributed nearly twice as much as male-headed households. Private transfers, which include remittances, represent a relatively greater share of income for higher income groups (Figure 2.13). Auto-consumption tends to be more important for lower income groups.

Figure 2.12: Income Composition of Rural Households

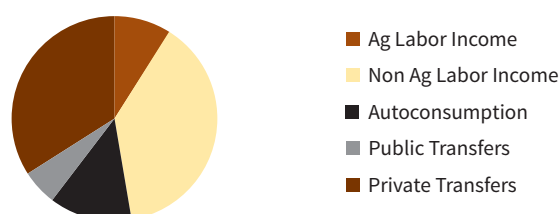
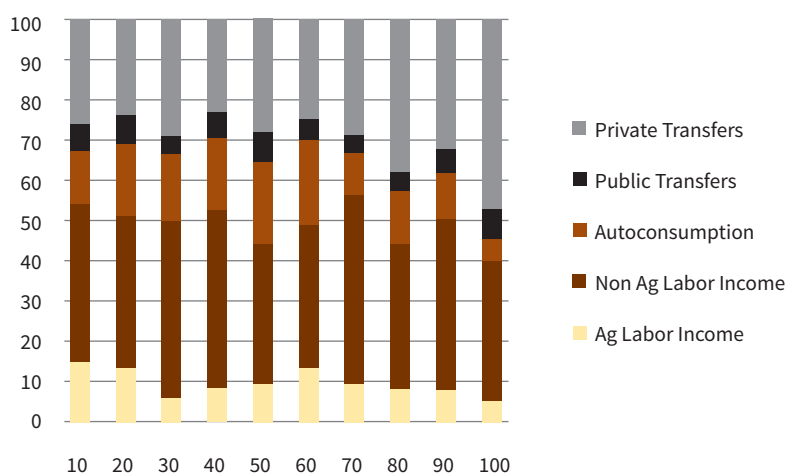


Figure 2.13: Income Composition, by Expenditure Percentiles of Rural Households



31. **Women are not only more likely than men to receive remittances from within and outside Haiti, but they are also more likely to receive them on regular basis.** Non-poor households are more likely to receive remittances from abroad but less likely to receive from within Haiti, and their remittances are more likely to be regular. Non poor households tend to receive more than twice the amount received by poor households. The most common use of transfer is for food followed by education. Food insecure households in the highest income quintiles receive the highest share of remittances as a proportion of income (Fig 2.14).

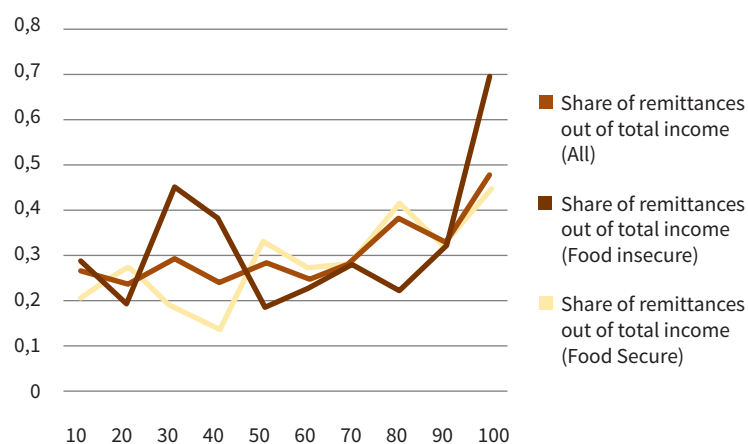
Table 2.14a. Remittances and Other Income (Percentages unless otherwise noted)

	All Rural	Poor	Non-Poor	Ttest	Female	Male	T-Test
Transfers:							
Remittances from Haiti	27.4	27.7	26.5	1.2	34.5	22.9	-11.6***
Remittances from Abroad	21.4	15.6	35.3	-19.7***	25.2	18.9	-6.3***
Any remittances	45.4	41.3	55.3	-14.0***	55.7	39.0	-16.7***
Remittances are regular	39.0	35.2	45.9	-10.6***	45.9	32.9	-13.1***
Average remittance size (HTG)	6473.6	4447.3	10130.9	-5,683.6***	7239.8	5786.6	-1,453.1
Remittance share of Income	269.4	226.8	346.5	-119.7	299.9	242.1	-57.9
Other Income Sources:							
Pension and other welfare	0.3	0.3	0.3	0.0	0.3	0.4	0.1
Real Estate	2.9	1.9	5.2	-3.3**	2.7	3.0	0.3
Other	5.9	5.1	7.7	-2.6*	4.5	6.7	2.1*

Table 2.14b.: Uses of transfers (Percentages)

	All Rural	Poor	Non-Poor	T-Test
Food	65.6	68.2	60.8	7.4**
Rent	0.1	0.1	0.1	-0.1
Education	15.1	15.0	15.4	-0.4
Health	6.0	5.3	7.2	-1.8
Construction or repairs to housing	2.1	1.9	2.3	-0.4
Family events (deaths, weddings etc)	2.2	2.0	2.4	-0.4
Economic Activity (Buying tools, raw materials etc)	2.1	1.9	2.6	-0.7
Other	27.4	22.7	35.7	-13.0***

Figure 2.14: Share of Remittances in Total Income, by Expenditure Decile



Determinants of Rural Income Generating Activities²⁶



32. **Increasing agricultural productivity is an important engine for reducing poverty and improving food security in developing countries (WDR 2008).** Because almost 80 percent of rural households in Haiti are engaged agriculture, improving agricultural productivity is one of the main levers for generating pro-poor growth and alleviating food insecurity. For this reason, it is important to examine the agricultural sector, with a view to identifying the factors that can lead to improved productivity. Other studies have examined the determinants of agricultural growth in Haiti (see Verner 2008), but the availability of new data allows us to update and expand upon previous findings. Even though the data used for the analysis are cross sectional data, we hope to be able identify the main factors that correlate with increased productivity in the agricultural sector. It should be highlighted that the analysis does not claim causality but rather aims to establish robust correlations.
33. The measure of agricultural productivity used in our analysis is *value of total harvest per hectare*. Consistent with the literature, we include the following variables as covariates: characteristics of the household such as gender of head, education of head, age of head and household size; landholding; physical inputs such as fertilizer, seeds, and pesticides; labor inputs; and other plot characteristics. The determinants of agricultural productivity are explored using a simple household level OLS specification in the form below.

$$\ln Y = \beta_0 + \beta_1 L^2 + \sum_i \alpha_i \ln P_i + \sum_j \gamma_j \ln D_j + \Omega X + \lambda + \varepsilon \quad (1)$$

Where Y is the total value of harvest per hectare, L is the total land size cultivated by the household in hectare, P_i and D_j represent the amounts of physical and labor inputs²⁸ (respectively) used by the household, X ²⁹ is a vector of other household and plot characteristics, department fixed effects are captured by λ , and ε is the idiosyncratic error term. In addition to estimating the regression for the entire rural sample, we also estimate the model for poor and non-poor agricultural households separately to find if there are noticeable differences in

-
- 27 Summary statistics of all variables used in the regressions are presented in appendix Tables A14a and A14b. Unfortunately, the data do not include GPS coordinates, which prevented the inclusion of geo-variables such as weather variables like temperature and rainfall in the analysis. Also, distant variables such as distance to market and roads were not available.
- 28 All physical inputs variables (log fertilizer use, log pesticide use, log seeds use), refer to input costs that were divided by the hectare size cultivated and were normalized by log transformation.
- 29 HH grows a cash crop is a dummy variable for whether the household produces either mango and/or coffee. Assistance post-earthquake variable is a dummy for whether household received help in the form of agricultural physical inputs such as fertilizer since earthquake. There is no information on amount received in module. The # of working age males and females refers to household members aged between 15 and 64.

the significant factors of production between poor and non-poor households.

34. **Farm size and agricultural productivity are inversely related in Haiti.** We find that larger farms are less productive than smaller farms. More precisely, a 1 percent increase in the farm size is correlated with a 0.4 percent decrease in agricultural productivity. This is a common finding in the agricultural literature relating to developing countries.³⁰ Global experience suggests that the reasons explaining this relationship probably have to do with differences in access to credit, irrigation³¹, labor, purchased inputs, or more often some combination of these.³² Some factors probably have greater importance in Haiti than in many other developing countries. For example, in this case remittances from abroad are strongly correlated to higher productivity of agricultural households: a 10 percent increase in international remittances is associated with a 2 percent increase agricultural productivity. This result must be interpreted with care, however, as the result is not statistically significant when the sample is separated into poor and non-poor households.

Table 2.15: Determinants of Agricultural Productivity

Dependent Variable: Log Total Crop Value per Ha	(All Rural)	(Poor)	(NonPoor)
Land Size:			
Log Harvested Hectares	-0.398*** (0.087)	-0.334*** (0.100)	-0.664*** (0.190)
Log Harvested Hectares, squared	0.048*** (0.011)	0.045*** (0.012)	0.101*** (0.033)

30 According to Barrett et al. (2010), the inverse relationship (IR) between farm size and productivity likely stems from one of three main reasons: (i) imperfect factor markets, (ii) omitted variables or (iii) statistical issues related to the measurement of plot size. As Carletto (2013) describes, imperfect factor markets (land, labor, insurance) are linked to differences in the shadow price of production factors that in turn lead to differences in the application of inputs per unit of land, in ways that are correlated with farm size. Carletto (2013) assesses the concerns about measurement issues being the reason why we observe IR and finds that this is with availability of better land measurements; the IR finding is strengthened, not weakened. This finding supports studies by Unal (2008) which showed that IR exists in Turkey and where Unal finds that IR is in particular driven by failures in the labor market. Vadivelu et al. (2001) and Masterson (2007) also find empirical evidence of IR in India and Paraguay. See Eastwood et al. 2010, Lipton 2009 for further examples.

31 Available survey data does not include irrigation access information or land quality/topography information. Future consideration of these specificities would enable a better understanding of their role in the Haitian context.

32 See Eswaran and Kotwal 1986.

Physical Inputs:			
Log Fertilizer use (HTG/ha)	0.250*** (0.049)	0.221*** (0.059)	0.331*** (0.097)
Log Pesticide use (HTG/ha)	0.254*** (0.056)	0.277*** (0.065)	0.171 (0.113)
Log Seed use (HTG/ha)	0.317*** (0.035)	0.356*** (0.040)	0.177*** (0.076)
Labor Inputs:			
Log Household labor used per ha	0.095 (0.075)	0.141* (0.084)	-0.179 (0.177)
Log Non HHlabor used per ha	0.145*** (0.046)	0.173*** (0.053)	0.048 (0.103)
Other Agricultural/Plot Characteristics			
Household owns livestock	0.163 (0.100)	0.181 (0.113)	0.093 (0.230)
Household grows at least one cash crop1	0.057 (0.099)	0.137 (0.114)	-0.264 (0.212)
Number of crops grown	0.234*** (0.026)	0.245*** (0.030)	0.176*** (0.051)
Household owns plot	1.074*** (0.143)	1.106*** (0.163)	1.101*** (0.313)
Assistance post-earthquake: fertilizer, tools, seeds, plant cutting	-0.060 (0.317)	-0.021 (0.371)	-0.048 (0.630)
Household Characteristics:			
Household Head:			
Household head is male	0.018 (0.095)	-0.001 (0.107)	-0.014 (0.211)
Age	0.012 (0.019)	0.019 (0.022)	-0.008 (0.038)
Age, squared	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Years education	0.024 (0.016)	0.025 (0.020)	0.005 (0.027)
Household Composition :			
# of working age male members	0.039 (0.043)	0.036 (0.048)	0.066 (0.104)

# of working age female members	0.013	-0.002	0.056
	(0.047)	(0.053)	(0.116)
# of dependents	-0.039	-0.036	-0.016
	(0.025)	(0.028)	(0.067)
Remittances :			
Household receives remittances from abroad	0.220*	0.197	0.212
	(0.116)	(0.140)	(0.211)
Household receives remittances from within Haiti	0.132	0.146	0.156
	(0.098)	(0.114)	(0.196)
Other Economic Activities :			
Nonfarm Household Enterprise	0.001	0.013	0.101
	(0.098)	(0.114)	(0.210)
Other Nonfarm wage	-0.159	-0.096	0.013
	(0.162)	(0.183)	(0.369)
Asset-Based Wealth Index	0.006	0.004	0.000
	(0.007)	(0.010)	(0.012)
Constant	0.910	0.390	2.987**
	(0.559)	(0.637)	(1.243)
Observations	1,499.000	1,180.000	319.000

Note: OLS point estimates with robust standard errors in brackets. Results for state fixed effects and asset based wealth index control variable not shown. Significance denoted * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

- 35. Higher expenditure on purchased inputs and on labor is correlated with increased productivity.** Use of purchased inputs (fertilizer, pesticide, and seeds) and of labor is positively associated with agricultural productivity. The main source of labor and the importance of labor vary, however, depending on the income level of the household. Among all households, a sample that relies mainly on non-household labor, a 10 percent increase in labor use per ha is correlated with a 1.5 percent increase in agricultural productivity. In contrast, among poor households, a sample that relies more heavily on household labor, a 10 percent increase in household labor use per ha is correlated with a 1.4 percent increase in productivity.
- 36. Crop diversification is correlated with higher agricultural productivity.** Households that grow larger numbers of crops have higher incomes on average (Table A13). While causality cannot be confirmed based on the present analysis, diversification seems beneficial as a risk management strategy. It may also suggest that intercropping has positive impacts on agricultural productivity. Interestingly, growing cash crops (mangoes and coffee) does not appear to be significantly correlated with agricultural productivity. Keeping of livestock is positively correlated with higher agricultural productivity for the third land

quintile only. Although the correlation is positive for the higher quintiles, the difference is not statistically significant.

37. **The remittances from abroad are positively correlated with agricultural productivity but when disaggregated by land size quintiles, we find that it is only significant for the smallest land quintile** (Table A13). This implies that remittances from abroad seem to matter the most for the productivity of the smallest land owners. Households with smaller land sizes are more likely to be credit constrained and thus have less access to loans to purchase inputs. Even if it is assumed that all households are equally credit constrained, any additional income such as remittances may have higher marginal impact on input expenses for smaller land owners than for larger land owners.



38. **Access to markets³³ is an important factor that determines the ability of agricultural households to sell products, purchase inputs, and lease in additional land or hire additional workers if needed.** In Haiti, households with larger landholdings are more likely to have access to markets. Remittances from abroad and income from pensions are positively correlated with market access. This suggests that access to other income sources can help rural households meet the transaction costs involved in gaining market access. Wealthier households are also more likely to have access to markets.
39. **The bigger the plots size of a household, the more is spent on inputs like fertilizer, seeds and hired labor, but under proportional to the land size.** Given the inverse land size-productivity relationship found earlier, it would appear that even though households with bigger plot sizes spend more on inputs, the expenses are probably under proportional to their land size. That is to say that a farmer with twice as large a plot of land might spend more on inputs but most likely will not spend twice as much.
40. **Diversifying within agriculture appears to be positively correlated with higher expenses on inputs.** Households that grow multiple crops are likely to spend more on seeds and hired labor. We also find that households with livestock activities are more likely to hire non household labor, lease-in land and face lower fertilizer cost. Having multiple agriculture activities could serve as a risk strategy for households such that a shock to one crop does not necessarily mean poor harvest for the season since the household can rely on production from other crops.
41. **There is a positive and significant correlation between owning a nonfarm enterprise and higher expenses on fertilizer indicating some farm-nonfarm linkage.** Similarly, there is a positive correlation between nonfarm wage and expenses on hired labor. Households with multiple income sources could be less credit constrained and thus more likely to spend on agriculture inputs. Studies have shown that farm households with nonfarm income generating activities could spend more on inputs (Oseni and Winters, 2009).
42. **Female headed households are less likely to hire non household labor or lease in land for cultivation.** This indicates that female headed households may face additional specific constraints in hiring extra help to work on their plots as well as acquiring additional land for cultivation. This is not surprising as female headed households are more likely to be credit constrained as they are probably single headed households unlike male headed households that are most likely dual headed households. For example, studies from Nicaragua (Foltz et al., 2000) and Nigeria (Lawal and Muiywa, 2009) find that female headed households can be almost 200 percent more credit constrained than dual-headed households. In addition, other studies (Snapp et al. 2002) also find that female headed households face important credit constraints and that these constraints are important barriers to household production capabilities.

33 Access to markets is measured as a ratio of value of sales to value of total production of all crops that the household cultivates.

Table 2.16: Determinants of market access to inputs

	Market Access ¹	Seeds ²	Fertilizer ²	Pesticides ²	Non HH labor ³	Leased in Land ³
Land:						
Log of total plot size	0.019*** (0.007)	850.408 (660.750)	-243.921 (191.712)	-42.110** (18.144)	0.0910*** (0.0153)	0.112*** (0.0142)
Sq Log of total plot size	0.001 (0.002)	2,126.263*** (157.946)	173.864*** (45.827)	-0.431 (4.337)	0.00201 (0.00356)	0.0146*** (0.00325)
Nonfarm:						
Nonfarm enterprise	-0.034** (0.016)	-1,535.508 (1,387.012)	720.703** (402.433)	-21.502 (38.087)	0.0307 (0.0306)	-0.00316 (0.0292)
Nonfarm wage	-0.043 (0.026)	515.617 (2,302.530)	-858.380 (668.064)	1.493 (63.226)	0.0873* (0.0451)	-0.0363 (0.0481)
Farm:						
Value of harvest per ha	na	-148.399 (299.190)	185.929** (86.808)	22.996*** (8.216)	0.0338*** (0.00691)	0.0221*** (0.00728)
Ownership of livestock	-0.020 (0.016)	-1,036.176 (1,401.978)	-90.844 (406.775)	-62.773* (38.498)	0.143*** (0.0323)	0.0645** (0.0289)
Number of crops grown	0.006 (0.004)	1,025.099*** (372.112)	-30.189 (107.966)	7.600 (10.218)	0.0294*** (0.00863)	-0.00700 (0.00788)
Household grows cash crop	-0.004 (0.016)	-3,160.726** (1,407.305)	63.037 (408.321)	-65.600* (38.644)	-0.0176 (0.0310)	-0.0251 (0.0299)
Other Income:						
Remittances from Haiti	0.002 (0.017)	-1,892.488 (1,456.818)	-391.101 (422.687)	-50.915 (40.004)	-0.0135 (0.0331)	0.0187 (0.0317)
Remittances from Abroad	0.042** (0.020)	-389.195 (1,732.524)	971.607* (502.681)	-39.803 (47.574)	0.0162 (0.0384)	0.0214 (0.0375)
Pensions	0.275** (0.130)	-3,118.391 (11,376.657)	-437.114 (3,300.865)	80.340 (312.398)	0.0615 (0.247)	-0.133 (0.186)
Rental Income	0.044 (0.041)	910.500 (3,614.575)	-574.407 (1,048.746)	-10.980 (99.255)	0.167*** (0.0624)	0.0537 (0.0812)
Other Income	-0.035 (0.030)	258.282 (2,639.686)	-277.860 (765.888)	-22.757 (72.485)	0.112** (0.0531)	0.0254 (0.0565)

Household Head:						
Household head is female	0.001	-1,501.420	-500.677	42.033	-0.0782**	-0.134***
	(0.015)	(1,339.073)	(388.524)	(36.770)	(0.0305)	(0.0259)
Age	-0.001	353.275	-45.357	0.158	0.00468	0.00892
	(0.003)	(264.923)	(76.866)	(7.275)	(0.00581)	(0.00600)
Age, squared	0.000	-3.171	0.410	0.007	-4.61e-05	-0.000122**
	(0.000)	(2.490)	(0.722)	(0.068)	(5.47e-05)	(5.74e-05)
Years education	-0.002	82.623	57.633	14.308**	0.00717	-0.00818*
	(0.003)	(225.301)	(65.370)	(6.187)	(0.00525)	(0.00470)
Household Composition :						
# of working age male members	0.007	-823.415	318.467*	4.643	-0.0124	-0.0181
	(0.007)	(576.346)	(167.223)	(15.826)	(0.0130)	(0.0124)
# of working age female members	0.009	352.673	-219.500	-9.421	-0.00780	-0.0179
	(0.007)	(656.024)	(190.341)	(18.014)	(0.0146)	(0.0142)
Number of Dependents	-0.012***	505.405	10.655	15.166	-0.00604	-0.00260
	(0.004)	(349.938)	(101.532)	(9.609)	(0.00777)	(0.00743)
Asset Based Wealth Index	0.003**	-13.368	17.207	-1.464	0.00209	-4.58e-05
	(0.001)	(104.936)	(30.446)	(2.881)	(0.00259)	(0.00224)

1. Proxy for market access is defined as share of sales value/ total production value

2. Access to input use is defined by cost of input per ha

3. Access to leased in land and non household labor is given by a dummy where leased in=1 or non hh labor=1 if ag hh uses either

4. Department fixed effects and asset based wealth index control variable were also included but not reported above.



43. **Nonfarm activity, although less prevalent than agriculture, remains an important economic activity in rural Haiti, especially among female-headed households.** About 46 percent of all rural households have at least one member engaged in a nonfarm activity.³⁴ Female-headed households represent about 52 percent of employment in this sector. Later in this report, we discuss how participation in nonfarm activities reduces the likelihood of being poor and increases food security.
44. **Given the importance of nonfarm activities in Haiti's rural economy, it is important to understand the determinants of participation in nonfarm activities.** Again, even though the data used for the analysis are cross-sectional, we hope to establish some robust relationships. Three separate regressions were estimated to explore the determinants of participation in nonfarm activities. The dependent variables for the three regressions included: (i) any nonfarm activity, (ii) nonfarm enterprise activities only, and (iii) nonfarm wage activities only. Running all three regressions allows us to compare results across types of nonfarm activities and determine what differences there are, if any, in the determinants of participation in a nonfarm enterprise versus nonfarm wage activities. Following common findings in the literature, the covariates included: gender, education and age of household head; male and female household labor supply; participation in other income generating activity; and remittances received by the household.
45. The determinants of nonfarm participation in rural Haiti were estimated using a Logit model of the following general form:

$$P = \beta_0 + \beta_1 P_F + \beta_2 R_D + \beta_3 R_A + \Omega X + \lambda + \varepsilon \quad (2)$$

$$P_{NFE} = \beta_0 + \beta_1 P_F + \beta_2 R_D + \beta_3 R_A + \Omega X + \lambda + \varepsilon \quad (3)$$

$$P_{NFW} = \beta_0 + \beta_1 P_F + \beta_2 R_D + \beta_3 R_A + \Omega X + \lambda + \varepsilon \quad (4)$$

Where P is equal to 1 if the household has at least one person engaged in a nonfarm activity, P_F is equal to 1 if the household has at least one person engaged in a farm activity, R_D is equal to 1 if household receives remittances from within Haiti, R_A is equal to 1 if household receives remittances from abroad, X is a vector of other household characteristics,³⁵ department fixed effects are captured by λ , and ε the idiosyncratic error term. Regressions (3) and (4) above are subsamples where P_{NFE} is equal to 1 if household has at least one member engaged in nonfarm enterprise activities and P_{NFW} is equal to 1 if households has at least one member engaged in nonfarm wage activities. The variable specifications are similar to those used in equation (2) described above.

34 This statistics refers to household enterprise, wage, salary or unpaid nonfarm employment.

35 Age variable enters the regression analysis in a nonlinear form, i.e. we specify Age and Age squared, to capture any effects of being older might have on likelihood of participation versus being younger.

- 46. Education and household labor are positively correlated with participation in nonfarm activities.** Household wealth measured using an asset index was found to be positively correlated with participating in any nonfarm activity and also with ownership of a household non-farm enterprise. Interestingly, receiving remittances from abroad shows no significant effect on participation in nonfarm activities, while receiving remittances from within Haiti has a negative effect. This could be an indication that only the poorest households receive remittance from within the country and are more likely agriculture households.

Table 2.17. Determinants Nonfarm Enterprise Participation

Dependent Variable:	Any Nonfarm Activity	Nonfarm Enterprise	Nonfarm Wage
Household Characteristics:			
Household head is male	0.00912 (0.0281)	-0.0207 (0.0238)	0.00899 (0.0128)
Age	0.0117** (0.00504)	0.0201*** (0.00449)	-0.00499** (0.00213)
Age, squared	-0.000114** (4.78e-05)	-0.000185*** (4.27e-05)	4.53e-05** (2.07e-05)
Years education	0.0176*** (0.00424)	0.00604* (0.00345)	0.00831*** (0.00170)
Household Composition :			
# of working age female members	0.0740*** (0.0138)	0.0387*** (0.0114)	0.0248*** (0.00600)
# of working age male members	0.100*** (0.0122)	0.0477*** (0.00993)	0.0405*** (0.00508)
# of dependents	0.0230*** (0.00748)	0.0272*** (0.00634)	-0.00377 (0.00366)
Other Household Economic Activity:			
Any Farm Activity	-0.473*** (0.0261)	-0.313*** (0.0278)	-0.196*** (0.0223)

Remittances :			
Household receives remittances from abroad	-0.0748** (0.0314)	-0.0470* (0.0259)	-0.0213* (0.0125)
Household receives remittances from within Haiti	-0.135*** (0.0269)	-0.0724*** (0.0230)	-0.0515*** (0.0116)
Asset Based Wealth Index	0.00606*** (0.00166)	0.00211* (0.00118)	0.000395 (0.000539)
Observations: 2261			

Note: Logit regression with department fixed effects. Department FE not shown.
Marginal effects reported with standard errors in brackets.
Significance denoted *** p<0.01, ** p<0.05, * p<0.1

Determinants of Poverty and Food Insecurity

7



47. **Poverty and food insecurity are barriers to development for rural Haiti.** As mentioned above, 70.7 percent of the rural population lives below the national poverty line of \$1.98/day, and 35.7 percent of rural households suffer from food insecurity. In this report we are particularly interested in understanding how the economic activities pursued by rural households may contribute to poverty alleviation as well as increasing food security. Poverty and food insecurity are likely related, but they are not necessarily mutually inclusive events, and therefore separate regressions are estimated to capture potential differences in the determinants of each. In addition to the economic activity variables, we include covariates similar to those used in regressions (2) through (4) above, especially household characteristics such as gender of household head, age, and education.
48. The determinants of poverty and food insecurity were estimated using a Logit model of the following form:

$$P_{np} = \beta_0 + \beta_1 P_{NFE} + \beta_2 P_{NFW} + \Phi Z + \Omega X + \lambda + \varepsilon \quad (5)$$

$$P_{fs} = \beta_0 + \beta_1 P_{NFE} + \beta_2 P_{NFW} + \Phi Z + \Omega X + \lambda + \varepsilon \quad (6)$$

Where P_{np} is equal to 1 if household consumption expenditure is above the national poverty line of \$1.98/day (non-poor); P_{fs} is equal to 1 if household is defined as food secure based on the FAO HDDS measure; P_{NFE} is equal to 1 if household has at least one member participating in a nonfarm enterprise activity; P_{NFW} is equal to 1 if the household has at least one member participating in a nonfarm wage activity; Z is a vector of farm household characteristics; X is a vector of household level characteristics; department fixed effects are captured by λ , and ε is still the idiosyncratic error term.

49. In addition to estimating equations (5) and (6) above on the entire sample of all rural households, the same equations are estimated on the subsample of farm households to determine whether there are any determinants that are more likely to affect farm households.
50. **Households with larger landholdings and more diversified livelihoods are less likely to be food insecure.** Larger landholdings are negatively correlated with poverty and food security. Having a nonfarm activity is positively correlated with food security and lower likelihood of being poor. Livestock ownership is positively correlated with being food secure even though it does not appear to be correlated with lower likelihood of being poor. Not surprisingly, the more assets owned by a household, the less likely it is to be poor and more likely to be food secure. Also, having more working age females in the household increases the likelihood of being food secure. In general, receiving remittances from abroad or from within Haiti is associated with reduced poverty and increased food insecurity. These findings hold true across all variations in specifications conducted. Table 2.13b highlights the idea that remittances are used to buy food instead of investing in any productive asset.

Table 2.18: Determinants of Poverty and Food Insecurity

Dependent Variable:	All Rural		All Farm	
	Non-Poor	Food Secure	Non-Poor	Food Secure
Nonfarm Activity:				
Nonfarm enterprise	0.114*** (0.0238)	0.125*** (0.0229)	0.0968*** (0.0274)	0.0710** (0.0304)
Nonfarm wage	-0.0123 (0.0284)	-0.0488 (0.0358)	-0.00448 (0.0361)	-0.0674 (0.0552)
Farm Activity:				
Value of harvest per ha	-0.00109 (0.00468)	-0.00444 (0.00533)	-0.000623 (0.00430)	-0.00344 (0.00608)
Ownership of land	-0.0307 (0.0366)	-0.0651 (0.0413)	-0.0169 (0.0322)	-0.0711* (0.0419)
Livestock	0.0275 (0.0269)	0.108*** (0.0288)	0.0214 (0.0206)	0.115*** (0.0323)
Share of Sales Value/Total Production Value	0.0393 (0.0462)	0.104** (0.0517)	0.0221 (0.0366)	0.0954* (0.0528)
Number of crops grown	0.0122* (0.00685)	0.0200** (0.00793)	0.0102* (0.00544)	0.0202** (0.00812)
Cash crop	0.0269 (0.0282)	0.0391 (0.0302)	0.0214 (0.0213)	0.0349 (0.0313)
Other Income:				
Remittances from Haiti	-0.00692 (0.0217)	0.0243 (0.0255)	0.0157 (0.0225)	0.0562* (0.0317)
Remittances from Abroad	0.0927*** (0.0291)	0.0231 (0.0297)	0.0508* (0.0305)	0.0179 (0.0393)
Pension and other welfare	-0.103 (0.108)	0.129 (0.158)	-0.118** (0.0459)	0.0328 (0.0864)
Real Estate	0.0435 (0.0616)	0.0467 (0.0689)	0.0172 (0.0550)	0.0797 (0.0562)
Other	0.0634 (0.0467)	0.0596 (0.0456)	0.0515 (0.0471)	-0.0149 (0.0316)
Household Head:				
Household head is female	0.00384 (0.0223)	-0.0109 (0.0258)	-0.0237 (0.0207)	-0.0149 (0.0316)
Age	0.0102*** (0.00361)	0.00447 (0.00429)	0.00631 (0.00399)	0.00138 (0.00592)

Age, squared	-9.02e-05*** (3.43e-05)	-5.53e-05 (4.03e-05)	-5.39e-05 (3.74e-05)	-1.89e-05 (5.55e-05)
Years education	0.0127*** (0.00299)	0.0170*** (0.00400)	0.0104*** (0.00321)	0.0150*** (0.00552)
Committed relationship	-0.0306 (0.0229)	-0.0109 (0.0261)	-0.0278 (0.0237)	0.0392 (0.0340)
Household Composition :				
# of working age male members	-0.0721*** (0.0102)	-0.0133 (0.0107)	-0.0466*** (0.00976)	-0.0166 (0.0129)
# of working age female members	-0.0697*** (0.0117)	0.0320** (0.0125)	-0.0633*** (0.0115)	0.0233 (0.0152)
Number of Dependants	-0.0871*** (0.00680)	0.0205*** (0.00687)	-0.0630*** (0.00646)	0.0203** (0.00811)
Asset Based Wealth Index	0.0117*** (0.00128)	0.0121*** (0.00168)	0.0107*** (0.00165)	0.0156*** (0.00312)

Observations: 2261 for full sample, 1505 for farm subsample

Note: Logit regression with department fixed effects. Control variable for department fixed effects not shown

Marginal effects reported with standard errors in brackets.

Significance denoted *** p<0.01, ** p<0.05, * p<0.1

51. In addition to the four main sets of analyses described and shown above, different specifications of the models were estimated to provide additional robustness checks. For the determinants of agricultural productivity, we estimated the regression using cash crop share of total production value instead of a dummy for whether the household grows a cash crop. This did not change interpretation of coefficients or provide statistical significance to cash crop variable. For determinants of participation in nonfarm activity, various specifications using (i) household network variables, (ii) land size in lieu of farm activity or (iii) ownership of land in lieu of farm activity, all yielded similar results. Lastly, for the determinants of poverty and food security, regressions were estimated using (i) share of sales value/ total production value, (ii) types of crops grown, (iii) production value of crops by food group as share of total production, (iv) cash crop share of total production value and (v) food crop share of total production value. All results were consistent across all specifications. In addition, a separate regression was estimated using per capita consumption expenditures as dependent variable instead of poverty dummy. The results³⁶ were also consistent with those described above.

³⁶ Regression results from robustness checks available upon request.

Key Findings and Recommendations



52. The information and analysis presented in this report point to two priority areas for rural development interventions in Haiti: (i) promoting diversification of livelihoods sources among rural households, and (ii) improving the performance of rural markets for inputs and outputs. Focusing on these areas could increase agricultural productivity, boost rural incomes, improve food security, thereby potentially reducing constraints to rural development.

8.1 Promoting Diversification of Livelihoods Sources among Rural Households

8.1.1 Findings

53. **Diversifying agricultural production activities is correlated with higher productivity and could reduce vulnerability to shocks.** Growing multiple crops is positively correlated with higher agricultural productivity, especially among poor households. Cultivating multiple crops presumably also provides protection against unexpected shocks affecting a particular crop.³⁷ The benefits are even more pronounced when livestock activities are taken into account. This double benefit explains why for a given level of income, households with more crop diversification are more likely to be food secure. It should be noted, however, that diversification alone is not enough to raise rural households out of poverty, and in fact poor households in Haiti tend to be more diversified than non-poor households. This suggests that poor households rely on diversification to manage risk to a greater extent than non-poor households, which have greater ability to resort to food purchases to overcome unexpected food production shortfalls.
54. **Remittances are positively associated with higher incomes, increased agricultural productivity, and improved food security, but the causal relationships are difficult to discern.** Rural households that receive remittances are less likely to be poor, more likely to have productive farms, and more likely to be food secure than rural households that do not receive remittances, but there is considerable variability in the sources of remittances, in the households that receive remittances, and in the use of remittances. Remittances originating from within Haiti tend to go to poorer households and are positively correlated with improved food security for the receiving households, without necessarily impacting agricultural productivity. This suggests that poorer households may be using these remittances to purchase food. In contrast, remittances originating from international sources tend to go to wealthier households. While these remittances also are positively correlated with improved food security, in the wealthier households receipt of remittances seem to be positively correlated with agricultural productivity. This suggests that wealthier households may be using remittances to invest in their agricultural activities.

37 Given the numerous weather and sanitary shocks that Haiti repeatedly experienced growing multiple crops allow households to mitigate the risk of a shock with the hope that one of the crops might be less affected than the other.

55. **Non-farm activities in rural areas seem to provide a pathway to escape from poverty and food insecurity.** Nonfarm activities can be a significant source of income for rural households in Haiti, with positive impacts on food security. Rural households that engage in both agricultural and nonagricultural activities are more likely to be wealthier and food secure than households that engage only in one type of activity or the other. Such activities can be related to agriculture on the upstream (input suppliers) or on the downstream (value-adding and processing) or be separate to the sector (such as small retail). Interestingly, households that receive remittances are less likely to engage in nonfarm activities, which may indicate that such households feel less pressure to diversify their productive activities because the remittances already provide some level of protection against unexpected agricultural production shortfalls.
56. **Female headed households face particular constraints that impact their productivity which in turn increases their economic vulnerability.** In particular, they have lower access to productive inputs which could lead to lower productivity thereby creating a gender gap. As expected higher quantity of factors of production such as labor, fertilizer, and seed were found to be positively correlated with increases agricultural productivity. A similar finding is observed in the nonfarm enterprise sector where female headed households also report lower access to inputs and lower quantities of inputs used.

8.1.2 Recommendations

57. **Promote diversification of agricultural production activities as a way to increase income and improve food security.** Given the benefits of diversification, households that rely on agriculture as a major livelihood source (which is to say the vast majority of rural households in Haiti) should be encouraged to grow multiple crops and to complement cropping activities with livestock keeping. Efforts to promote diversification might include educational campaigns to increase awareness of the benefits of diversification, research to identify crops and livestock species suited for particular locations or production environments, extension activities to disseminate locally appropriate management methods, and interventions to improve the availability and accessibility of key inputs. Nevertheless, farmers might also be able to expand productivity / increase income on a single crop, if they select to invest in crops that provide higher profits.
58. **Help poor rural households take advantage of non-farm employment opportunities as a way of generating additional revenue and managing risk.** Although the poorest households are those most in need of nonfarm employment (as a way to boost income and manage risk), they often face the greatest challenges in accessing non-farm employment opportunities owing to their lack of key assets (education, skills, start-up capital), access to basic services and/or distance to markets and labor (FAO 1998). Special attention therefore should be given to interventions that will help the poorest households

overcome these entry barriers, including not only interventions designed to improve the quality of the rural labor force (e.g., basic education, vocational training), but also interventions designed to generate increased rural non-farm employment opportunities (e.g., programs to encourage expansion of rural enterprises, support to rural financial institutions).

59. **Encourage poor rural households to invest remittances in improving the productivity of their agricultural activities.** Poor rural households that receive remittances often have no choice but to use those remittances to purchase food needed to meet immediate consumption needs. They frequently have little left over to invest in their agricultural enterprises. As a result, the urgency of addressing short-run needs prevents them from ever being able to build the base of productive assets needed to generate an enhanced stream of income over the longer term, and they remain trapped in poverty. Interventions are needed to help poor rural households invest a portion of the remittances they may receive in productive assets that can ensure a permanent stream of future income. Global experience suggests that well-designed safety net programs may play an important role in this regard—for example food-for-work or cash-for-work programs that involve construction of small-scale productive infrastructure (e.g., irrigation systems, grain storage facilities).
60. Invest in soil and water management technologies to improve the productivity of the natural resource base on which agriculture depends. Over the longer term, the welfare of rural households in Haiti will depend crucially on the quality of the natural resource base on which agriculture depends. Severe population pressure combined with uncontrolled exploitation of natural resources and unsustainable farming practices has exacted a heavy toll, leaving vast areas of the country with little or no forest cover, heavily eroded landscapes, and severely depleted soils. Efforts are needed to compensate for decades of mismanagement, with the goal of reversing land degradation, restoring soil fertility, re-establishing vegetative cover, and conserving and protecting increasingly scarce water resources. The obvious place to begin would be through the promotion of more environmentally friendly agricultural production practices, combined with introduction of regulations to restrict the uncontrolled exploitation of common-pool resources especially including trees. These could be complemented in time with schemes to promote payments for environmental services (PES), which could provide opportunities for rural households to generate additional income by preserving the environment. Investment in PES initiatives, which led to good results in some countries, could have many positive externalities, such as mitigating the impact of climate/weather shocks but as also positive effects on soil fertility, nutrient retention, which in the long term will contribute to a better agricultural productivity. Although not available in the survey data used in this report, capturing the GPS coordinates of households would allow for the inclusion of irrigation, erosion, land quality and climate shocks in future empirical analyses.

8.2 Improving the Performance of Rural Markets for Inputs and Outputs

8.2.1 Findings

61. **Agricultural productivity in Haiti is severely constrained by the limited availability and high cost of purchased inputs**³⁸. A major factor contributing to the low levels of agricultural productivity prevailing in Haiti is the low use of purchased inputs (especially fertilizer and improved seeds and planting materials). The problem is particularly pronounced in female-headed households, which compared to male-headed households use fewer inputs, have less productive farms, enjoy lower incomes, and suffer from higher rates of food insecurity.
62. **For many rural households, incentives to invest in improved agricultural productivity are undermined by lack of access to reliable markets for outputs.** The majority of rural households in Haiti report significant problems in accessing markets where they can sell surplus production. Lack of market access is particularly pronounced for poorer households; wealthier households are more likely to have the means to overcome the costs associated with identifying and reaching attractive markets for their products. Cut off from output markets, rural households have little incentive to produce surpluses that could be sold to generate additional income.

8.2.2 Recommendations

63. **Strengthen input distribution systems.** Sustained productivity growth in Haitian agriculture will not be possible without continuous technological innovation, which depends in part on the timely availability of improved inputs. One of the biggest challenges facing policy makers in Haiti is how to strengthen private sector-led input distribution systems. In the past, input distribution has often been carried out by public agencies and parastatals. Generally speaking, the state-led efforts have been costly and inefficient. In recognition of past shortcomings, the government has developed national strategies for seed and fertilizer that rely on private-sector service delivery mechanisms.
 - a. **Seed:** Dissemination of modern crop varieties represents one of the largest potential “quick wins” in Haitian agriculture. Modern varieties hold the potential to deliver significant yield increases in virtually all of the major staples. Seed is the delivery vehicle through which modern varieties get to farmers. Seed production and marketing are by nature commercial activities, so efforts to strengthen seed distribution systems should be led by the private sector. At the same time, it must be recognized that newly

38 The availability of GPS data would have allowed us to include other variables of interest to this analysis including irrigation information, climate shocks, variations in land quality.

established private seed companies face many obstacles and may require public support during an initial phase. This support must come in two forms: (i) public investments that lower R&D costs of private companies (e.g., investments in public plant breeding research and public production of foundation seed), and (ii) enactment of policies that favor the emergence of a pluralistic and competitive seed industry.

- b. Fertilizer:* Stimulating the development of an efficient, profitable, and competitive fertilizer industry will require a two-pronged approach to strengthen demand for fertilizer on the one hand and improve the supply of fertilizer on the other. Demand for fertilizer is currently very weak in Haiti, so actions undertaken to improve supply will be unsuccessful unless they are accompanied by activities that can increase effective demand. Possible interventions include measures that would improve the ability of farmers to access credit needed to purchase fertilizer, as well as scale up the use of fertilizer vouchers to make fertilizer more affordable to the poorest farmers. It is important that these programs be time-bound, however, to ensure that subsidies can be phased out as the quantities used of fertilizer increase and commercial distribution becomes profitable. Efforts to strengthen demand for fertilizer must be accompanied by parallel efforts to improve supply. Fertilizer is a private good, so the case for extensive public-sector involvement in fertilizer production and distribution is weak. Fertilizer market development efforts therefore should be aimed at creating viable private production and distribution systems. As with seed, public support may be needed during an initial phase to allow emerging private fertilizer companies to become established and expand their operations to a commercially viable scale, but this support should be time-bound. Haiti lacks the raw materials needed to produce fertilizer, so the domestic fertilizer industry will rely for the foreseeable future on imported components. The government should promote private investment in the industry, but it should avoid directly participating in importing and distributing fertilizer.

- 64. Improve access of rural households to output markets.** Many rural households in Haiti have little incentive to invest in expanding their agricultural enterprises because of the difficulty of selling surplus production. Efforts are needed to reduce the transactions costs incurred by rural households in identifying and accessing remunerative markets for outputs. An initial set of interventions could focus on improving flows of market information. Advances in information technology have stimulated the emergence throughout the developing world of many different types of mobile phone- and internet-based market information systems that speed flows of market information and help connect buyers and sellers. Such efforts will have to be complemented with investments in infrastructure—especially rural roads—that can allow households located in remote areas to access inputs and evacuate outputs quickly and at lower cost. Construction of rural roads is obviously expensive, so such efforts would have to be preceded by a rigorous analytical exercise to identify investment opportunities with the greatest potential returns.

- 65. Exploit immediate opportunities to match supply and demand.** Development of efficient markets for agricultural commodities in Haiti will take time. In the short run, however, opportunities exist to link selected producers with remunerative markets. For example, food aid programs, school feeding initiatives, and other institutional feeding schemes can more systematically source products from local producers. Global experience points to many recent cases in which international agencies, NGOs, and government agencies have turned to local sources when conducting institutional procurement, thereby providing secure markets for local producers (WB, 2013).³⁹

Example: In Brazil, the “Zero Hunger National School-Feeding Program”⁴⁰ was very successful in reducing hunger and increasing the income of smallholders by imposing- by law- that 30 percent of the school-feeding budget be used for purchasing family farming production.⁴¹

- 66. Build competitiveness of rural households.** Improving market access of rural households will have limited impact if these households are unable to take advantage of new opportunities. For that reason, efforts are needed to strengthen the competitiveness of rural producers. This will require attention to several areas, some of which have already been mentioned: (i) increasing farm-level productivity, (ii) decreasing post-harvest losses, (iii) promoting value addition, (iv) improving access to markets, and (v) strengthening business skills of producers. One promising approach that has been used successfully in many other countries to tackle this multi-pronged agenda is the Productive Alliances model. Productive Alliances link producer groups to markets: In the last decade, the expression productive alliance has been more and more attached to a series of projects promoted and funded by the World Bank, in collaboration with various Governments of developing countries, especially in Latin America and the Caribbean. A Productive Alliance is a formal agreement between a group of organized farmers and a buyer, for the provision of a certain good, in a specified quantity and quality. While Productive Alliances can take many forms and operate in different ways, the approach is characterized by four key elements: (i) an organized group of producers, (ii) an institutional buyer (usually an agribusiness firm), (iii) resources to finance investment in production and marketing, and (iv) technical assistance. In some more advanced model the financial intermediary is added to the model.

- 67. Strengthen food safety through regulations and implementing institutions.** As Haiti’s food system transitions from its current subsistence orientation to become more market-oriented, food quality and safety will become increasingly important for public health and competitiveness. A comprehensive food safety

³⁹ Structured demand connects large, predictable sources of demand for agricultural products to small farmers, which reduces risk and encourages improved quality, leading to improved systems, increased income and reduced poverty, see WFP, 2013 and Bill and Melinda Gates Foundation for a detailed analysis of theory of change behind the “Structured Demand”.

⁴⁰ Programa Nacional de Alimentação Escolar, PNAE

⁴¹ See WFP, 2013 for more details

strategy with a “from farm to fork” approach to food safety is best practice to ensure that investments in improving food quality and nutritional content are sustained over time. Such a strategy should raise awareness about food safety and nutrition issues, provide production and market incentives, and develop the appropriate policy and institutional framework to ensure the availability of the necessary infrastructure and services. It is recommended that special attention will be given to animal source foods, as their perishability put special demands on their marketing and preparation to prevent contamination and other food safety risks. In addition, residues harmful to consumers can be an issue in certain types of production systems and the widespread use of antimicrobial agents for preventive measures or as growth promoters, is contributing significantly to growing microbe resistance which makes such antimicrobial products ineffective in treating infectious or parasitic infections in humans or animals.



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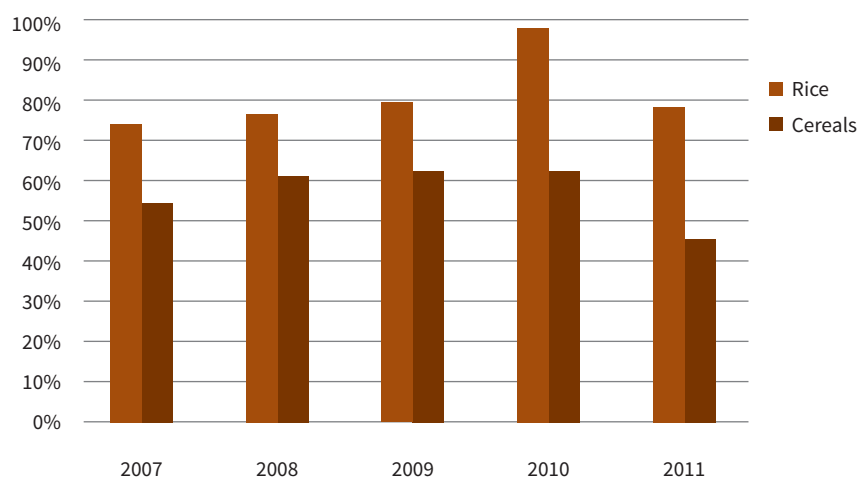
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Appendix



Figure A1: Import dependency (Import / Domestic supply quantity)⁴²



Source: FAOSTAT

Table A1: Household Characteristics by Region

	Region			
	Nord	Sud	Transversale	Ouest
Household Head is male	61.5	63.5	62.3	58.6
Age of household head	49.9	51.7	47.8	49.1
Household Head Edu (years)	2.8	2.6	2.5	3.5
Household Head is literate	44.2	46.2	43.1	50.7
Household head in committed relationship	70.4	67.1	62.5	63.5
Household size	5.5	5.0	4.6	4.6
Number of children under 5yrs old	0.7	0.6	0.7	0.5
Dependency Ratio ¹	97.2	95.0	97.3	87.6
Per capita Annual Consumption (HTG) ²	24374.9	29429.7	30301.3	37370.9
House was damaged in earthquake	20.9	32.8	28.7	58.4

42 Domestic supply quantity: Production + imports - exports + changes in stocks (decrease or increase) = supply for domestic utilization. There are various ways of defining supply and, in fact, various concepts are in use. The elements involved are production, imports, exports and changes in stocks (increase or decrease). There is no doubt that production, imports and stock changes (either decrease or increase in stocks) are genuine supply elements. (source FAOSTAT)

Housing Characteristics				
Ownership of dwelling	87.4	81.3	87.4	80.4
Dwelling is considered precarious	25.1	20.9	14.9	13.3
Number of rooms	3.0	2.9	2.4	2.5
Walls are mostly made of bricks/stone or cement	38.7	56.8	41.9	59.5
Roof is mainly cement	3.8	5.5	2.7	11.0
Flooring is mainly cement or ceramic/mosaic	34.1	53.0	33.6	65.3
Main source of cooking fuel is wood	84.8	85.4	85.0	71.8
Main source of lighting is electricity	5.9	12.6	7.8	22.2
Main drinking water source is from a protected or safe source ¹	60.9	54.6	49.1	65.3
No toilet system (nature)	34.2	39.1	44.3	26.5
Observations (unweighted)	567	643	506	545

Table A2a: Economic Activities by Region and Gender

	Farm only	Non farm only	Both Farm and Nonfarm
All Rural	53.7	21.9	24.5
Region			
Nord	52.5	22.2	25.3
Sud	53.3	17.1	29.6
Transversale	61.8	17.1	21.1
Ouest	44.4	32.4	23.2
Gender of Head			
Male	57.2	16.4	26.4
Female	47.3	31.7	21.0

Table A2b: Poverty Distribution of Rural Households by farm and nonfarm participation

	Farm only		Nonfarm only		Both Farm and Nonfarm	
	Poor	Non Poor	Poor	Non Poor	Poor	Non Poor
All Rural	80.6	19.4	55.8	44.2	75.0	25.0
Region						
Nord	89.3	10.7	73.4	26.6	86.8	13.2
Sud	79.0	21.0	60.2	39.8	80.7	19.3
Transversale	78.8	21.2	59.5	40.5	64.7	35.3
Ouest	76.3	23.7	39.2	60.8	68.1	31.9
Gender of Head						
Female	83.6	16.4	56.0	44.0	78.9	21.1
Male	79.3	20.7	55.6	44.4	73.3	26.7

Table A3: Type of Employment

		Wage earner	Self-employed	Unpaid worker
All Rural		10.2	52.6	36.9
Region				
	Nord	11.9	48.6	39.1
	Sud	8.3	57.2	34.1
	Transversale	7.6	55.0	37.2
	Ouest	13.7	48.6	37.2
Gender of Head				
	Male	9.6	50.9	39.3
	Female	11.5	56.2	31.8
Poverty Status				
	Poor	9.9	50.8	39.0
	Non-Poor	11.1	58.0	30.4

Table A4. Land Acquisitions

	Agricultural Households by land acquisition title and land size:								
	Owner		Lease-In or Received from third party		Lease-Out or Given to third party		Fallow		Land Size (under cultivation)
	%	Ha	%	Ha	%	Ha	%	Ha	Ha
All Rural	89.7	1.0	31.7	0.3	16.4	0.1	34.5	0.4	1.3
Region									
Nord	95.1	1.1	31.6	0.3	16.0	0.1	41.6	0.4	1.5
Sud	85.5	1.0	27.4	0.3	13.9	0.2	37.2	0.4	1.2
Transversale	88.4	1.0	32.7	0.3	19.5	0.2	30.7	0.4	1.3
Ouest	91.4	0.9	35.6	0.4	14.3	0.1	30.4	0.3	1.3
Headship									
Female	89.8	0.9	23.3	0.3	12.8	0.1	31.4	0.3	1.2
Male	89.6	1.1	35.4	0.3	17.9	0.2	35.9	0.4	1.4
Poverty Status									
Poor	90.1	0.9	30.2	0.3	14.9	0.1	34.7	0.4	1.2
Non Poor	88.3	1.2	36.6	0.4	21.0	0.2	33.9	0.4	1.6

Table A5: Farm Activity of Agricultural Households

	Any Agriculture	Cash Crop ¹	Sold Crop	Food Crop	Livestock	Fisheries	Forestry	Ag Wage
All Rural	71.4	49.7	84.3	97.7	74.8	4.2	30.4	4.3
Region								
Nord	72.5	61.3	84.1	96.1	71.0	1.7	33.7	6.0
Sud	78.3	55.4	82.1	96.9	76.9	7.3	25.8	4.3
Transversale	75.9	43.8	88.8	98.8	71.9	4.4	31.8	2.6
Ouest	58.7	40.6	79.9	98.5	81.0	2.3	30.5	5.0
Gender of Head								
Female	57.6	46.9	82.3	96.9	69.8	4.7	21.6	3.9
Male	80.1	51.0	85.2	98.1	77.0	3.9	34.3	4.6
Consumption Quintile								
Lowest	85.4	50.0	82.7	98.6	72.6	0.5	29.9	10.0
20-40	76.2	47.1	83.0	96.9	78.1	2.0	31.7	4.7
40-60	75.7	49.8	85.2	96.5	75.2	6.1	31.9	2.6
60-80	70.4	47.7	85.4	98.5	74.4	4.1	32.1	3.7
Highest	52.3	54.8	85.5	98.2	73.5	9.0	25.4	1.4
Poverty Status								
Poor	77.3	47.8	83.6	97.6	74.1	3.2	30.8	5.3
Non Poor	56.9	55.7	86.4	98.2	77.0	7.1	29.0	2.0
Food Security Status								
Food Secure	71.5	53.5	86.2	97.5	77.0	5.9	30.8	3.6
Food Insecure	71.2	42.7	80.9	98.0	70.7	1.0	29.7	5.6

1. Cash crop refer to either mangos or coffee.

Table A6: Nonfarm Enterprise Profile

		Reason for Owning Household Enterprise			
		Could not find Salaried Employment %	To increase income %	To be independent %	Family business %
All Rural		31.2	39.0	25.5	10.1
Gender of Head					
	Female	32.2	32.2	27.1	11.3
	Male	30.4	44.0	24.3	9.3
Poverty Status					
	Poor	33.5	38.0	26.2	8.8
	Nonpoor	27.2	40.7	24.2	12.4

Table A7 :Nonfarm Enterprise Profile

	Market			Type of Product Sold			Revenues
	Export	Domestic ¹		Pre-fabricated	Manufactured	Services	Average Sales
		Household	Public and Private Sector				
	%	%	%	%	%	%	Mean
All Rural	1.1	89.0	11.4	71.4	27.3	15.4	21682.4
Gender of Head							
Female	1.5	87.7	10.8	74.1	23.7	12.3	17062.3
Male	0.9	89.9	11.9	69.4	29.9	17.7	25115.4
Poverty Status							
Poor	1.2	88.6	10.8	69.5	30.0	14.1	11085.3
Nonpoor	1.0	89.6	12.5	74.6	22.6	17.7	39632.5

1. The domestic market was divided into two target groups: 1. domestic households or 2. government or private sector enterprises.

Table A8.: Food Security and Poverty (Percentages)

	FAO HDDS		Self-Reported	
	Food secure	Food insecure	Food secure	Food insecure
Poor	55.7	44.3	62.2	37.8
Non Poor	85.3	14.7	79.9	20.1
Cons Quintiles				
Lowest	31.1	68.9	45.9	54.1
20-40	56.3	43.7	62.0	38.0
40-60	66.9	33.1	69.1	30.9
60-80	75.5	24.5	77.3	22.7
Highest	86.5	13.5	79.4	20.6

Table A9. Food Security and Household Characteristics

	Based on Food Security Index (FAO)	
	Food Secure	Food Insecure
Household Head is male	63.1	58.6
Age of household head	48.6	50.9
Household Head Edu (years)	3.4	1.8
Household Head is literate	51.2	36.5

Household head in committed relationship ²	67.8	61.2
Household size	5.1	4.6
Number of children under 5yrs old	0.6	0.6
Dependency Ratio ³	92.4	98.0
Per capita Annual Consumption (HTG) ⁴	36680.7	19669.3
House was damaged in earthquake	34.8	36.4

Table A10. Food Security and Housing Characteristics

	Based on Food Security Index (FAO)	
	Food Secure	Food Insecure
Ownership of dwelling	84.0	84.8
Dwelling is considered precarious	16.2	21.4
Number of rooms	2.8	2.5
Walls are mostly made of bricks/stone or cement	53.6	40.7
Roof is mainly cement	7.0	3.2
Flooring is mainly cement or ceramic/mosaic	52.1	34.9
Main source of cooking fuel is wood	77.7	89.0
Main source of lighting is electricity	14.7	7.2
Main drinking water source is from a protected or safe source ⁵	59.9	51.5
No toilet system (nature)	31.7	45.2

Table A11a: Share of Value of Sales/ Value of Production

	All Farm HHs	Gender		T-Test	Poverty Status		T-Test	Food Security		T-Test
		Male	Female		Poor	NonPoor		Food Insecure	Food Secure	
Coffee	40.9	39.5	44.5	-5.0	42.7	35.7	7.0	38.5	42.0	-3.5
Maize	27.1	26.7	28.0	-1.3	26.4	29.6	-3.2	23.7	29.1	-5.5**
Millet	24.5	23.7	26.4	-2.7	24.3	24.9	-0.6	19.3	27.8	-8.6**
Greenbeans	43.4	48.1	32.5	15.6	45.7	35.8	9.9	27.3	51.1	-23.8
Rice	45.9	44.6	48.9	-4.3	42.5	51.2	-8.7	37.0	48.3	-11.3*
Mango	13.1	14.5	9.3	5.3**	12.5	14.6	-2.0	8.7	14.9	-6.2***
Cassava	25.9	25.9	26.0	-0.1	25.7	26.7	-1.0	23.3	27.2	-3.9
Peanuts	49.6	49.3	50.5	-1.3	50.9	45.2	5.7	49.7	49.6	0.1
Vegetable	37.4	38.7	34.5	4.2	35.9	40.4	-4.6	32.3	39.5	-7.2
Banana	33.0	33.0	33.0	0.0	33.5	31.1	2.4	33.1	32.9	0.1

Table A11b: Descriptive Stats Market Access

		Share sales value/ Total Production Value	Seeds cost (per ha)	Fertilizer cost (per ha)	Pesticide cost (per ha)	Hired in	Leased In
		%	HTG	HTG	HTG	%	%
All Rural		38.1	2736.6	1052.0	128.3	67.3	31.7
Region							
	Nord	35.8	1406.7	185.0	59.5	61.7	31.6
	Sud	35.5	2117.9	1090.0	67.8	68.9	27.4
	Transversale	42.8	2657.7	1442.6	166.1	67.5	32.7
	Ouest	35.7	5025.0	1244.1	211.4	70.7	35.6
Gender of Head							
	Female	38.8	2634.0	632.5	193.3	59.4	23.3
	Male	37.8	2781.5	1235.8	99.7	70.7	35.4
Poverty							
	Poor	36.6	2882.3	750.2	128.0	65.0	30.2
	Nonpoor	42.7	2275.7	2006.3	129.1	74.4	36.5
Food Security							
	Food Insecure	35.7	1801.5	543.3	134.4	61.7	27.0
	Food Secure	39.4	3245.7	1329.0	124.9	70.3	34.3

Table A12a: Share of Value of Sales/ Value of Production by Food Group

	All Farm HHs	Gender		T-Test	Poverty Status		T-Test	Food Security		T-Test
		Male	Female		Poor	NonPoor		Food Insecure	Food Secure	
Grains and Cereal	30.8	30.2	32.3	-2.1	28.8	37.2	-8.5***	25.2	33.9	-8.7***
Starch, roots and tubers	25.9	25.9	26.0	-0.1	25.7	26.7	-1.0	23.3	27.2	-3.9*
Pulses, Nuts and Seeds	49.6	49.3	50.5	-1.3	50.9	45.2	5.7	49.7	49.6	0.1
Fruits	30.6	30.6	30.5	0.1	31.2	28.6	2.7	29.6	31.1	-1.5
Vegetables	44.0	48.5	34.2	14.4	46.0	38.2	7.8	29.6	51.1	-21.5

TableA12b: Share of Value of Consumption/ Value of Production by Food Group

	All Farm HHs	Gender		T-Test	Poverty Status		T-Test	Food Security		T-Test
		Male	Female		Poor	NonPoor		Food Insecure	Food Secure	
Grains and Cereal	52.7	52.4	53.5	-1.1	54.6	47.0	7.6***	58.3	49.7	8.5***
Starch, roots and tubers	26.5	26.5	26.4	0.1	26.4	26.6	-0.2	25.0	27.2	-2.2
Pulses, Nuts and Seeds	23.2	20.6	30.3	-9.6*	23.1	23.7	-0.6	21.8	23.9	-2.1
Fruits	62.8	64.2	59.1	5.2	64.7	56.8	7.9*	55.2	66.8	-11.6
Vegetables	48.5	46.1	53.9	-7.9	50.1	43.7	6.3	46.0	49.7	-3.8

Table A13: Determinants of Agricultural Productivity

Dependent Variable: Log Total Crop Value/ Ha	(All Rural)	Land Q1	Land Q2	Land Q3	Land Q4	Land Q5
Land Size:						
Log Harvested Hectares	-0.398*** (0.087)	-2.048* (1.097)	-0.675* (0.391)	1.378 (1.951)	-2.509 (4.672)	-2.050*** (0.739)
Log Harvested Hectares, squared	0.048*** (0.011)	-0.114 (0.072)	0.072 (0.120)	2.310 (5.468)	2.154 (5.186)	0.457** (0.232)
Physical Inputs:						
Log Fertilizer use (HTG/ha)	0.250*** (0.049)	-0.229 (0.304)	0.178** (0.088)	0.191 (0.221)	0.223** (0.093)	0.377*** (0.098)
Log Pesticide use (HTG/ha)	0.254*** (0.056)	0.420 (0.348)	0.210** (0.105)	-0.191 (0.241)	0.259** (0.118)	0.247*** (0.077)
Log Seed use (HTG/ha)	0.317*** (0.035)	0.205 (0.145)	0.210*** (0.069)	0.705*** (0.150)	0.251*** (0.066)	0.169*** (0.062)
Labor Inputs:						
Log Household labor used per ha	0.095 (0.075)	0.457 (0.706)	-0.111 (0.117)	0.057 (0.203)	-0.046 (0.120)	-0.129 (0.119)
Log Non HHlabor used per ha	0.145*** (0.046)	0.340* (0.201)	0.045 (0.099)	0.030 (0.152)	0.076 (0.086)	0.058 (0.077)
Other Agricultural/Plot Characteristics						
Household owns livestock	0.163 (0.100)	0.191 (0.582)	-0.138 (0.152)	0.881*** (0.306)	0.346** (0.163)	0.120 (0.169)
Household grows at least one cash crop ¹	0.057 (0.099)	0.017 (0.718)	0.240 (0.153)	0.578** (0.286)	-0.171 (0.157)	0.040 (0.150)
Number of crops grown	0.234*** (0.026)	0.264 (0.203)	0.290*** (0.043)	0.070 (0.070)	0.191*** (0.040)	0.245*** (0.037)
Household owns plot	1.074***	0.437	-0.051	-1.234*	0.381	0.333

	(0.143)	(1.057)	(0.217)	(0.677)	(0.248)	(0.278)
Assistance post-earthquake:	-0.060	1.520	0.161	-0.452	0.523	-0.729*
fertilizer, tools, seeds, plant cutting	(0.317)	(3.254)	(0.483)	(0.749)	(0.654)	(0.406)
Household Characteristics:						
Household Head:						
Household head is male	0.018	0.486	-0.064	-0.029	-0.099	-0.170
	(0.095)	(0.565)	(0.149)	(0.330)	(0.156)	(0.155)
Age	0.012	0.149	-0.008	-0.031	0.045	0.023
	(0.019)	(0.108)	(0.027)	(0.071)	(0.033)	(0.030)
Age, squared	-0.000	-0.001	0.000	0.000	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Years education	0.024	0.082	0.007	-0.027	0.067**	0.033
	(0.016)	(0.112)	(0.025)	(0.046)	(0.028)	(0.021)
Household Composition :						
# of working age male members	0.039	-0.145	0.169**	0.026	0.023	0.040
	(0.043)	(0.272)	(0.073)	(0.114)	(0.069)	(0.058)
# of working age female members	0.013	-0.168	0.027	0.022	0.050	-0.051
	(0.047)	(0.350)	(0.077)	(0.183)	(0.072)	(0.063)
# of dependants	-0.039	-0.215	0.063	-0.040	-0.084**	-0.032
	(0.025)	(0.181)	(0.041)	(0.072)	(0.038)	(0.036)
Remittances :						
Household receives remittances from abroad	0.220*	3.161***	0.102	0.025	-0.052	0.114
	(0.116)	(1.002)	(0.190)	(0.315)	(0.178)	(0.165)
Household receives remittances from within Haiti	0.132	1.162*	-0.099	0.052	-0.220	0.180
	(0.098)	(0.631)	(0.149)	(0.279)	(0.159)	(0.162)
Other Economic Activities :						
Nonfarm Household Enterprise	0.001	1.008	-0.031	-0.003	-0.017	0.093
	(0.098)	(0.717)	(0.162)	(0.287)	(0.152)	(0.143)
Other Nonfarm wage	-0.159	-0.246	-0.361	-0.167	-0.304	0.242
	(0.162)	(0.872)	(0.280)	(0.459)	(0.277)	(0.217)
Asset Based Wealth Index	0.006	-0.020	0.016	0.035	0.003	0.004
	(0.007)	(0.043)	(0.014)	(0.030)	(0.013)	(0.009)
Constant	0.910	-6.268**	3.639***	4.374*	2.296	3.680***
	(0.559)	(2.965)	(0.938)	(2.419)	(1.428)	(1.174)
Observations	1,499.000	117.000	575.000	112.000	418.000	277.000
R-Squared	0.586	0.894	0.315	0.494	0.346	0.514

Table A13: Determinants of Agricultural Productivity

Dependent Variable: Log Total Crop Value/ Ha	(All Rural)	Land Q1	Land Q2	Land Q3	Land Q4	Land Q5
Land Size:						
Log Harvested Hectares	-0.459*** (0.095)	-2.346*** (0.994)	-0.805** (0.392)	1.841 (2.003)	-1.155 (4.999)	-2.294*** (0.785)
Log Harvested Hectares, squared	0.047*** (0.013)	-0.147*** (0.065)	0.053 (0.123)	2.651 (5.664)	0.679 (5.554)	0.495** (0.246)
Physical Inputs:						
Log Fertilizer use (HTG/ha)	0.108*** (0.020)	-0.048 (0.142)	0.101*** (0.024)	0.113 (0.072)	0.042 (0.033)	0.132*** (0.038)
Log Pesticide use (HTG/ha)	0.042* (0.024)	0.115 (0.150)	-0.016 (0.031)	-0.103 (0.071)	0.123*** (0.039)	0.026 (0.039)
Log Seed use (HTG/ha)	0.047*** (0.013)	-0.029 (0.071)	0.013 (0.017)	0.037 (0.039)	-0.001 (0.022)	0.028 (0.023)
Labor Inputs:						
Log Household labor used per ha	0.212** (0.085)	0.584 (0.684)	-0.101 (0.119)	0.156 (0.213)	-0.007 (0.128)	-0.166 (0.125)
Log Non HHLabor used per ha	0.198*** (0.037)	0.160 (0.136)	0.111** (0.048)	-0.023 (0.112)	0.130* (0.071)	0.107 (0.077)
Other Agricultural/Plot Characteristics						
Household owns livestock	-0.024 (0.113)	-0.101 (0.552)	-0.241 (0.154)	0.663** (0.330)	0.256 (0.174)	0.110 (0.180)
Household grows at least one cash crop ¹	0.018 (0.113)	0.031 (0.718)	0.196 (0.156)	0.413 (0.313)	-0.197 (0.168)	0.103 (0.159)
Number of crops grown	0.366*** (0.029)	0.232 (0.170)	0.323*** (0.043)	0.125* (0.076)	0.255*** (0.043)	0.261*** (0.039)
Household owns plot	1.978*** (0.155)	0.667 (1.028)	-0.023 (0.221)	-1.594** (0.729)	0.309 (0.265)	0.252 (0.295)
Assistance post-earthquake: fertilizer, tools, seeds, plant cutting	-0.071 (0.363)	1.948 (3.204)	0.195 (0.495)	-1.118 (0.800)	0.672 (0.702)	-0.768* (0.429)
Household Characteristics:						
Household Head:						
Household head is male	0.096 (0.108)	0.588 (0.557)	-0.065 (0.152)	0.119 (0.360)	-0.185 (0.167)	-0.207 (0.163)
Age	0.025 (0.021)	0.135 (0.107)	0.009 (0.027)	0.004 (0.077)	0.035 (0.035)	0.026 (0.032)
Age, squared	-0.000	-0.001	-0.000	-0.000	-0.000	-0.000

	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Years education	0.020	0.115	0.015	-0.023	0.071**	0.042*
	(0.018)	(0.110)	(0.026)	(0.050)	(0.030)	(0.022)
Household Composition :						
# of working age male members	0.021	-0.159	0.169**	0.127	-0.000	0.091
	(0.049)	(0.265)	(0.075)	(0.124)	(0.074)	(0.061)
# of working age female members	0.004	0.067	0.036	0.061	0.020	-0.072
	(0.054)	(0.330)	(0.079)	(0.202)	(0.078)	(0.067)
# of dependants	-0.031	-0.168	0.071*	-0.017	-0.091**	-0.030
	(0.028)	(0.172)	(0.042)	(0.075)	(0.041)	(0.038)
Remittances :						
Household receives remittances from abroad	0.253*	2.954***	0.113	-0.091	-0.137	0.098
	(0.132)	(0.985)	(0.194)	(0.346)	(0.190)	(0.176)
Household receives remittances from within Haiti	0.121	1.038*	-0.112	0.251	-0.232	0.176
	(0.111)	(0.599)	(0.152)	(0.305)	(0.170)	(0.172)
Other Economic Activities :						
Nonfarm Household Enterprise	-0.047	0.709	-0.040	-0.085	0.062	0.155
	(0.112)	(0.697)	(0.166)	(0.311)	(0.162)	(0.151)
Other Nonfarm wage	-0.314*	-0.447	-0.353	-0.279	-0.386	0.183
	(0.184)	(0.859)	(0.286)	(0.506)	(0.297)	(0.229)
Asset Based Wealth Index	0.009	-0.021	0.015	0.047	0.013	0.005
	(0.008)	(0.043)	(0.014)	(0.032)	(0.013)	(0.010)
Constant	3.474***	-4.218*	6.377***	8.931***	5.924***	7.311***
	(0.561)	(2.645)	(0.772)	(2.060)	(1.407)	(1.048)
Observations	1,499.000	117.000	575.000	112.000	418.000	277.000
R-Squared	0.457	0.887	0.270	0.342	0.234	0.440

Table A14a: Summary Statistics and test of mean differences by poverty status

	Full	Poor	Nonpoor	Difference
Production:				
Value of total harvest (HTG)	9504.1	8046.1	13064.7	-5,018.7**
Value of total harvest per ha (HTG)	71428.7	80718.0	48742.5	31,975.4
Log value of harvest per ha	5.8	6.2	5.0	1.2***
Harvested Land Size:				
Harvested hectares	0.9	0.9	0.9	-0.0
Harvested hectares squared	3.1	2.2	5.5	-3.3

Log of Harvested Hectares	-0.2	-0.3	-0.1	-0.2***
Log of Harvested Hectares squared	1.3	1.4	1.0	0.5**
Physical inputs:				
Fertilizer incidence of use (%)	15.2	14.0	18.1	-4.1*
Fertilizer cost per hectare (HTG)	684.2	517.0	1092.4	-575.4
Log of Fertilizer cost per hectare	1.0	0.9	1.3	-0.4**
Pesticide incidence of use (%)	14.6	15.3	12.8	2.5
Pesticide cost per hectare (HTG)	84.4	90.2	70.3	20.0
Log of Pesticide cost per hectare	0.7	0.7	0.6	0.1
Seeds incidence of use (%)	36.6	38.2	32.9	5.2*
Seeds cost per hectare (HTG)	1801.1	2031.2	1239.1	792.1
Log of seeds cost per hectare	2.4	2.5	2.2	0.3
Total input cost (HTG)	3080.6	2540.8	4399.0	-1,858.2**
Household and NonHousehold Labor:				
Number of NonHH labor used	3.8	3.6	4.2	-0.6
Number of NonHH labor used per hectare	13.4	15.9	7.3	8.6
Log of NonHH labor per hectare	0.8	0.8	0.7	0.1
Number of HH labor used	1.7	1.9	1.2	0.7***
Number of HH labor used per hectare	15.3	20.0	3.8	0.4***
Log of HH labor used per hectare	0.7	0.8	0.4	16.3***
Other agricultural characteristics:				
HH owns livestock (%)	49.1	52.0	41.8	10.2***
HH grows a cash crop (%)	32.6	33.6	30.2	3.4
Number of crops grown	3.1	3.3	2.6	0.7***
HH owns plot	58.8	63.3	48.0	15.3***
HH received productive input assistance(%)	1.0	1.0	1.0	0.0
Socioeconomic and demographic Characteristics:				
HH head is male (%)	61.5	61.8	60.6	1.2
Age of head	49.4	49.7	48.8	0.9
Age of head squared	2682.4	2708.4	2618.7	89.7
Education of head (yrs)	2.8	2.1	4.5	-2.4***
Number of working age males	1.4	1.5	1.1	0.3***
Number of working age females	1.3	1.4	1.1	0.3***
Number of dependants	2.2	2.6	1.2	1.4***
HH received remittances from abroad (%)	21.4	15.7	35.2	-19.5***
HH received remittances from Haiti (%)	27.4	27.7	26.6	1.1
HH member receives pension (%)	0.3	0.3	0.3	-0.0

HH member receives income from real estate transaction (%)	2.9	1.9	5.3	-3.3**
HH member receives other income (%)	5.9	5.1	7.8	-2.7*
			85.3	
Other Household Characteristics:				
HH is nonpoor (%)	29.1	na	na	na
HH is food secure (FAO measure) (%)	64.3	55.7	85.3	-29.6***
Nonagricultural Income:				
At least one HH member working in either NFE and/or NFW	41.2	36.9	51.8	-14.9***
At least one HH member working in NFE	31.5	28.0	40.1	-12.1***
At least one HH member working in NFW	13.8	13.2	15.3	-2.1
Observations (unweighted)	2261.0	1653.0	608.0	

Table A14b: Summary Statistics and test of mean differences
by poverty status- on Farm HH only

	All Farm HH	Poor	Nonpoor	Difference
Production:				
Value of total harvest (HTG)	14478.0	11450.1	24038.9	-12,588.8***
Value of total harvest per ha (HTG)	108810.7	114867.4	89685.5	25,181.9
Log value of harvest per ha	8.9	8.8	9.2	-0.4**
Harvested Land Size:				
Harvested hectares	1.3	1.2	1.6	-0.4**
Harvested hectares squared	4.8	3.1	10.0	-7.0
Log of Harvested Hectares	-0.3	-0.4	-0.2	-0.2*
Log of Harvested Hectares squared	1.9	2.0	1.7	0.3
Physical inputs:				
Fertilizer incidence of use (%)	23.2	20.0	33.3	-13.3***
Fertilizer cost per hectare (HTG)	1042.3	735.8	2010.1	-1,274.3*
Log of Fertilizer cost per hectare	1.5	1.2	2.4	-1.2***
Pesticide incidence of use (%)	22.2	21.8	23.5	-1.7
Pesticide cost per hectare (HTG)	128.6	128.4	129.3	-0.9
Log of Pesticide hectare	1.1	1.0	1.2	-0.1
Seeds incidence of use (%)	55.8	54.3	60.6	-6.3*
Seeds cost per hectare (HTG)	2743.7	2890.6	2280.0	610.6
Log of seeds cost per hectare	3.7	3.6	4.1	-0.5*
Total input cost (HTG)	4692.8	3615.7	8094.1	-4,478.4***

Household and NonHousehold Labor:				
Number of NonHH labor used	5.7	5.1	7.7	-2.6**
Number of NonHH labor used per hectare	20.4	22.6	13.5	9.2
Log of NonHH labor per hectare	1.2	1.2	1.4	-0.2
Number of HH labor used	2.6	2.7	2.2	0.5***
Number of HH labor used per hectare	23.3	28.5	6.9	21.6***
Log of HH labor used per hectare	1.0	1.1	0.8	0.4***
Other agricultural characteristics:				
HH owns livestock (%)	74.7	74.0	77.0	-2.9
HH grows a cash crop (%)	49.7	47.8	55.6	-7.8*
Number of crops grown	4.7	4.6	4.7	-0.1
HH owns plot	89.6	90.1	88.3	1.8
HH received productive input assistance(%)	1.4	1.3	1.8	-0.5
	38.2	36.7	42.8	-6.1***
Socioeconomic and demographic Characteristics:				
HH head is male (%)	69.6	68.2	74.0	-6.1
Age of head	51.2	50.9	52.3	-1.4
Age of head squared	2826.6	2789.5	2943.9	-154.4
Education of head (yrs)	2.0	1.6	3.3	-1.7***
Number of working age males	1.5	1.6	1.3	0.3***
Number of working age females	1.4	1.5	1.0	0.4***
Number of dependants	2.3	2.7	1.3	1.3***
HH received remittances from abroad (%)	18.1	14.6	29.2	-14.6***
HH received remittances from Haiti (%)	24.7	23.4	28.9	-5.6*
HH member receives pension (%)	0.3	0.3	0.5	-0.2
HH member receives income from real estate transaction (%)	3.6	2.1	8.2	-6.1***
HH member receives other income (%)	5.9	4.9	9.0	-4.2*
Other Household Characteristics:				
HH is nonpoor (%)	24.1	na	na	na
HH is food secure (FAO measure) (%)	64.6	57.3	87.8	-30.5***
Nonagricultural Income:				
At least one HH member working in either NFE and/or NFW	28.3	26.2	34.7	-8.4**
At least one HH member working in NFE	23.6	21.3	31.0	-9.7***
At least one HH member working in NFW	6.8	7.0	6.0	1.0
Observations (unweighted)	1499	1180	319	

Significance denoted *** p<0.01, ** p<0.05, * p<0.1





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