THE DETERMINANTS OF RURAL NON-AGRICULTURAL EMPLOYMENT:

Case of education factor in Musanze District

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ABSTRACT

This thesis examines the factors influencing non-agricultural employment, level of participation in non-agricultural employment and factor rewards to non-agricultural activities in Musanze district. The focus is made on education as main factor that is affecting non agriculture employment. A double hurdle model is used to estimate the determinants of participation in nonagricultural employment, the level of participation, and the earnings level of rural individuals and households by non-agricultural categories. The participation decision is estimated using a Probit model while the level of participation and returns to participation are estimated using truncation. The results suggest that females do not play an important role in participation, intensity of participation, and returns to participation. Female level of participation tends to be centered on nonagricultural self-employment activities. Education is found to be an important determinant in all three models, especially nonagricultural wage employment. Furthermore, the dependency ratio shows that many household members are dependents, and this has a strong negative impact on the participation decision, level of participation, and earnings. Finally, focusing on main activities, those individuals participating in primary non-agricultural wage-employment are more likely to live closer to centers whereas those participating more in non-agricultural self-employed are more likely to live closer to good roads and grouped settlements. Education must be an important component of any policy intervention, and it should be focused on training while also recognizing gender heterogeneity. Policy makers should also note income disparitiy, which is indicated by a high portion of income in nonagricultural wage employment. To end policymakers must try to remediate the problem of overpopulation via family planning.

Keywords: Agriculture ,double hurdle, probit regression, truncation regression, Non-Agriculture, Education .

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LIST OF ACRONYMS AND ABBREVIATIONS

AGOA: African Growth and Opportunity Act

EDPRS: Economic Development and Poverty Reduction Strategy

EICV1:Enquête Integrale sur les Conditions de Vie des Menages 1

ECIV2: Enquête Integrale sur les Conditions de Vie des Menages 1

NEPAD: New Partnership for Africa Development

MINECOFIN: Ministry of Finance and Economic Planning

PDD Musanze : Plan de Dévélopment du District de Musanze

RNFE : Rural Non-Farm Employment

SOTIRU: Société de Transformation Industrielle de Ruhengeri

VUP: Vision Umurenge Program

€: Euro currency

FRW: Rwandan Franc currency

Exchange rate € 1:FRW 800

CERAI: Centre de Enseignement Rural Altisanal et Integré

1. Introduction

The decline in soil fertility, the high population growth rate and natural hazards are major factors hindering equitable development, not only in Rwanda but also in most of the Sub-Saharan African countries. Smaling and Braun (1996) estimate that soils in Sub-Saharan Africa are being depleted at annual rates of 22kg/ha for nitrogen, 2.5kg/ha for phosphorus and 15kg/ha for potassium. The increase in the cost of chemical fertilizers has increased the problem of infertility of the soils, as small-scale farmers cannot afford to buy the commodity. In addition, the population increase implies that there is more pressure on land, which leads to reduced fallowing periods and consequently reduced crop yields (Smaling and Braun, 1996). Furthermore, as is the case in other developing countries, Rwandans living in rural areas have limited capacity to cope with shocks due to natural hazards such as earthquakes, droughts, floods and hurricanes. Therefore, natural disasters can have persistent negative effects on the welfare of the rural population (Van den Berg, 2010). This therefore necessitates income diversification of households in order to cope with risks. It is in the same scope that most developing countries promote a wave of policy interventions to deal with structural problems and unemployment in rural areas that are hit hardest.

In Rwanda, current government policies and strategies have been designed with the objective of reducing poverty. One of those strategies, Economic Development and Poverty Reduction Strategy (EDPRS), is focused on developing the rural and agricultural sector and generating non-agricultural opportunities in the rural areas (MINECOFIN, 2007). This strategy is particularly important since it acknowledges a high degree of diversification in the rural areas, which was not traditionally regarded as important. The creation of micro and small enterprises is envisioned as a way to create non-farm employment opportunities for the poor in the rural areas (MINECOFIN, 2007). Lanjouw said that the reactivation of a local economy generates activities which are expected to absorb the rural labour surplus and thereby slow down migration to the urban areas, which is a huge burden for developing countries (Lanjouw and Lanjouw, 2001).

Several studies (MINECOFIN, 2007 and MINECOFIN, 2008) conducted in Rwanda have observed an important portion of rural income resulting from non-agricultural activities. However, agricultural production is still the most important source of income in Rwanda, as the agriculture sector employs about 80% of the population (Strode et al., 2007) .

According to these studies, the rural employment composition has undergone important changes, evidencing an increase in employment from non-farm sources. These changes are due to several factors which include: low contributions from peasant agriculture compared to more modern sectors, low productivity of the peasant agriculture, and changes in the organization of the market for agricultural goods which promote more capital intensive activities (Strode et al., 2007) .

In addition to those changes, there is a difficult situation due to diminishing or time-varying returns to labour or land caused by market failures (e.g. for credit) or frictions (e.g. for mobility or entry into high-return niches), from ex-ante risk management, and from ex-post coping with adverse shocks. The consequences include lower returns to productive assets, which can vary across time (e.g. land, labour or livestock across dry and wet seasons) among individuals within a household, or among households within a community (Barrett et al., 2001) .

In an analysis of structural changes in Rwanda, the Ministry of Finance and Economic Planning (MINECOFIN, 2009) explains that the difficult situation in the rural areas has forced peasants to look for alternate sources of income. The major issues discussed that affect peasants are small landholdings, a lack of access to credit and low repayment capacity, and increasing costs of agricultural production. It is obvious that these are only a few salient factors among a myriad of issues influencing these trends in rural employment and rural incomes in Rwanda.

1.1 Problem statement

The countryside of Rwanda, like in other African countries, faces the strong inter-related challenges of rural poverty (Barrett et al., 2005) . There are multiple reasons behind that poverty but the crucial ones are: overpopulation, land degradation and illiteracy.

The high population growth make unavailable arable land whereas 80% of Rwandan are living from agriculture work (Strode et al., 2007). So then, the scarcity of land push Rwandan population to look for other means of living.

Rwanda, in fact, is small country with an area of 26338km^2. Its population is estimated at 10 412 826 (NISR, 2011) with 93% of Rwandans living in rural areas (Barrett et al., 2005) . Rwanda has a fertility rate of 4.6 (children per women) with a population growth rate of 2.9% (NISR, 2011) . This population growth rate accompanied with its small size makes Rwanda one of the most overpopulated countries with a density of 395 habitant/km^2 (NISR, 2011) and sometimes

more in some provinces. The Northern province (where Musanze district is located) has the highest density in Rwanda, apart from Kigali town, with a population density that goes beyond 710/km^2 (Musanze, 2011) . The consequence is that more than 60% of Rwandan farmers cultivate less than 0.7 ha, and more than a quarter cultivate less than a fifth of a hectare. Very few households cultivate large land areas (NISR, 2008) . This scarcity of arable land has lowered rural population income over time.

In addition, as mentioned above, Rwanda faces the problem of land degradation. Several parts of the country are mountainous with steep slopes and fragmented land. The steep slopes are prone to erosion, which decreases the productive capacity of the land and makes it difficult to meet the food demands of the Rwandan population.

Furthermore, for a long time Rwanda has been in the category of countries with low literacy rates . The current adult literacy rate is 65% of the total population over 15 years (NISR, 2011) . A high illiteracy rate is considered as a main factor underlying underdevelopment and one of the major factors underlying poverty. The illiteracy has been reinforced by many factors in Rwanda. Those include class repetition, dropout, low performance and lack of link between education and needs(MINEDUC,2008). To solve the problem of poverty the government of Rwanda launched some education and trainings program to alleviate illiteracy. In education reform, the government included technical and vocational education and trainings so that education can meet rural needs.

Vocational training was particularly promoted within the 1977 reform with the establishment of Centres for Rural and Artisan Education (CERAI) which provided some general academic subjects while focusing on vocational skills training (agriculture, home economics, crafts) (MINEDUC,2008). Some success of this program has been recorded in some district like in Rubavu (north west province and next door to Musanze district) where the trained people are producing handcrafts that are sold in every corner of Rwanda and particularly in Musanze district shops (see annexe 5) because of huge tourists. The district of Rubavu also accounts the high density as well as Musanze district but its population are not migrating due to many opportunity offered by KIAKA cooperative and Nyundo secondary school in technical and handcrafts education and training (MINECOFIN,2009). The district of musanze- which is highly over-populated (density of 710hbt/km2)- houses only one vocational training institution and does not account any technical education school (Musanze,2008).

So due to lack of technical and vocational training that may facilitate non-agricultural jobs entrance, like in Rubavu district, an increase of Musanze inhabitant does not translate into an increase in non-farm employment(Clay and Kampayana,1997). The consequence is the migration of Musanze inhabitants to eastern province where land is still available (Strode et al. (2007). To the extent that poor farm households with little access to land can obtain the training to facilitate their participation in the non-farm sector, their relative economic position will likewise be enhanced. Thus, it is important to study how education is affecting Musanze nonagricultural jobs. Therefore, this Research was done to upgrade the understanding of the determinants of nonfarm participation-mainly education- and describes the characteristics of non-farm activities available in Musanze region in general

1.2 Objective

The general aim of this study is firstly to identify the factors that determine participation in rural Non-agricultural employment and secondly to analyse level of participation and returns to participation in non-agricultural activities. The specific aim is to identify effect of education to non-agricultural activities

1.3 Research questions

i) What are the determinants of an individual's participation in non-agricultural employment in Musanze district?

ii) What is the level of labour allocated to non-farm activities?

iii) To what extent are the income from participation in non-agriculture employment?

iv) To what extent does education contribute to non-agricultural employment participation?

v) Does being educated mean being better rewarded?

1.4 Overview of the study

The parts of the thesis are organized as follows. The second chapter presents the background of employment in Rwanda. The third chapter deals with the theoretical framework. The fourth chapter presents the data and methodology. The fifth chapter describes the results and discussion. Finally, the sixth chapter consists of the conclusions and recommendations.

2.Background of employment in Rwanda

2.1 Situation of non-agricultural employment in Rwanda

Due to its high population growth rate, as stated in the introduction, Rwanda has been characterized by an excess supply of labour that is low-skilled and poorly educated as well as a lack of decent jobs. There is also some evidence that the process matching workers and jobs is not optimal (Abbott et al., 2010). Indeed, there is evidence of a decline in the proportion of adults in employment, accounted for by increased participation in education and a sectorial shift out of subsistence agriculture into non-farm work and farm labouring (Abbott et al. 2010).

Since 2000 there has been a decline in the proportion of workers employed in the primary sector (mainly agriculture) and an increase in employment in the secondary sector (manufacturing) and the tertiary sector (services). Employment in agriculture fell by 13% between 2000 and 2006, while in manufacturing and the service sector it increased. The most notable increase was in the service sector, which increased its share of employment from less than a tenth of all jobs in 2000 to nearly a fifth in 2006 (Strode et al 2007). According to the same source, non-agricultural jobs have been found to be on average better paid than agricultural jobs, although many non-agricultural jobs were lower-paying in 2006 compared to pay levels in 2000.

Besides, within the same period, waged employment has increased by 10%, driven by a 40% increase of waged farm employment, as well as a 4% increase of non-farm waged employment. Likewise, employment in independent non-farm enterprises increased by 5%. Clay and Kampayana (1997) argue that the causal mechanisms for this shift have not been extensively researched but are likely to be a combination of push factors, landholdings too small to support the household, and the availability of waged employment in agriculture and non-agriculture. This argument is supported by the estimates made by Strode et al. (2007). They said that the shift from working on a family farming enterprise to other types of employment accommodated the additional half million workers that entered the labour market between 2000 and 2006.

Considering the jobs started within 2000 and 2006 period (excluding independent farmers), Abbott et al. (2010) found that under half (45% of job started) were as unpaid farm worker while 12 per cent(of new jobs) were in paid farm work; thus over 40 per cent of new jobs were in non-farm employment. Abbott et al (2010) found that independent non-farm work together with

waged non-farm was especially important for young people aged 21 to 30 years, with just over fifty per cent of them starting non-farm employment.

However, they realize that the Rwandan labour market continues to be characterised by a deficit of decent work, with the numbers of working poor remaining high. The National Institute of statistics of Rwanda (NISR, 2006) said that 40% of working adults (14years old and above) have more than one source of income with those in rural areas being more likely to have more than one job and men more so than women. The Rwandan labour market is well understood if time-related underemployment as well as unemployment are taken into account. Underemployment can provide information on the extent to which the economy can provide full employment for all those who want it and thus a better understanding of the true employment situation (International Labour Organisation 2004).

Abbott et al. (2010) found that Rwanda has low unemployment (people available for and seeking work) , but high under-employment, especially amongst men in rural areas. The average number of hours worked a week in all jobs is 31 (men 35, women 28) but this falls to 27 (30 men, 25 women) for those whose main occupation is agriculture. However, women, in addition, spend well over 20 hours a week on domestic duties while men spend only around five (Pamela et al., 2010). Assuming a normal working week of 40 hours in productive labour, this suggests that up to a quarter of the adult workforce is in reality surplus to requirements, with the vast majority residing in rural areas (The International Labour Organisation 2004). However, we must exercise some caution because, as Fox and Gaal (2008) point out, measuring labour force participation in countries like Rwanda is problematic given the variety of activities in which people engage across the day, especially in rural areas, and the pattern of work across the seasons.

Whilst most men and women engage in productive labour, there is a concern that underemployment may be turning into unemployment for a growing number of young people, especially in rural areas (Abbott et al., 2010). A 2009 report (Education Development Centre, 2009) also found that there is a growing pool of unemployed/marginally employed young people, especially men, who have, migrated from rural areas to urban areas, including Kigali. The Centre for Support to Small and Medium Enterprises in Rwanda (CAPMER) estimate that 85 per cent of Rwandan young people are in reality unemployed with most young people in rural

areas being surplus labour. There is a low level of human capital and the workforce is poorly educated, with a majority of the population having primary school education or none, and only just over two-thirds of the population declare themselves as literate (71.5% of men and 60.1% of women). Literacy rates are much lower in rural areas than in Kigali or other urban areas (Abbott et al., 2010). Educational attainment is poor even amongst younger age groups, with many of those who have only attended primary school being barely literate (Education Development Centre 2009) .

There is also a mismatch between the skills of those seeking employment and the skills employers are looking for, with a shortage of skilled labour at all levels from technical and vocational to higher education (Abbott and Rwirahira 2010). Abbott and Rwirahira (2010) estimated that there is a 60 per cent skills gap in the private sector and a 30 per cent skills gap in the public sector.

2.2 Household Enterprises in a Segmented and Segregated Labour Market

It is important to understand the location of non-farm household enterprises within the Rwanda labour market as they comprise a distinct segment. Household Enterprises provide employment, main or supplementary, for a growing number of adults (≥14 years old) in rural as well as urban areas. They provide one important route out of agricultural work and generally provide a higher standard of living than enjoyed by those dependent on agricultural employment alone (Strode et al 2007; Vinck et al 2009; Gaal 2010).

However, it is important not to see them in isolation from agricultural employment. In rural areas agricultural and non-farm employment are linked through investment, production and consumption, and both form part of complex livelihood strategies at both the individual and the household levels (Winters et al 2008; Vinck et al 2009). In urban areas, household enterprises are more likely to be an individual's sole employment, although many households combine income from more than one type of employment, including household enterprises.

According to Pamela et al. (2010) the Rwandan labour market has three main segments: agricultural work (wage employed or self-employed), own-account non-farm work (non-agriculture self-employed) and wage non-farm employment. They found that the vast majority of workers are either self-employed or unpaid family workers, mainly in agriculture. The majority of

workers are in agriculture (86.7% of women, 67.9% of men). Just under six per of women (5.7%) and 10.3 % of men run a household enterprise. Only 1% of men and 0.3 % of women are employers, that is to say owners of enterprises that have paid employees. Six per cent of women and 20 %of men are in paid employment with the remaining 2.3% of women and 0.7 % of men being family workers in non-farm enterprises.

According to Storde et al (2007), the majority of those in waged employment work in the informal sector, with over 90 % of those in waged farm work employed in the informal sector compared with 58 % of those in non-waged farm work. A higher level of education the decreases the likelihood of being engaged in agricultural work; 10.7 % of those with no education compared to 96.7 % of those with higher education are employed outside the agricultural sector (Strode et al., 2007).

Abbott et al (2010) said that the labour market in the capital (Kigali) is very different from the rest of the country, and in urban areas outside of Kigali compared with rural areas. Waged non-farm employment is heavily concentrated in Kigali, where 48 % of workers are employed in this type of employment and 18 % in independent non-farm work. The proportion of workers in these types of employment varies little by province(see table1), although a slightly lower proportion of workers are in non-farm employment in the Eastern Province compared to the others.

Table 1 :Main job of economically active people, by province (% of those aged 15 years and over)

	EICV2						EICV1
Job type	City of Kigali	Southern	Western	Northern	Eastern	National	National
Wage farm	4	8	9	10	7	8	4
Subsistence farmer[7]	24	75	74	75	79	71	85
Wage non farm	48	8	8	7	6	11	7
Independent non-farm	18	7	7	7	7	8	4
Unpaid non farm worker	6	2	1	1	1	2	1
All	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Pamela et al,2010

There is some evidence that a growth in employment opportunities attracts migrants, with Kigali and the Eastern Province attracting a significantly larger number of migrants than the other provinces and the Northern Province experiencing a higher rate of out-migration than the other provinces (Strode et al.2007). Migration to the Eastern Province is mainly to take up agricultural work, as there is more land available than in other parts of Rwanda. Migration to Kigali is to take up non-farm employment, including starting a household enterprise.

Occupational mobility appears to be mainly from working on a family farm to paid farm work, operating a non-farm enterprise or paid non-farm work. Non-farm workers are less likely to live below the poverty line than those who derive their main income from agriculture. Nearly ¾ of those in paid non-agricultural employment and just under 2/3 of those in independent non-farm work earn a living wage. However, the majority of those dependent on agriculture are poor, ranging from 72.4 % of those engaged in waged farm work to 57.9 % of independent farmers (Strode et al 2007).

There is gender segregation, with women predominantly located in lower status and less well remunerated jobs within the segmented labour market (Human Development Department 2009) Men are disproportionately moving out of farm work, and they captured ¾ of the new jobs created between 2000 and 2006 while being more likely to start a small business than women. In total 19 % of workers were in paid non-farm employment as their sole or main occupation in 2006 (salaried and own account) compared with 11 % in 2000. But only 11.6 % of women compared to 27.8 % of men were in paid non-farm work. Median earnings are higher for men; the ratio of female to male earnings is 0.67; the ratio of rural to urban earnings is 0.49, and the ratio of waged to non-waged is 1.64; the ratio of secondary to primary is 2.20 and of tertiary to secondary 2.87 (World Bank, 2012) .

2.3 Summary

In brief, Rwanda has been characterized by an excess supply of labour that is low-skilled and poorly educated as well as a lack of decent jobs. There is also a mismatch between the skills of those seeking employment and the skills employers are looking for, with a shortage of skilled labour at all levels from technical and vocational to higher education

In addition, the Rwandan labour market has three main segments: agricultural work (wage employed or self-employed), own-account non-farm work (non-agriculture self-employed) and wage non-farm employment. The labour supplied in Rwanda is poorly educated and low-skilled. This leads to a mismatch between the skills of those seeking employment and the skills employers are looking for. The size of the working poor population remains high in Rwanda, with a remarkable decline in the proportion of workers employed in the primary sector (mainly agriculture) and an increase in employment in the secondary sector (manufacturing) and the tertiary sector (services). Women have a predominantly lower status and less well remunerated jobs due to gender segregation

3.Theoretical Framework

There is a crucial change in the rural economy of developing countries. As the rural economy grows, household participation and the intensity of involvement in farm activities declines and is gradually replaced by participation in non-farm activities(Winter et al,2008). While gains in wealth do not lead to complete divestment from farm activities, the share of income derived from farm activities declines and the share from non-farm activities increases substantially(Winter et al,2008). The pattern appears to be driven by a process of accumulation of assets and investment in education and infrastructure, contained within the framework of a dynamic rural economy and broader changes in the macroeconomic framework. However, as already discussed in the introduction, the pressure lead by high population growth on land productivity reduces rural earnings and then pushes peasants to look for other livelihoods outside of farming by diversifying their activities. Then the issues to know what non-farm employment is, what income diversification is and how rural non-agricultural labour supply is derived, are raised.

3.1 Rural non-farm employment and Income diversification

Developing countries have been a focus of a lot of studies and particularly in their rural areas. Those studies have found that agriculture is not the only important sector in the rural economy. They have shown that the non-farm sector plays a significant role in contribution of employment and income in the rural areas (Lanjouw and Lanjouw, 2001; Haggblade et al., 2007). What are non-farm activities? What is income diversification?

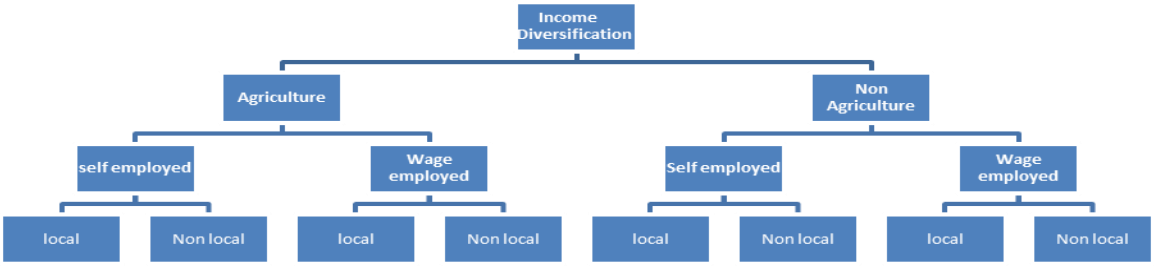
According to Barrett et al. (2001), there has been confusion in development literature over the terms off-farm, non-farm and non-agriculture due to a lack of classification reference. He said that the basic classification may follow the sectorial distinctions of national accounting systems: primary, secondary, and tertiary. Therefore, sectorial farm/non-farm assignment concerns only the nature of the product and the types of factors used in the production process. It does not matter where the activity takes place, at what scale, with what technology, or whether the participant earns profit or labour income (wages or salary) from the activity. Thus, the term rural non-farm employment may be defined as being "*all those activities associated with waged work or self-employment in income generating activities (including income in-kind) that are not agricultural but located in rural areas*" (Davis, 2001). Davis suggest that rural non-farm activities might include manufacturing (i.e. agro-processing) and be accumulative (e.g. setting-up a small

business), adaptive, switching from cash-crop cultivation to commodity trading (perhaps in response to drought), coping (e.g. non-agricultural wage labour or sale of household assets as an immediate response to a shock), or be a survival strategy as a response to livelihood shock. For Barret (2001), income diversification in non-farm activities falls into three major categories that are classified on the basis of sectorial (agricultural and non-agricultural income), functional (self-employed income and wage employed) and spatial (local and non-local activities) dimensions. Figure 1 is an adaptation from the above categorization. It is important to note that in most cases people confuse off-farm and non-farm terms. It is worth noting that off-farm is defined on the basis of the spatial component and indicates where employment takes place. In this study, any activity carried out in the community where the household resides or in another neighbouring community or town is considered local.

The non-local category is defined as any activity carried out in another place where a person spends the night. This may be in another community, town, city or country. Consequently, a non-farm activity may be on farm or off-farm. One can go into further detail, distinguishing between different skill requirement levels in each of the sectors. Escobal (2001) disaggregates each of the two major categories of non-farm employment, self- employment and wage employment into "high skilled" and "low skilled".

On one hand, some activities are characterized by having low entry barriers and low rates of return, making access and exit from the market easy (Dirven, 2004) . On the other hand, Van den Berg (2010) found that there is no free entry and exit in non-agricultural self- employment and non-agricultural wage employment because of education requirement in Nicaragua. Therefore, the study focuses on checking the affordability requirements of getting in and out in non-farm self-employment and non-agriculture wage employment.

Figure 1: structural chart of general categories of income sources



Source: Adaptation made from Barret (Barrett et al., 2001) by Author

3.2 Deriving labour supply

To explore the topic of non-farm employment, this study uses a utility maximization framework under the agricultural household approach (Sadoulet and de Janvry, 1995). Caillavet (1994) said that the household approach is accounted when both production and consumption decisions are interrelated and when household characteristics play an important role in determining household behaviour, as is the case in imperfect markets (Lofgren and Robinson, 1999). From the constrained utility maximization problem, Sadoulet and de Janvry (Sadoulet and de Janvry, 1995) derive, in a case of market failure (non-separability case), a labour supply function of the form:

(1) LS = f (p, k, z) Where: LS = Labour supply,

p = Vector of input and output prices,

k = Vector of assets available to the household which includes arable land, and other fixed capital such as infrastructure,

z = Vector of household characteristics which includes family composition (such as time endowment, size of adult workers, dependence ratio, age and gender) and education (Van den Berg and Kumbi, 2006)

The above relationship between labour supply and its arguments has been mentioned in several studies: the closer the household is to a rural market the higher is the access to labour market and thus likely to increase the profitability of non-farm production and services.

Education as an important component of individuals' human capital, has a huge impact on non-farm employment. Reardon (1997) and Matsumota (2006) found a positive and consistent impact of education within African regions.

A household member may have the incentive to participate in non-farm employment- say because of higher wage rates offered- but if the education level requirements are not in place, then even though the incentives are in place, the household will not be able to take advantage of them (Reardon ,1997). Woldehanna and Oskam(2001) said that education is a crucial factor in employment participation. They found that skilled and educated people are self-employed or can secure stable long-term employment at relatively high salaries, while the unskilled and uneducated people depend disproportionately on more erratic, lower paying casual wage labor, especially in the farm sector

The same results on the positive relationship of level of education and participation in non-farm employment has been found also by Readon(1997). Reardon(1997)argues that several studies document that the level of education increases participation in non-farm employment and income from it.

Education is widely seen as one of the most efficient ways to reduce inequality (Toh, 1984). Education provides greater economic opportunities, especially to the poor (Blanden and Machin, 2004). It determines occupational choice and the level of pay, and it plays a pivotal role as a signal of ability and productivity in the job market. Education shifts the composition of the labour force away from unskilled to skilled. While this process may very well initially increase income inequality (Chiswick, 1968), in the long term it is expected to reduce income inequality (Schultz, 1963).

Similarly, age is another component indicating level of participation and life experience. In their study on Ghana, ABDULAI and DELGADO (1999) said that at a younger age, participation increases with age of the individual or the household head until around 40 years old. Beyond, an increase in age is associated with a decline in probability and level of participation.

Otherwise, gender of the individual or the household head may also affect participation. Lanjouw et al. (2001) have noted that women were less likely to participate in rural non-farm employment in Tanzania. However, the findings of Reardon et al. (2001) in Latin America were not conclusive. They found that the effect of gender is either not significant or is very different across studies.

Furthermore, physical capital is assumed to play a role for non-farm production.

Reardon et al. (2001) have found that land holding, which indicates farming potential, is negatively correlated with the share of non-farm income in Latin America, even if some of the studies also found that the level of income from rural non-farm employment increases with land holdings. This is because land holdings affect not only the incentives but also the capacity to engage in non-farm employment. Land holdings can increase likelihood to access on credit, social capital and own liquidity which are important to productive activities (Reardon et al., 2007).

Alternatively, under the same reduced-form model (equation 1) , Corral and Reardon (2001) indicate the variables in the labour supply function in terms of a household's incentives and capacities. In equation (1), the incentives are expressed as the "returns" in the forms of prices of inputs and outputs. Reardon (1997) explains that incentives either "pull" or "push" individuals

into the labour market. The potentially higher returns to labour that could be obtained from working off the farm would “pull” or attract households into diversifying activities. Lanjouw and Lanjouw (2001) similarly explain that households which are “pulled” into non-farm activities participate as a means of obtaining more income and improving their current living conditions. By contrast, factors such as low farm productivity, lack of access to credit, for example will tend to “push” households into non-agricultural activities. Households that are “pushed” into non-agricultural activities resort to diversification as a safety net.

The capacities are expressed as the vectors of capital and household characteristics (human capital) of a household which enable it to respond to the incentives. These assets are described as the level of education, amount of cattle owned, and amount of land owned for example (Corral and Reardon, 2001).

These capacities will place households in relatively better positions to respond to incentives. A household may have the incentive to participate in non-farm employment- say because of higher wage rates offered- but if the capacities are not in place (job requirements), then even though the incentives are in place, the household will not be able to take advantage of them.

Following the incentives and capacity approach, Atamonov and Marrit (2011) hypothesize that region, household and/or individual characteristics may have a dual impact on participation in non-agricultural activities through their potentially conflicting effects on incentives and capacities. Likewise, Atamonov and Marrit (2011) gather the same labour supply arguments (explanatory variables of participation function in non-farm activities:equation 1) into individual characteristics (I), Household characteristics (H), household assets (A), locations characteristics and access to infrastructure. Thereby, they specified an empirical model as follows:

(2) $Y_i = \Phi (I, H, A, I_{ct}, I_{nf})$; Where: Y_i: is reflecting participation in or returns from non-farm activities

I: is individual characteristics (such as sex, age, education level)

H: is a vector household characteristic (such as sex and age of household, size of adults in working age, dependence ratio)

A: is the household assets (such as arable land and livestock)

I_{ct}: locations characteristics (reflecting price proxies such as distance to the nearest market, grouped inhabitants

$I_{nf:}$ Accessibility to infrastructure

Following the incentives and capacity approach, equation (2) is going to be applied throughout this study. The reason is that we hypothesize that the same characteristic of household or individual may have a dual impact on the participation, level of participation and returns to nonfarm activities through its potentially conflicting effect on incentives and capacity. For example, some nonagriculture activities may be mostly occupied by women, while returns are biased toward men.

In addition, larger land endowments may diminish the incentives to engage in rural nonagricultural employment but can increase the capacity to undertake or expand nonfarm activities with high returns by either investing cash from agricultural activities or using land as guarantee to get credit. Likewise , livestock ownership may decrease the need to engage in the rural non-agricultural activities but its proceeds may facilitate engagement in profitable nonfarm activities. Furthermore, education may also have a diverse impact on participation and income from rural non-agricultural activities abstraction made to primary activities (if focus is made on main activity) (Abdul,2011).

4.Data and Methodology

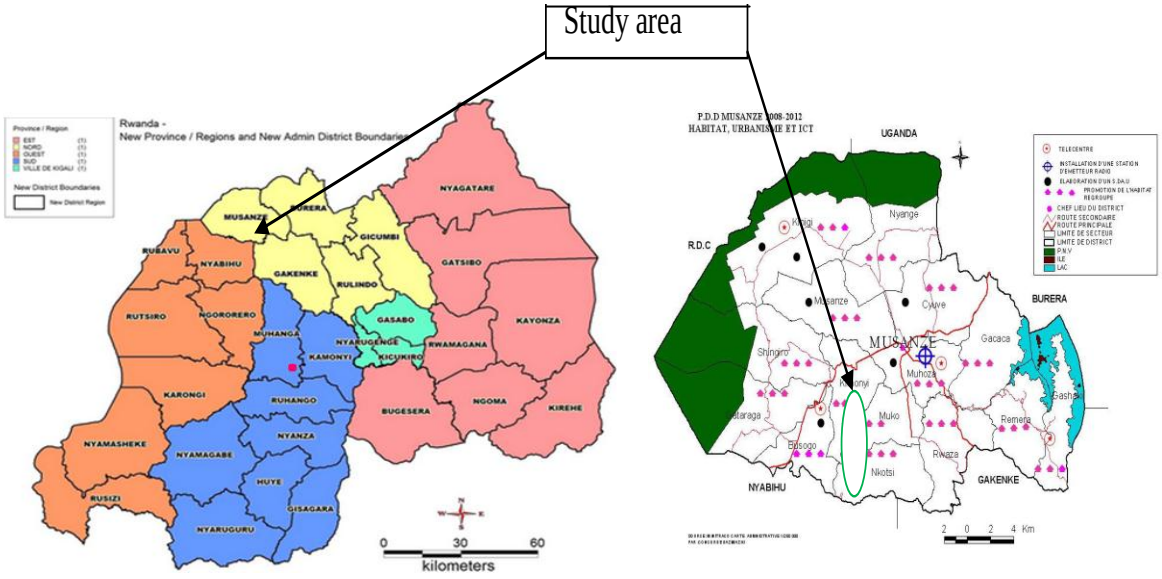
This section includes a description of the data, methods, variables and econometric models used to test empirically which individual, household and physical asset characteristics determine non-agricultural labour supply, the level of participation and the level of income.

Section 4.1 describes the study area. Section 4.2 indicates firstly how the survey has been carried out and the sampling technique that has been used to gather information. Secondly , it describes the dependent and independent variables. Finally, Section 4.3 describes the econometric models and specifications used to regress the determinants of participation, intensity of participation and the reward from each factor given participation.

4.1 Study area

This study was carried out in Musanze district of the Northern province in Rwanda. The study area selection is based on the fact that the district's economy is primarily based on agriculture and livestock farming while other economic sectors are being developed progressively.

Figure2: map of Rwanda districts and map of Musanze district



Source:USAID/Rwanda,website,2010.

source: Musanze,2008.

Musanze District is one of the five districts that make up the Northern Province in Rwanda. It is located in the northern region of the country. It is composed of 15 administrative sectors, with a population of 314,242 inhabitants over a total surface area of 530.4 km². The District of Musanze shares its borders with Burera District to the east, Gakenke District to the south, Nyabihu district to west (western province) and the Democratic Republic of the Congo and Uganda to the north.

Musanze district has inter-tropical, highland and volcanic geographical characteristics. It is characterized by a cool temperate climate with very fertile soils. Musanze inhabitants are producers of vegetables, cereals, legumes, pyrethrum and potatoes. The district also has dairy cattle for milk production. By contrast, Musanze District is not suitable for extensive agricultural production due to a high population density estimated at 592 inhabitants/km^2 on average (the density is 529 and 574 respectively in Nkotsi and Kimonyi) (Musanze, 2011) , and household landholdings are relatively small, averaging 0.55 hectares per household in Nkotsi and Kimonyi. With this being the case, Musanze is a district where a considerable rural exodus has been recorded (MINECOFIN, 2009; Musanze, 2011) as non-farm job creation does not follow the population growth rate.

The population of Musanze District is employed in agricultural production activities, up to about 90% (Musanze, 2011). The secondary and tertiary sectors are underdeveloped. Handcraft activities are limited and sometimes temporary in Musanze rural area. However, the District town has many cooperatives that hold small crop processing units, handcrafts and repair works, which are not able to generate employment. The bulk of permanent employees is made up of teachers, employees of the District, banks, hotels and various institutions working in the District. Furthermore, the District has about 1,497 unemployed persons that have finished their secondary school studies. Likewise, the industrial sector is not well developed. Musanze District has 3 food processing plants all of which are located in Musanze town. These are: The wheat processing plant of Ruhengeri (SOTIRU), the Pyrethrum processing plant of Rwanda (SOPYRWA) and a soap factory. The populations of Nkotsi and Kimonyi are not likely to work in these processing plants as these areas are located far from Musanze town.

Musanze District town is a hub for business. Its position at the crossroads of the roads from Kigali to Rubavu District close to Goma Town of the Eastern Democratic Republic of the Congo, and to Cyanika, close to Kisoro town in Uganda promotes trade. The District is served by a road

network that can be grouped into categories: paved and unpaved roads. International routes: Goma (D.R. Congo) -Kigali via Rubavu; Musanze-Kisoro (Uganda) via Cyanika, unpaved roads (Musanze - Kigali-Musanze and Muhanga via Vunga), the main axes as well as local trails linking neighbourhoods, sectors and cells between them. Maintenance activities are limited to simple road maintenance for 391 km and 18 km of periodic maintenance. Many of these roads are in poor condition and need to be rehabilitated (Musanze, 2011). Musanze District has five open-markets with modern facilities, one of them being located in the study area (Kinkware open-Market).

Concerning the education sector, the overall structure of Musanze district is copied on the national system. The education sector in Musanze District includes preschool, primary, secondary, vocational training and literacy training. However, Paxton (2012) said that this structure is changing considerably since 2009 with the introduction of the Nine(9) Years Basic Education system and the beginning of the introduction of the Twelve Years Basic Education system since early 2012.

Based on the average density and proportion of students per teacher in secondary and preschool, the situation is relatively satisfactory in the Musanze town in comparison to its rural area.

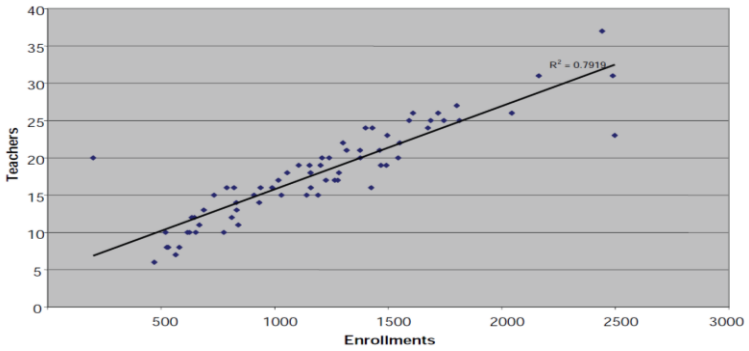
Table2:Education situation in Musanze (year 2008)

Type	Number of schools	Number of classrooms	Number of students	Mean students/ classroom	Number of teachers	Mean students/ teacher
Preschool	88	177	7,086	40	177	40
Primary	75	1,224	89,736	70	1283	70
Secondary	27	243	9,900	41	334	30

Source: Plan de Dévéloppement du District de MUSANZE,2008

At the primary school level, the scatter plot for teachers and student enrollment gives a general idea of the variations in the pupil to teacher ratio according to school size. The Musanze district scatter plot shown in table 3 is quite typical, showing that some variation still exists in the deployment of teachers: for example, the number of teachers at a primary schools with around 800 students ranges from 11 to 16. Thus a student / teacher ratio ranging between 73:1 and 50:1 is observed.

Table 3: MUSANZE typical Scatter Plot of Teachers and Enrolment at Primary Public Schools



Source: MINEDUC School Statstics, 2008.

The ratio of 73:1 is the highest in Rwanda and this may have an impact on performance of students. In reality ,such a high ratio leads to repetition and dropout.

Construction, rehabilitation and equipping of classrooms for all levels of education are emerging as one of the alternatives to solve the problem of that high ratio. This will improve access to education and the quality will be guaranteed by the existence of qualified and competitive teachers. In tertiary education, Musanze District houses the Institute of Agriculture and Animal Husbandry Busogo (ISAE) and the National Institute of Higher Education (INES). These institutions represent the potential of the District. Concerning the vocational training and literacy training, Musanze District has one private vocational training center (CFJ) and 179 literacy centers frequented by 7656 (27%) of 28,407 illiterate identified.

Concerning education in the study area; Nkotsi sector has 5 primary school centres and one ordinal level secondary school. Some of the facilities are old and deserve outreach and or rehabilitation. Kimonyi sector has two primary educational centers (Birira and Kitabura) and one school under construction(kivumu). Both sectors are in need of new primary school centres to reduce the student / teacher ratios, which are respectively 69:1 and 71:1 for Nkotsi and Kimonyi

4.2 Sampling, data collection and variables

This study was conducted over a period of six weeks (May – June 2012) in Nkotsi and Kimonyi. The cross-section data was collected on the characteristics of individual and households, owned assets, location characteristics, employment status and returns to participation. The choice of these sectors has been motivated first by the fact that both sectors have a roughly equal number of households and residents. Nkotsi has 3,096 households and 12,408

inhabitants while Kimonyi has 3082 households and 12,886 inhabitants (Musanze, 2011). Secondly, the choice of study areas has been motivated by accessibility and constraints due to the time available for the data collection process.

A two-stage random sample (see annexe A-3) has been conducted to select 50 households from Kimonyi sector and 50 households from Nkotsi sector. The total sample size is 100 households surveyed totaling 406 inhabitants.

The sampling has been carried out as follows: Kimonyi sector is comprised of 19 villages with a total of 3096 households (Musanze, 2011). Five out of 19 villages from Kimonyi have been selected randomly (see annexe A-3). From these five villages, ten households within each village have been randomly selected and interviewed. Similarly, Nkotsi sector has 28 villages with a total of 3082 households (Musanze, 2011). Again, five out of 28 villages from Nkotsi have been selected. And from the latter, ten households in every selected village, were randomly selected and interviewed. A questionnaire has been used as a method of collecting primary data (see annex A-5). The major limitation of the survey has been the time constraint that did not allow data collection of a larger sample. The questionnaire, which includes both closed and codified questions, consists of 5 sections. Section 0 covers the identification and characteristics of the respondents. Section 1 deals with economic activities in general. Section 2 contains questions on non-agricultural activities/ Section 3 collects data on agriculture, and, lastly, section 4 includes income transfer questions.

The variables that are going to be applied in this study are derived from equation(2) as described in the theoretical framework.

The independent variables show individual characteristics, household characteristics and location characteristics. Each variable is linked to the categories of variables described in the conceptual labour supply model (equation 2). Tables 4 and 5 below provide a list of the dependent (table 4) and independent (table5) variables used in the study. All of these dependent variables measure the probability of an individual participating in non-agricultural employment in the rural areas (see table 4).

The next dependent variable, days worked per year, measures how much time an individual dedicates to non-farm activities, given their participation on the non-farm labour market. A day of work is a common measure of labour in the rural areas of Rwanda (see table 4) . The variable in

this study aggregates (or disaggregates) the number of hours, days, weeks and months of work declared by an individual; eight hours of work per day make up a day's work.

The last dependent variable is the returns (earned income) deducted from different factors that affect the participation in non-agricultural employment. In equation (2) , returns are also a function of the same explanatory variables which seek to establish which characteristics are more important in determining an individual's level of income from different incentives and capacities. The returns are either individual income from primary non-farm self-employment or individual wages from public or private paid employment.

Table 4. List of dependent variables for non-agricultural labour supply models

Dependant variable description	**Value**
Participation in non-agricultural self-employment	1=yes, 0=No
Participation in non-agricultural wage employment	1=yes, 0=No
Days per year worked for those who participate	Number of days
Returns derived from non-agricultural activities	Income/wage in Rwf

Source: Author's typology adapted from Barrett (Barrett et al., 2001)

In addition, this study considers a set of explanatory variables that corresponds to the theoretical variables expressed in the equation (2) . Each variable is listed in following table (Table 5).

Table 5. List of independent variables for non-agriculture labour supply models

Independent variable	*value*
Individuals characteristics	
Individual gender (female=1)	1=Female, 0=Male
Individual is household head	1=Yes, 0=No
Individual is spouse of household head	1=Yes, 0=No
Individual age	Years
Literate	1=Yes, 0=No
Education completed by each household member:	1=Yes, 0=No
Primary standards1-6	1=yes, 0=No
Secondary standards 7-12	1=yes, 0=No
Tertiary standards >12	
Household characteristics	
Gender of head of household (Female=1)	1=Female, 0=Male
Age of head of household	Years
Adult workers in household over age 14	Number
Dependence ratio	%
assets	
Landholdings per household	Hectares
Value of livestock per household as of February 2012	In Rwf
Locational characteristics	
Distance from household to nearest fair/market	Km
Populated centre or scattered settlement	1=scat, 0=pop
Dummy for the quality of roads, bridges and communication infrastructure	1=good (Tarmac or laterite);
in the area in which the farm household is located	0 = other

Source: Author's typology adapted from Matshe (Matshe and Young, 2004) and Atamanov (Atamanov and Van den Berg, 2012)

The level of education is represented by a dummy variable (according to cycle of education completed) while the age is measured in years. Gender is measured in terms of the sex of the respondent and whether the individual is the head of household or the spouse. The household asset variables are expressed as arable land and livestock. Land is measured in hectares while livestock is measured as the value of total livestock owned at the end of the previous agricultural season (February 2012). Having livestock could be a determinant of participation, but it could also be a result of additional income from non-farm activities.

Return to participation is measured as total non-agricultural revenue earned through the entire year. The number of adults in the household takes into account all individuals in the household over the age of 14 years who are considered to be part of the active population economically. Having more adult members in the household may increase participation and level of income; but it may also be a choice variable as households may choose to have more children or live

with extended family members as a way to obtain higher incomes. Other explanatory variables include location characteristics like distance to the closest market, to good infrastructure and being located in a grouped settlement(populated centre) or not. The distance to the nearest market /or centre and infrastructure (good) is measured in km.

4.3 Estimation Method: Double hurdle model

To address the research questions stated above, different estimations have been made to analyse the determinants of participation in non-agricultural employment and intensity of participation on the one hand, and the determinants of participation in non-agricultural employment and income level on the other.

The double hurdle estimations are used because individuals working in non-agricultural activities must be both a participant in the market and have decided on a positive level of work time. In fact, if we observe the dimension time of work, a two stage process must have been completed. As Matshe and Young(2004) found, firstly, the individual decides to participate in the labour market and secondly allocates some amount of time to work. Consequently, no work time may be observed either because of the participation decision or the hours of work decision. In addition, a person may be a potential participant in the non-agricultural labour market but for certain levels of relevant variables decide not to work in non-agricultural activities. Thus, no time spent on non-agricultural work can be generated by a 'failure' at either or both of the obstacles (hurdles). Two sequential decisions are taken. An individual decides to join the labour force or not. Similarly, the individual decides to take up a job offer or is chosen from the queue for a job.

Thereby, the double-hurdle model allows one to establish the distinction between the participation decision, the level of participation and the returns from non-farm activities. The model is fitted in two-stages. The first stage is a probit estimation and the second is a truncation estimation (Burke, 2009) .

The model has been developed by Cragg (1971) and has been applied by Matshe and Young (2004) and Serumaga-Zake and Naudé (2003). Matshe and Young (2004) estimated off-farm household labour allocation decisions in Zimbabwe while Serumaga-Zake and Naudé (2003) applied the same model to estimate the private rate of return to education in South Africa. In their study, Matshe and Young (2004) state that by separating the model into two stages (double hurdle), the problem of zero observations is avoided. As we have seen in the previous

paragraph, zero observations are not due to individual lack of some requirements (corner solution) in the hours of work equation, but are due to the preferences of not to be engaged in non-agricultural work whatever the values of exogenous variables (abstention) (Matshe and Young, 2004) .

With respect to equation 2 {$Yi = \Phi\ (I, H, A, I_{ct}, I_{nf})$} , the analysis of the decision as well as the level and returns to participation are estimated by means of explanatory variables with following regressions:

(3) $P\ (y=1|x) = \beta_{10} + \beta_{1i} X_{1i} + u_1$ *(Participation)*

(4) $L^* = \beta_{20} + \beta_{2i} X_{2i} + u_2$ *(Level of labour)*

$L = L^*$ if $L^* > 0$

$L = 0$ if $L^* \leq 0$

(5) $Y^* = \beta_{30} + \beta_{3i} X_{3i} + u_3$ *(Return)*

$Y = Y^*$ if $Y^* > 0$

$Y = 0$ if $Y^* \leq 0$

Where: P= the probability of participation by an individual in a non-farm activity

β_{ji}= Unknown parameters {with j=1,2,3; and i= 0,1,2,3,...16}

X_i= I, H, A, I_{ct}, I_{nf} (Explanatory variables explained in equation 2)

U_1 = The error term of participation.

U_2 = The error term of level of labour.

U_3 = The error term of return.

L= dependent variable reflecting participation in non-agricultural activities

Y=dependent variable reflecting income from non-agricultural activities

In this study, statistical software has been used. Descriptive indicators such as means and standard deviations are calculated for the analysis of the data. Econometric tools have been used to estimate equation (2) . The STATA 11 econometric package is applied in order to run the Probit estimation for equation (3) and to run the truncation regression for equations (4) and (5) .The first stage of this model examines participation in three categories of employment: non-agricultural employment, non-agricultural wage employment and non-agricultural self-employment. The second stage examines, on the one hand, the level of participation in non-agricultural employment, non-agricultural wage-employment, and non-agricultural self-employment; on the other hand, the returns to (from) non-agricultural employment, non-agricultural wage-employment, and non-agricultural self-employment are examined.

5. Presentation and discussion of Results

This part deals with the analysis of outputs derived from the surveyed data. It uses descriptive statistics to analyse and discuss the characteristics of the agricultural and non-agricultural activities of the sample. Furthermore, econometric estimations are analysed and discussed.

5.1Descriptive analysis

5.1.1 Description of the characteristics of individuals and households

Table 6 summarizes the survey results for the NKOTSI and KIMONYI sectors. It provides the descriptive characteristics of 406 observations.

Table6. Descriptive statistics of the model variables (N=406)

Variables	***mean***	***Standard deviation***
Characteristics of Individuals		
Female (%)	53	49
Individual age (years)	22	17
Individual can read and write (% Yes)	53	49
Non-Education (%)	33	46
Primary Education (%)	50	50
Secondary Education (%)	15	35
Tertiary Education (%)	2	13
Characteristics of Households		
Gender of household head (% Female)	26	43
Age of household head (years)	43	13.64
Number of adults in household (over age 14)	2	.72
Household size (number of individuals)	5	2.22
Dependency ratio (%)	56	2144
Assets		
Total value of livestock per household (in FRW)	162119	77292
Size of arable land of the household (in hectares)	.54	.66
Characteristics of the Location		
Distance from household to nearest market (km.)	3.4	2.71
Scattered settlement (%)	60	48
Good infrastructure (%)	28	45

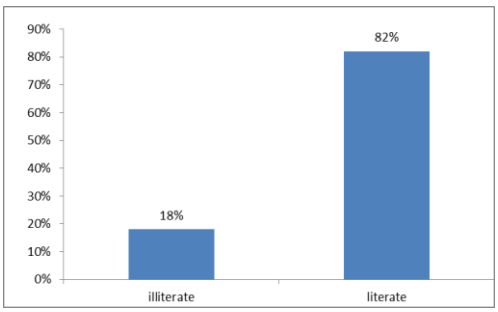
Source: Author's computation of survey data, 2012

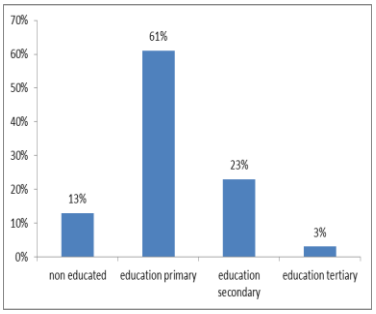
Firstly, the table above indicates that 53% of surveyed population are women. The same results is reported by national statistics where it is indicated that the majority of Rwandans are women. In fact, the number of males per hundred females is 90.2 (NISR,2011). Concerning the responsibility within the household, Table 3 above shows the percentage of households headed by women. The proportion of female-headed households in the study area falls below the percentage of households headed by women at the north province level which is 29% (NISR,2011). The results show that 26% of the interviewed households are headed by females and this is the lowest indicator if we consider the national statistics, according to which 52% of households are headed by women (MINECOFIN,2009).

From the table, it can be seen that the average individual age is 22 whereas the average age of household head is 43. This shows that the sample is mainly composed of young people and young households.

The Literacy variable is interesting as its rate is 53% (far below the national literacy rate which is 76%). Furthermore, completion of primary school does not mean necessarily being able to write and read (see Figure3).The national literacy rate is 76% according to the report of the third Integrated Household Living Conditions Survey (MINECOFIN,2009). We obtain the same results- that the number of illiterate people is still large- if we consider also the range of adult workers.

Figure3: Education rates and literacy level distribution of surveyed population(≥14 years N=292).

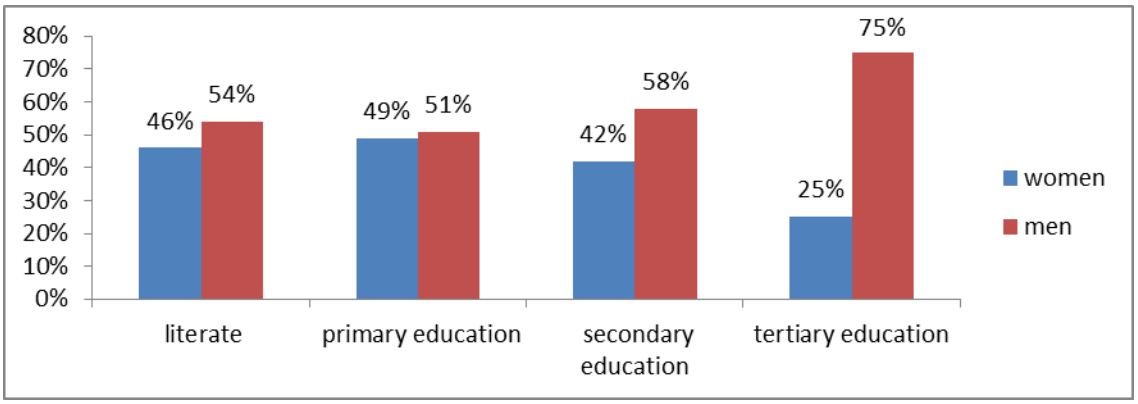




The above graphs indicate that the percentage of illiterate people is higher than the percentage of non-educated people (the difference is 5%).This can be explained by poor educational performance, repetition, dropout and low attendance due to socio-economic level, as mentioned before in the problem statement.

If we examine the gender factor, figure4 below indicates that women are both less literate and less educated than men even if women are more representative in terms of number in the sample.

Figure4:Literacy and education rate for persons aged 14 and above (N=292)



In fact, even if theoretically every child must complete primary and if possible nine years of basic education, 20% of schoolchildren drop out of primary school, with the majority being female . According to the Executive Secretaries of Nkotsi and Kimonyi sectors and cells, sometimes female children are obliged by their parents to stay home and help them look after their younger brothers and sisters. This is so despite the fact that dropping out of primary school not allowed by government.

As can be read from Table 7 below, although the majority of people who are employed have one job (67%), a significant number of people live on more than one job (29% have two jobs and 4% have three or more jobs). The table below shows that husbands are more involved in multiple activities whereas wives and relatives are likely to participate more in one occupation.

Table 7: Number of jobs held by adult (≥14 years old) household members (N=292)

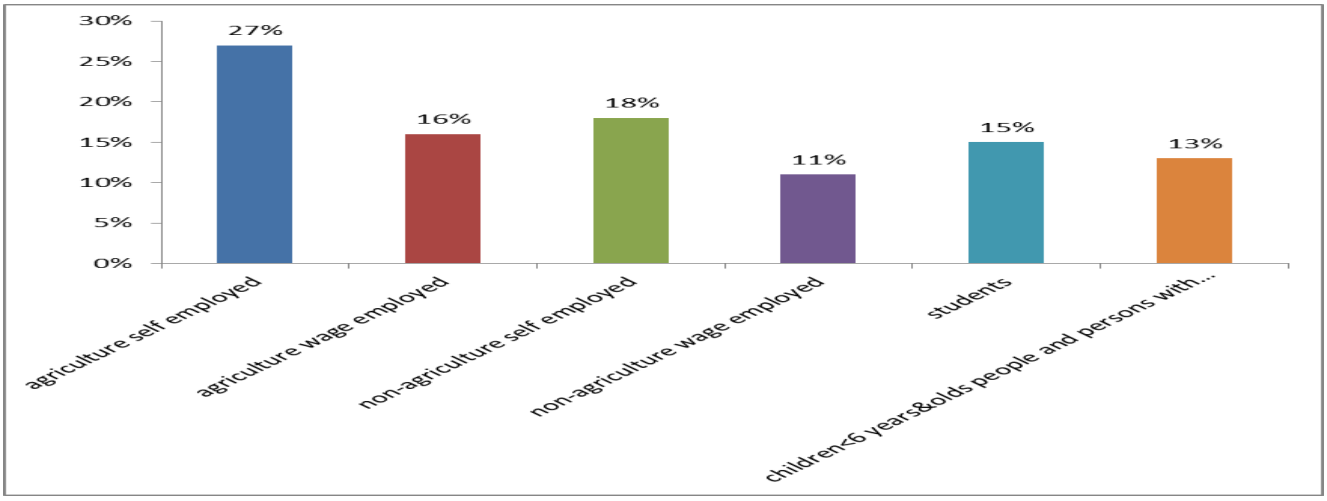
Number of jobs	Husband (%)	Wife (%)	Others (Son and/or daughter & relatives) (%)	All (%)
1	46	71	83	67
2	49	25	16	29
3	5	4	1	4
Total (%)	100	100	100	100

From this table, it can be seen that almost half of husbands (men) and roughly one fourth of wives (women) are involved in more than one job during the course of the year. Wives (Women) are less likely to do another job, especially because they are the most concerned with household

chores. Table 6 shows that the average size of the household is 5 members and that the average age is 22 with two (2) adult workers in each household on average. This shows that the household seems to possess a burden of taking care of young children or students, and it mostly is the wife who takes care of them. The dependency ratio (56%) factor indicates also the same results (Table 3). A high ratio means that those in the working age and the overall economy face a large burden in supporting the aging population.

Regarding the main occupation of adult workers during the last four weeks, the figure 5 below reflects the main usual job of the whole sample. The majority of people are employed on farms as independent farmers. The main occupations were determined based on the amount of time spent by the household members. Those surveyed were asked to classify their occupations as primary based on how much time (year/month/weeks/days) is spent. In other words, an individual may have one primary job with several secondary occupations. The occupation that took the most time of the working members of the household i.e., which required more days of work per person in a year was treated as primary. Thus, the occupation which was selected was the one on which the working household member (s) spent most of their time.

Figure 5: Occupational distribution of surveyed people according to their main activity (N=406)



Given the figure above, it is clear that agriculture still has a greater portion compared to other activities, as it represents roughly 27% and 16% of the portions in wage and self-employed main activities. The rate of non-agricultural wage employment seems to be less than the real one. The reason is that from 2010 there have been land survey operations and other activities related to

land ownership registration and certification. Currently, the land survey programme employs half of non-agricultural wage employment. Furthermore, the people in transition to higher education (one year after completing secondary school and before entering university) are favoured for this work.

If we consider gender segmentation, we can separate how women and men are distributed within each type of activity. Table 8 below indicates the workforce distribution based on the gender factor. The result shows that men participate more in non-agricultural jobs than women. Likewise, women are participating more in agricultural employment than men. There are several explanations to this:

Firstly, we found that women are less educated than men (figure 4) and this is an important factor that bars their access to the non-agricultural market. In the second place, women are gathered in associations and cooperatives where their contribution is only limited to their labour (agriculture case). Thirdly, they are the most responsible for domestic chores namely fetching water and firewood, preparing food and, as stated above, taking care of their children. Therefore, they participate more in agriculture as family farms are often located not far from home.

Table 8:Workforce participation by gender

(Participation in main jobs of those aged ≥14 years old and working throughout the year (N=292)

Usual work status	N	Male (%)	Female (%)
Agriculture self-employed	110	49	51
Agriculture wage employed	65	44	56
Non agriculture self employed	44	53	47
Non Agriculture wage employed	73	72	28

Table 9 below ,based on activities undertaken in previous 12 months, shows a diversity of work patterns, with some 75% of all working adults working on their own land in the previous 12 months and 35% of people doing paid agricultural work. Furthermore, 28% worked for salary or wages outside of agriculture and 35% performed non-agricultural independent jobs during the previous 12 months (defined as having run or operated a non-farm business for cash or profit for him/herself such as a small shop or other income generating activity).

Table 9: Economic activities undertaken in previous 12 months in the Study area (N=292):

Participation in any of the following activities (last 12 months)	Total
Worked on own land	75%
Paid agricultural activity	35%
Worked for non-agriculture salary or wages (teaching, survey agents, local government agent, shop-keeper, night-housekeeper, masonry (bricklayer), carpentry, maize, sorghum and cassava mill work, carrying on head other people's goods)	28%
Run an independent non-agriculture activity (trading, brick handcraft, wood handcraft, small shops, traditional weaving, sewing and knitting.)	35%
VUP Public Works Programme	0%

The major non-farm economic activities that are available in Musanze rural households, as indicated by Table 6 above, are masonry (bricklaying), trading (banana, fruit, tomatoes sweet potatoes), wood handcraft, small shops, traditional weaving, sewing, teaching, being a local government agent, shop keeping, and maize and cassava mill work.

A number of craft products are sold in Musanze town where there are a lot of tourists. As the respondents participating in the handicraft activities reported, they learnt the handcraft skills in their family neighbourhood and/or through training.

The selling of harvest and trading fertilisers is difficult as the Rwanda Agriculture Board has the monopoly of supplying fertilisers and given that cooperatives are the only ones allowed to buy and sell main crop harvests such as potatoes and corn(maize). The government does not allow people to manage the flow of fertilisers themselves due to illegal trade to neighbouring countries. The main bottlenecks that inhibit the development and/ or launching new non-agricultural activities (reported by the Musanze rural inhabitants) include the lack of running cost and high transportation cost.

Arable land size is relatively small, averaging 0. 54 hectare (ha), similar to the average size for all individual farms in Rwanda which is 0.57 ha (MINECOFIN, 2009). Mostly, Musanze town is quite difficult to access. The reason is that even if Musanze town is closer to the two sectors (Nkotsi is at 8 km from the town whereas Kimonyi is at 5 km), the transport means are not developed (poor road conditions in highland area). The same results have been reported in the District Development report(musanze,2008). It is reported that Nkotsi road infrastructure and

internal communication is in poor condition such that it requires maintenance and upkeep (Musanze, 2011).

In our study area, the farmers use livestock as a means to cope with low income from their farm harvest and as a source of school fees for their children. It has been observed that livestock are used for different purposes like milk and meat production. In addition, cattle, goats and sheep, in case consumed, have other features like selling their hides and skins. Their faeces are also used as compost. Small ruminants (sheep and goats) are needed to meet immediate cash demands of the households and also for meat production for household consumption, especially during wedding ceremonies and holidays. Poultry are raised for eggs and meat products.

Table 10: Livestock owned by households (N=100)

livestock	Ownership frequency (%)	total
cattle	17	22
sheep	13	22
goats	26	57
pigs	15	21
rabbits	6	40
other poultry	10	28

The table above shows that people surveyed are not involved a lot in livestock. The reasons include first of all scarcity of arable land (see table 3) and consequently lack of grazing land. Secondly, there is a lack of funds to raise livestock intensively on narrow space (see table 6), Thirdly, there is a lack of training/formation on how to raise livestock.

Briefly, the rural household environment of the district is characterized by small farms, scarcity of land for expansion, lack of enough grazing land, families with many dependants and low level of education. To alleviate this problem Musanze rural inhabitants are therefore engaged in non-farm activities in order to have more alternative sources of income. Therefore, they can get income to compensate for the uninsured agricultural returns as well as the gap in their agricultural income between two harvest seasons.

5.1.2 Income description

Table 11 below shows the income disparity by source of income. This disparity is partly explained by the following three factors: firstly, the fact that agriculture is seasonal (only two agricultural seasons of 4 months each in Rwanda), secondly, the low returns (from sales) of those who are participating mainly in agriculture, thirdly by the price distortion during the harvesting period (fall in prices). This fall in prices is explained in most cases by the fact that there are cooperatives that have the monopoly of collecting and distributing agriculture harvest countrywide. The most important categories of non-agricultural work are: construction, artisanal work, commerce and services. Musanze district is more oriented towards subsistence agriculture, with a town characterized by intensive and commercial agriculture and non-agricultural products and therefore demanding more labour.

Table 11. Monthly income disparity for those participating in main activities (N=292) :

Variable	Mean/per Capita	Std. Dev.
Agricultural self-employment income	6613.5	23256.5
Agricultural wage employment	7858.4	26189.3
Total agricultural income	14471.5	36477.4
Non-agricultural self-employment income	22443.9	79549.3
Non-agricultural wage employment	40455.1	229618.2
Total non-agricultural income	62899.1	257173.7
Total income	**77371.3**	**540033.1**

To calculate the mean for the table above, the reference monthly income has been April for those surveyed in May, and May for those surveyed in June. It is worth noting that, for regressions, annual income has been considered with the non-agricultural seasonal income times the number of seasons and all regular income has been extrapolated over twelve months(the whole year). Furthermore, table 11 indicates income mean description that do not include consumption. The calculation of consumption seems to be very hard as the rural inhabitants do not weighs many harvests consumed at home. Then, only sales have been taken into account.

5.2 Presentation and Discussion of Regression results

Tables 12, 13 and 14 present the double-hurdle estimation in two stages, namely, the first stage by Probit model and the second by truncation. Separate regressions are performed for non-agriculture employment, non-agricultural self-employment, and non-agricultural wage employment. Regression results show the marginal effects and their p_values on participation, the level of participation and returns to participation. Based on the results presented in following tables (Table 12,13 and 14), the effects of individual characteristics on participation decision, the level of participation and the reward to the factors that explain the participation are discussed. All tables (Table 12,13 and 14) present the result of three equations, respectively the participation, intensity to participation and returns estimations. Standards errors are robust due to clustering.

As it is indicated in Table 12 below, the signs of the marginal effects for secondary education, tertiary education, head of household and infrastructure variables are significantly related to non-farm employment. The spouse and dependency ratio variable are explaining participation and intensity of participation whereas age, primary education and age of household variables are significantly related to participation only.

Table 12: Regression results for non-agriculture employment

Variables	Participation		Level of participation (Yearly Days of work) (Double Hurdle)		Return to participation (Double Hurdle)	
	Marginal effect	P_val	Marginal effect	P_val	Marginal effect	P_val
Individual characteristics						
Female	-.015093	(0.888)	-2.408986	(0.677)	-17630.53	(0.694)
Dummy, 1for head	.2095371	(0.083)*	59.13943	(0.003)***	66755.7	(0.028)**
Dummy, 1for spouse	.1682476	(0.034)**	34.49757	(0.038)**	-79952	(0.275)
age	.0074779	(0.015)**	.466218	(0.238)	571.9984	(0.899)
Literate	.2743832	(0.042)**	8.263463	(0.349)	142881.4	(0.225)
Dummy Education Primary	.3465619	(0.072)*	8.488404	(0.271)	144348.6	(0.166)
Dummy Education secondary	.4956695	(0.043)**	44.10088	(0.029)**	412471.4	(0.027)**
Dummy, Education tertiary	.724541	(0.000)***	125.8019	(0.001)***	1624635	(0.000)***
Household characteristics						
Sex of head of household (female=1)	.0169457	(0.894)	-2.162204	(0.822)	-11833.52	(0.847)
Age of head of household	-.0049341	(0.039)**	-.3152589	(0.143)	-2744.703	(0.524)
Adult workers	-.0054414	(0.927)	-.7094422	(0.909)	-18579.52	(0.733)
Dependency ratio	-.0029625	(0.077)*	-.4007833	(0.047)**	-3163.353	(0.127)
Assets						
landholding	.0507996	(0.314)	.8001461	(0.915)	8423.423	(0.723)
livestock	-2.66e-08	(0.518)	-2.98e-07	(0.974)	.0731809	(0.435)
Location						
Distance (km)	.0079672	(0.574)	-1.244426	(0.450)	-14507.88	(0.330)
scattered settlements (scat=1)	.0547273	(0.449)	-5.229123	(0.512)	-47215.2	(0.499)
Infrastructure (good=1)	.2953346	(0.002)**	28.98343	(0.011)**	144605.7	(0.062)*
Number of obs	292		172		172	
Wald chi2 (17)	52.09		100.86		105.16	
Prob > chi2	0.0000		0.0000		0.0000	
Pseudo R2	0.2238					

(*), (**), (***) represent respectively the level of significance at 10%,5% and 1%

The core findings of interest are education. Additional years of education increase the likelihood of participation in non-agricultural employment. The dummy variables related to the level of education(Secondary and Tertiary education) are positively related with the likelihood to participate, the level of participation and returns to participation. Other things being equal, completion of secondary school increases the participation decision, the level of participation and returns to participation by 49%, 44 days and an average return of RWF 412,471 respectively. Likewise, the dummy variable related to tertiary education increases respectively the participation decision, the level of participation and returns to participation by 72%, 125 days and RWF 1,624,635 ceteris paribus. Furthermore, primary education increases by 34% the participation decision if other things remain constant. Literate variable is also positive and significantly related to participation. It increases participation in non-agricultural activities by 27%. Therefore, the marginal effects of returns indicate that educated people, who are more likely to engage in non-agricultural employment, receive higher earnings from these activities. Similarly, the results of this crucial effect of the education variable have been reported by Atamanov and Van den Berg (2011) and Reardon and Webb (2001).

This effect indicates that educational attainment is one of the most important determinants of participation in non-agricultural activities. The educated rural inhabitants have a positive interest in the involvement of non-agricultural activities in the study area. However the reason is not because non-farm activities require some high skills and training. Table 14 show that only literacy is explaining primary non-agricultural self-employment. Hence, we can note that households with some skill and educational background tended to engage in non-farm activities. Education tends to improve rationality and stimulate diversified use of resources .

Better educated individuals are perceived to be better able to cope with technological and environmental changes that directly influence productivity levels. Thus, at the macro level, human capital is an important determinant for labour productivity and eventually economic growth (Tsu-Tan Fu et.al, 2002). Individuals with higher education are rewarded with higher earnings as payment for their productivity and ability (Knight and Sabot, 1990).

The marginal effect of the dependency ratio is negatively and significantly related to non-agricultural employment. This illustrates the negative impact derived from the big size of dependants that are mostly children and schoolchildren in our case. As has been indicated in

Table 6, the household size is 5 on average whereas the mean individual age is 22 years. Thus, the dependants in a household constitute a burden for households.

The heads of household and the spouses are more likely to participate in non-agricultural employment. Being head of households increases participation by 20% the level of participation by 59 days and annually income by FRW 66,755 on average. Likewise, the participation and intensity of participation will increase respectively by 16% and 34 days for the spouse if the remaining factors remain the same. A one-year increase in age will increase the participation decision in non-agricultural activities by 0.7%.

In this research, it has been established that good infrastructure increases the likelihood of participating in non-agricultural jobs by 29%, the level of participation by 28 days and return to participation by RWF 144,605 on average per year. Atamanov and Marrit (2011) found the same positive benefit resulting from the access to good infrastructure, measured as the distance from rayon centres to the household neighbourhood.

The marginal effects of the variables of distance to the closest market, scattered settlements, livestock, landholding, adult worker, household head sex and female are not significant. Thus, an educated head of household with less dependants, staying closer to good infrastructure (mainly good road), is more likely to participate in non-agriculture employment.

However, a hypothesis of importance of entry barriers may be stated. Given that education dummy variables are positively significant, we can assume that less educated people have constraints in attempting to enter the non-agricultural market.

The following tables (Table 13 and Table 14) present estimations of non-agricultural employment separated into two categories of employment. The two categories are non-agricultural wage employment and self-employment. The segmentation into those two categories allows us to get insight in the determinants of specific factors to non-agricultural wage and self-employed activities based on the main activity held.

Table 13: Regression results for non-agricultural wage employment taken as main activity

Variables	Participation		Level of participation(Yearly Days of work) (Double Hurdle)		Return to participation (Double Hurdle)	
	Marginal effect	P_val	Marginal effect	P_val	Marginal effect	P_val
Individual characteristics						
female	.0149799	(0.673)	12.30898	(0.271)	28639.45	(0.216)
Dummy,1for head	.2247208	(0.050)**	22.95682	(0.007)**	33827.26	(0.086)*
Dummy,1for spouse	.2727535	(0.055)*	-10.99223	(0.513)	-34588.18	(0.358)
age	.0004166	(0.811)	.2452971	(0.406)	398.0824	(0.528)
literate	.1759084	(0.024)**	62.73629	(0.112)	65788.79	(0.164)
Dummy Education Primary	.1086377	(0.090)*	85.98136	(0.028)**	78283.44	(0.009)
Dummy Education secondary	.0350994	(0.040)***	87.98277	(0.031)**	120442.1	(0.024)**
Dummy Education tertiary	.3106216	(0.033)***	118.3898	(0.000)***	1329057	(0.000)***
Household characteristics						
Sex of head of household (female=1)	.0803097	(0.370)	-19.40175	(0.175)	-25750.26	(0.280)
Age head	-.0028957	(0.045)**	-.6328103	(0.025)**	-800.6658	(0.224)
Adults worker	-.0182659	(0.631)	-.5528653	(0.923)	2909.678	(0.817)
Dependency ratio	-.0010759	(0.287)**	-.1725916	(0.079)**	-768.6302	(0.136)
Assets						
landholding	-.0903278	(0.020)**	-7.633679	(0.123)	-13227.84	(0.349)
livestock	-4.63e-09	(0.828)	-1.22e-06	(0.904)	-.0098909	(0.656)
Location						
Distance (km)	-.0153069	(0.023)**	-1.583061	(0.312)	11.35238	(0.997)
scattered settlements (scat=1)	-.0481175	(0.281)	-4.020348	(0.685)	-4592.811	(0.799)
Infrastructure (good=1)	.0627038	(0.058)*	26.3531	(0.081)**	95620.25	(0.019)*
Number of obs	292		73		73	
Wald chi2 (17)	89.61		53.33		181.07	
Prob > chi2	0.0000		0.0001		0.0000	
Pseudo R2	0.3280					

(*), (**), (***) represent respectively the level of significance at 10%,5% and 1%

Table 14: Regression results for non-agricultural self-employment taken as main activity

Variables	Participation		Level of participation (Yearly Days of work) (Double Hurdle)		Return to participation (Double Hurdle)	
	Marginal effect	P_val	Marginal effect		Marginal effect	P_val
Individual characteristics						
female	-.0431999	(0.623)	-12.49615	(0.173)	-9697.418	(0.351)
Dummy,1for head	.4164875	(0.005)***	29.54996	(0.011)**	66457.52	(0.006)***
Dummy,1for spouse	.4018072	(0.026)**	38.33777	(0.019)**	31211.99	(0.109)
age	.0021985	(0.067)*	.3379392	(0.079)*	637.4863	(0.094)*
literate	.0179171	(0.052)*	22.07157	(0.013)**	2041.133	(0.028)**
Dummy Education Primary	-.0454001	(0.880)	-16.89501	(0.319)	9364.874	(0.669)
Dummy Education secondary	.0249617	(0.940)	9.560126	(0.735)	39093.36	(0.178)
Household characteristics						
Sex of head of household (female=1)	.1358143	(0.336)	17.87603	(0.206)	22668.83	(0.167)
Age head	.0013024	(0.754)	.2187048	(0.510)	229.2818	(0.375)
Adults worker	-.0969878	(0.189)	-2.091239	(0.8100.755)	8992.576	(0.246)
Dependency ratio	-.0023204	(0.035)**	-.3440135	(0.091)*	-174.2951	(0.374)
Assets						
landholding	-.3353462	(0.000)***	9.146759	(0.312)	561.2929	(0.938)
livestock	-4.58e-08	(0.361)	-2.49e-07	(0.983)	.0232991	(0.517)
Location						
Distance (km)	-.0359479	(-0.052)*	-.3451464	(0.878)	-629.398	(0.701)
scattered settlements (scat=1)	-.0457182	(0.064)*	-14.61878	(0.146)	4767.165	(0.589)
Infrastructure (good=1)	.1543107	(0.088)*	24.29982	(0.053)*	47110.13	(0.001)***
Number of obs	284		44		44	
Wald chi2 (17)	71.37		32.45		415.00	
Prob > chi2	0.0000		0.0132		0.0006	
Pseudo R2	0.2273					

(*), (**), (***) represent respectively the level of significance at 10%,5% and 1%

The results of Table 13 show that the participation in non-agricultural wage employment as the main activity is explained by the level of education, the age of household, the size of arable land owned by household, the distance to the nearest market, the dependency ratio, the infrastructure variables and whether the participant is the head of household or not. Being the head of household explains participation at 22% and increases the intensity of participation by 22 days whereas its reward is RWF 33,827 annually other things being equal. The level of education affects positively and significantly the participation in non-agricultural wage-employment. The completion of one cycle of education (primary or secondary or tertiary education) respectively affects non-agricultural wage employment (taken as primary occupation) by 10%, 3% and 31% ceteris paribus. These findings are similar to those described by Taylor and Yunez-Naude (2000) in Mexico where education was found to increase the likelihood of participation in wage work. Yet, primary education does not explain the return to participating in non-agricultural wage activities. This indicates that educated people are more qualified for formal non-agricultural jobs.

The number of dependants reduces the likelihood of participation by 0.1%, and lower the level of participation. Non-agricultural wage-employment comprises mainly work in land survey employment, teaching, local government agents, shop-keeper, night-housekeeper, masonry (bricklayer), carpentry, maize/sorghum/cassava mill work, carrying on one's head other people's goods. Having more dependants is a participation barrier for adults in wage activities due to the trade-off in labour allocation between taking care of dependants and supplying labour into productive activities. The same analysis has been emphasized by Atamanov and Marrit (2011)

The Positive relationship of infrastructure with non-agricultural wage employment indicates that individuals who live closer to good infrastructures (mainly good road which is accessible) are more likely to be engaged in non-agricultural wage employment. As Barrett et al. (2001) explain, "being in remote rural areas is costly and causes factor and product market failures". A large portion of irregular non-agricultural wage jobs (masonry, carpentry, etc.) are not local and appear to be acquired through temporary daily migration to Musanze town. It makes sense that if individuals were living a long distance away from passable road, they would be spending more time to reach Musanze town where there is opportunity of diversify non-farm jobs. Thus, being closer to passable road increase the availability of non-agricultural jobs offer seeing that passable road increases diversification of transport means.

Amazingly, the effect of living in grouped settlements (known as "*imidugudu"* in Rwanda) is not significant, whereas those grouped settlements are considered as small centres that may generate small non-agricultural enterprises. This is contradictory to the results of Elbers and Lanjouw (Elbers and Lanjouw, 2001) who said that participation in non-farm wage employment might rise with residing in a town or "populated centre" where the options of participation in wage and self-employment are more accessible. This may be due to the characteristics of the living location, poor infrastructure and lack of credits. Many grouped settlements are in remote areas where roads (bridges) are not passable. Furthermore, as said before, the effect of land surveys may have an impact on these results. In fact, half of the waged labour in the land survey are offered to the indigenous people of the area living there.

From the above explanation, it is obvious that the head of household with fewer dependants and who is living close to good infrastructure (passable road) is likely to participate in non-agricultural wage employment.

In addition, Table 14 above shows that the relation of informal education ('literate' variable) to participation in primary independent jobs is positive and significant. This variable contributes to 1.7% to participation decision and increases annual working days by 22 with a return of RWF 2,041. Formal education appears to be irrelevant for independent non-agricultural employment. This highlights the fact that more educated people are job seekers rather than job creators.

Like Matshe and Young (2004) and Malek and Usami (2009), we found that the determinants of participation in non-farm activities are not necessarily the same as the determinants of the level of participation. As the above results indicate, landholding factors affect only the participation decision and do not affect the intensity of participation whereas the 'spouse' variable affects significantly both the participation decision and the level of participation but not returns to participation

The effect of being a spouse is positively related with participation and intensity of participation in non-agricultural self-employment even if it is not significant for returns from independent non-

agricultural employment. The reason may be the link between the fact of taking care of dependants, and this is part of unpaid activities.

Heads of households(mostly men) are likely to participate more (at 41%) and work 29 days more per year and to earn more (RWF 66,457 more than their wives) other things being equal. The age variable is also positively and significantly related to the participation decision, intensity of work and the returns to participation.

Besides, it has been noticed that an increase in the number of dependants affects negatively participation in non-agricultural self-employment. As explained in the previous analysis, having more dependants is a handicap for participation. The increase by one percentage point in the dependency ratio decreases the participation decision by 0.2%, the level of participation by roughly a half of a day..

The effect of infrastructure is positively related to non-agricultural self-employment with a significant effect. In addition, good roads increase the participation decision by 15%, the level of participation by 24 days annually and annually return of RWF 47,110 on average.

It can also be noticed from the results that living in scattered settlements as opposed to being in grouped settlements (populated centre) decreases the likelihood of participation by 4%ceteris paribus .This is in conformity with the results of Elbers and Lanjouw and Barret et al (Elbers and Lanjouw, 2001; Barrett et al. 2001). They argue that residing in a town or “populated centre” makes the options of participation in self-employment more accessible (Elbers and Lanjouw, 2001, Barrett et al. 2001).

Given the above variables that have significant effects, it is obvious that a literate spouse or head of household with less dependants, located in a populated centre(or grouped settlements) and closer to a good road is more likely to participate in non-agricultural self-employment activities.

Taking all results together(table 12 ,13 and 14), we find that mainly education, dependants, age, infrastructure and head of household are variables that determine the individual’s participation in non-agricultural employment in Musanze district. Other factors like living in scattered settlements are alternatively changing according to the non-agricultural main activity. The

educated individuals with less dependants are more likely to participate in non-agricultural jobs, work more days and be better rewarded than the others.

Apparently as we found in theory, education provides greater economic opportunities, especially to the poor (Blanden and Machin, 2004). It determines occupational choice and the level of pay and it plays a pivotal role as a signal of ability and productivity in the job market. Education shifts the composition of the labour force away from unskilled to skilled. While this process may very well initially increase income inequality (Chiswick, 1968), in the long term it is expected to reduce income inequality (Schultz, 1963). Formal education enhanced the participation of non-agricultural activities and especially wage-non-agricultural activities. However, education may also raise the issues of inequality in Rwandan employment as only informal education (literate) is significant in primary non-agricultural self-employed activities . This may indicate that only poor low skilled people that are not able to obtain regular education are participating in nonfarm independent jobs.

Conclusion and recommendations

The main goals of this study were to estimate the factors that influence the probability of access to non-agricultural jobs, the intensity of participation and have an insight on the size of returns to the factors that are more likely to affect the participation decision. In the introductory chapters, the study has indicated that Rwanda as well as Musanze (like Rwanda in general) is facing three major problems, namely the scarcity of land due to the high rate of the population growth, illiteracy and land degradation. The study emphasizes the reasons that push the population to diversify their occupations in order to mitigate the risks linked to the irregularity of income and in order to cope with the lack of agricultural harvest due to weather hazards. Based on the conceptual framework, we have determined the crucial factors that may be included in the estimation.

The findings of this study provide a picture of the requirements of individuals living in the rural area of Musanze district in order to participate in non-agricultural employment. Musanze suffer from lack of vocational and technical institution. it houses only one vocational centre located in musanze town.

The descriptive statistics show us that Musanze has a young population with an average of 22 years of age. The average family size was 5 people and the average arable land is 0.5 ha. Women, 53% of the surveyed population, are more representative and less literate than men and these may be the reasons why they participate less in non-agricultural employment, especially in self-employment.

The study also elucidates a big gap in different income earnings. It has been shown that there is a disparity in income depending on the main sector of activity. The statistics indicate that a person participating mainly in independent agriculture has an average monthly income amounting to RWF 6,613 whereas a person working in wage employment earns RWF 40,455.

Using the Double Hurdle model in estimation, the study has found the determinant of non-agricultural employment in Musanze to be driven mostly by education and the number of dependants in the household. Much of the positive effect is seemingly contributed by formal education on the one hand, and the negative effect caused by a large number of dependants in a household on the other hand.

Briefly, education and dependency ration variables have been identified as crucial determinants of the non-agricultural work force. Educated people are likely to participate more in non-agricultural employment and receive higher non-agricultural income. Even when people participate mainly in non-agricultural self-employment, the household heads (mostly men) earn more income than women. Education, and especially higher education, is also found to be a strong positive determinant of non-agricultural wage-employment, intensity of work and providing high reward(returns). Interestingly, while higher level of formal education has no effect on the participation in primary non-agricultural self-employment activities, it significantly increases primary non-agricultural wage-employment participation and wage. This highlights that the education system creates job seekers rather than job creators. Jobs creators are those that are needed in rural areas.

On this note, the importance of education is also highlighted from the findings. It has been found that participation in non-agricultural self-employment requires to be literate. Secondary and higher education have proven to be a determinant for participation in wage-employment. Also, education is a determinant for obtaining higher incomes, especially in non-agricultural wage activities. Education has been found to increase the likelihood of participation in wage work. The opposite occurs for agricultural production and self-employment activities.

This study shows that education clearly contributes to higher earnings from non-agricultural wage income, although not so for independent non-agricultural employment.

Furthermore, the scarcity of land (population density of 710/km2) coupled with a high childbirth rate is a big burden for the entire community of Musanze district. It is necessary to emphasize birth control by including a family planning programme in each health post. Those health posts are available in the majority of villages but do not have family planning programmes in their services.

Likewise, interventions by the local government or private sector actors should acknowledge the heterogeneity of labour and income distribution in Musanze. In this district, given the high density of population which limits agricultural production (land becoming scarcer), households have to look to other activities in order to guarantee a certain level of income. The focus in this region should be directed at providing training for women to obtain qualifications so they can access non-agricultural jobs like men since agriculture is not a feasible alternative for many. As it

is said above, the study area has only one vocational training centre- which is not enough for the entire zone- and this will be likely to be more attended by men than women.

For future research it would be valuable to follow up on the baseline survey used for this study in order to compare changes between periods (Panel data analysis) and to see the patterns of rural employment and incomes in Musanze over time. It would also be interesting to analyse agriculture activities in the context of the governmental policies of one crop production by region and what the impacts have been. This is a new policy currently in implementation, and it would be better to conduct a study in the future to compare its impact versus the impacts of non-agricultural employment and incomes. For future studies, research could consider household consumption for a more complete picture of rural inhabitants' income.

Thus, a richer interpretation of the dynamics of factors that determine agricultural production, self-employment and non-agricultural wage incomes of the rural economy could be gained.

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ANNEXES

A-1.Collinearity Diagnostics

```
  Collinearity Diagnostics

                    SQRT                   R-
  Variable      VIF     VIF    Tolerance    Squared
----------------------------------------------------
    female      1.37    1.17    0.7317      0.2683
    h_head      3.75    1.94    0.2666      0.7334
  h_spouse      2.47    1.57    0.4044      0.5956
       age      4.72    2.17    0.2118      0.7882
edu_statusliterate1      2.79    1.67    0.3590      0.6410
   ed_prim      2.83    1.68    0.3533      0.6467
 ed_second      2.89    1.70    0.3454      0.6546
ed_tertiary      1.29    1.14    0.7744      0.2256
 hh_female      1.48    1.22    0.6757      0.3243
    hh_age      1.65    1.28    0.6065      0.3935
    h_ad_w      1.38    1.17    0.7256      0.2744
dependanceratio      1.47    1.21    0.6798      0.3202
landholding      1.19    1.09    0.8397      0.1603
 livestock      1.13    1.06    0.8876      0.1124
distancekm      1.29    1.13    0.7780      0.2220
dispeersedarea      1.21    1.10    0.8287      0.1713
infrasgood1      1.27    1.13    0.7868      0.2132
----------------------------------------------------
  Mean VIF      2.01

       Eigenval         Cond
                        Index
-------------------------------
    1     8.9583          1.0000
    2     1.3661          2.5608
    3     1.1451          2.7970
    4     1.0907          2.8659
    5     0.9243          3.1131
    6     0.7898          3.3678
    7     0.7617          3.4295
    8     0.6215          3.7967
    9     0.5715          3.9592
    10    0.4985          4.2390
    11    0.3510          5.0522
    12    0.2895          5.5624
    13    0.2416          6.0889
    14    0.1727          7.2024
    15    0.0923          9.8534
    16    0.0685         11.4389
    17    0.0412         14.7517
    18    0.0158         23.8347
-------------------------------
 Condition Number        23.8347
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
 Det(correlation matrix)    0.0126
```

```
. corr female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary hh_female hh_age h_ad_w  dependanceratio landholding livestock distancekm dispeersedarea infrasgood1
(obs=406)
```

	female	h_head	h_spouse	age	edu_st~1	ed_prim	ed_sec~d	ed_ter~y	hh_fem~e	hh_age	h_ad_w	depend~o	landho~g	livest~k	distan~m	dispee~a	infras~1
female	1.0000																
h_head	-0.2448	1.0000															
h_spouse	0.3844	-0.2040	1.0000														
age	0.0361	0.6530	0.2942	1.0000													
edu_status~1	-0.0691	0.0983	0.0647	0.1649	1.0000												
ed_prim	-0.0842	0.0089	-0.0295	-0.0122	0.3899	1.0000											
ed_second	-0.0201	-0.0555	-0.0252	0.0230	0.3905	-0.4226	1.0000										
ed_tertiary	-0.0446	0.0879	0.0876	0.0890	0.1317	-0.1425	-0.0596	1.0000									
hh_female	0.1772	0.0718	-0.2021	0.0355	-0.0661	-0.0480	-0.0257	-0.0832	1.0000								
hh_age	0.0253	0.0344	-0.1239	0.3336	0.0623	-0.0136	0.1231	-0.0017	0.1638	1.0000							
h_ad_w	-0.0283	-0.1527	0.0704	-0.0014	0.1020	0.0821	-0.0249	0.0473	-0.4161	-0.0206	1.0000						
dependance~o	-0.0391	-0.1530	-0.0356	-0.3847	-0.1559	0.0335	-0.1565	0.0015	-0.0745	-0.2939	-0.0436	1.0000					
landholding	0.0184	0.0294	0.0103	0.1432	0.0025	0.0275	0.0195	0.0649	-0.0377	0.1004	0.1749	-0.2795	1.0000				
livestock	-0.0467	-0.0545	-0.0226	-0.0315	0.0447	-0.0598	0.1452	-0.0127	-0.1004	0.0311	0.0185	0.0504	0.0957	1.0000			
distancekm	0.0479	0.0557	0.0642	0.0676	-0.0172	-0.0095	-0.0707	0.0382	0.0025	0.0892	-0.0622	-0.2075	-0.0114	-0.2145	1.0000		
dispeersed~a	-0.0952	-0.0285	0.0320	0.0238	0.0949	0.0090	0.1538	0.0411	-0.0841	-0.0575	0.0741	-0.1288	0.1986	0.1507	-0.2284	1.0000	
infrasgood1	-0.0734	-0.0440	-0.0108	-0.0333	0.1500	-0.0140	0.2223	0.0673	-0.1463	0.0025	0.0065	0.0436	0.0222	0.2350	-0.3236	0.2282	1.0000

A-2 Stata outputs results

```
probit na female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary hh_female hh_age
h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if age>13, vce(cluster
hhorder)

Iteration 0:   log pseudolikelihood = -148.71598
Iteration 1:   log pseudolikelihood = -116.17007
Iteration 2:   log pseudolikelihood = -115.43643
Iteration 3:   log pseudolikelihood = -115.43562
Iteration 4:   log pseudolikelihood = -115.43562

Probit regression                                 Number of obs   =        292
                                                  Wald chi2(17)   =      52.09
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -115.43562                 Pseudo R2       =     0.2238

                                (Std. Err. adjusted for 100 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
          na |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -.0475523   .3362267    -0.14   0.888    -.7065445    .6114399
      h_head |   .6390881   .3614261     1.77   0.077    -.0692941     1.34747
    h_spouse |    .495807   .3965905     1.25   0.021    -.2814962     1.27311
         age |   .0236084   .0100268     2.35   0.019     .0039563    .0432605
edu_status~1 |   .7930409   .4495882     1.22   0.022     -2.06621    .4801285
     ed_prim |   1.125699    .673191     1.67   0.094    -.1937314    2.445129
   ed_second |    1.39814   .7234871     1.93   0.053    -.0198689    2.816148
 ed_tertiary |   2.410537   .8851945     2.72   0.006     .6755878    4.145487
   hh_female |    .053054   .3947771     0.13   0.893    -.7206948    .8268028
      hh_age |  -.0155774   .0077677    -2.01   0.045    -.0308019    -.000353
```

```
      h_ad_w |   -.017179   .1885643    -0.09   0.927    -.3867583    .3524003
dependance~o |  -.0093528   .0053531    -1.75   0.081    -.0011391    .0198446
 landholding |   .1603783   .1594747     1.01   0.315    -.1521863     .472943
   livestock |  -8.40e-08   1.29e-07    -0.65   0.516    -3.38e-07    1.70e-07
  distancekm |    .025153    .044508     0.57   0.572    -.0620811    .1123871
dispeersed~a |   .1756409   .2383935     0.74   0.461    -.2916018    .6428837
 infrasgood1 |   .8560761   .2605571     3.29   0.001     .3453937    1.366759
       _cons |  -2.331779   .8558253    -2.72   0.006    -4.009166   -.6543921
------------------------------------------------------------------------------

. mfx

Marginal effects after probit
      y  = Pr(na) (predict)
         =  .24848125
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
  female*|   -.015093      .10696   -0.14   0.888  -.224732  .194546   .565041
  h_head*|   .2095371      .12098    1.73   0.083  -.027572  .446646   .390244
h_spouse*|   .1682476      .14135    1.19   0.034    -.1088  .445295   .252033
     age |   .0074779      .00307    2.43   0.015   .001456    .0135    33.248
edu_st~1*|   .2743832      .13461    1.17   0.042  -.734218  .185452   .731707
 ed_prim*|   .3465619      .19293    1.80   0.072  -.031566   .72469        .5
ed_sec~d*|   .4956695       .2448    2.02   0.043    .01588   .97546   .231707
ed_ter~y*|    .724541      .09864    7.35   0.000   .531204  .917878   .028455
hh_fem~e*|   .0169457      .12696    0.13   0.894  -.231893  .265785   .264228
  hh_age |  -.0049341      .00239   -2.07   0.039  -.009612 -.000256   44.9675
  h_ad_w |  -.0054414      .05976   -0.09   0.927  -.122565  .111683   2.05285
depend~o |  -.0029625      .00167   -1.77   0.077  -.000315   .00624    36.126
landho~g |   .0507996      .05049    1.01   0.314  -.048165  .149764   .607746
livest~k |  -2.66e-08      .00000   -0.65   0.518  -1.1e-07  5.4e-08    161508
distan~m |   .0079672      .01417    0.56   0.574  -.019799  .035733   3.60325
dispee~a*|   .0547273      .07224    0.76   0.449  -.086863  .196318   .630081
infras~1*|   .2953346      .09307    3.17   0.002   .112923  .477746   .284553
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1

. truncreg partna female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary hh_female
hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if na>0
,vce(cluster hhorder)
(note: 0 obs. truncated)

Fitting full model:

Iteration 0:   log pseudolikelihood = -437.74848
Iteration 1:   log pseudolikelihood =  -436.8523
Iteration 2:   log pseudolikelihood = -436.43723
Iteration 3:   log pseudolikelihood = -436.43609
Iteration 4:   log pseudolikelihood = -436.43609

Truncated regression
Limit:         lower =       -inf                     Number of obs =    172
               upper =       +inf                     Wald chi2(17) = 100.86
Log pseudolikelihood = -436.43609                     Prob > chi2   = 0.0000

                              (Std. Err. adjusted for 67 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
  partnadays |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -2.408986   5.775012    -0.42   0.677     -13.7278    8.909829
      h_head |   59.13943   19.75628     2.99   0.003     20.41784    97.86102
    h_spouse |   34.49757   16.61092     2.08   0.038      1.94077    67.05437
         age |    .466218   .3953869     1.18   0.238    -.3087262    1.241162
edu_status~1 |   8.263463   8.832567     0.94   0.349     -9.04805    25.57498
     ed_prim |   8.488404   7.710356     1.10   0.271    -6.623616    23.60042
   ed_second |   44.10088   20.23332     2.18   0.029     4.444294    83.75746
 ed_tertiary |   125.8019   38.92587     3.23   0.001     49.50861    202.0952
   hh_female |  -2.162204   9.616877    -0.22   0.822    -21.01094    16.68653
      hh_age |  -.3152589   .2154266    -1.46   0.143    -.7374872    .1069695
      h_ad_w |  -.7094422   6.234233    -0.11   0.909    -12.92831    11.50943
dependance~o |  -.4007833   .2014081    -1.99  -0.047     .0060306     .795536
 landholding |   .8001461   7.502428     0.11   0.915    -13.90434    15.50464
```

```
   livestock |  -2.98e-07   9.30e-06    -0.03   0.974    -.0000185    .0000179
  distancekm |  -1.244426   1.647809    -0.76   0.450    -4.474073     1.98522
dispeersed~a |  -5.229123   7.972976    -0.66   0.512    -10.39762    20.85587
 infrasgood1 |   28.98343   11.33611     2.56   0.011     6.765053     51.2018
       _cons |  -22.74646   23.72856    -0.96   0.338    -69.25359    23.76067
-------------+----------------------------------------------------------------
      /sigma |    70.2448   5.385225    13.04   0.000     59.68995    80.79965
------------------------------------------------------------------------------
. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =  33.036946
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]       X
---------+--------------------------------------------------------------------
  female*|  -2.408986     5.77501   -0.42   0.677  -13.7278  8.90983    .53202
  h_head*|   59.13943      19.756    2.99   0.003   20.4178   97.861   .236453
h_spouse*|   34.49757      16.611    2.08   0.038   1.94077  67.0544   .152709
     age |    .466218      .39539    1.18   0.238  -.308726  1.24116   22.8892
edu_st~1*|   8.263463     8.83257    0.94   0.349  -9.04805   25.575   .536946
 ed_prim*|   8.488404     7.71036    1.10   0.271  -6.62362  23.6004   .502463
ed_sec~d*|   44.10088      20.233    2.18   0.029   4.44429  83.7575   .150246
ed_ter~y*|   125.8019      38.926    3.23   0.001   49.5086  202.095   .019704
hh_fem~e*|  -2.162204     9.61688   -0.22   0.822  -21.0109  16.6865   .256158
  hh_age |  -.3152589      .21543   -1.46   0.143  -.737487   .10697   43.0419
  h_ad_w |  -.7094422     6.23423   -0.11   0.909  -12.9283  11.5094   2.00985
depend~o |  -.4007833      .20141   -1.99  -0.047   .006031  .795536   43.1034
landho~g |   .8001461     7.50243    0.11   0.915  -13.9043  15.5046   .544647
livest~k |  -2.98e-07      .00001   -0.03   0.974  -.000019  .000018    162119
distan~m |  -1.244426     1.64781   -0.76   0.450  -4.47407  1.98522   3.40788
dispee~a*|  -5.229123     7.97298   -0.66   0.512  -10.3976  20.8559   .608374
infras~1*|   28.98343      11.336    2.56   0.011   6.76505  51.2018   .285714
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1


truncreg  totalnainc female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if
na>0 ,vce(cluster hhorder)
(note: 0 obs. truncated)

Fitting full model:

Iteration 0:   log pseudolikelihood = -1003.3956
Iteration 1:   log pseudolikelihood =  -1002.517
Iteration 2:   log pseudolikelihood = -1002.0411
Iteration 3:   log pseudolikelihood = -1002.0391
Iteration 4:   log pseudolikelihood = -1002.0391

Truncated regression
Limit:         lower =       -inf                     Number of obs =    172
               upper =       +inf                     Wald chi2(17) = 105.16
Log pseudolikelihood = -1002.0391                     Prob > chi2   = 0.0000

                              (Std. Err. adjusted for 67 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
  totalnainc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -17630.53   44779.34    -0.39   0.694    -105396.4    70135.35
      h_head |    66755.7   105746.1     0.63   0.028    -140502.9    274014.3
    h_spouse |     -79952   63202.11    -1.09   0.225    -223425.5     63521.5
         age |   571.9984   4507.507     0.13   0.899    -8262.553     9406.55
edu_status~1 |  -142881.4   117731.6    -1.21   0.225      -373631    87868.31
     ed_prim |   144348.6   104237.3     1.38   0.166    -59952.77    348649.9
   ed_second |   412471.4   186373.7     2.21   0.032     47185.69    777757.2
 ed_tertiary |    1624635   348360.6     4.66   0.000     941860.7     2307409
   hh_female |  -11833.52   61509.97    -0.19   0.847    -132390.8    108723.8
      hh_age |  -2744.703    4305.25    -0.64   0.524    -11182.84    5693.432
      h_ad_w |  -18579.52   53466.64    -0.35   0.728    -123372.2    86213.18
dependance~o |  -3163.353   2070.685    -1.53   0.031    -895.1142     7221.82
 landholding |   8423.423   23743.11     0.35   0.723    -38112.22    54959.07
   livestock |   .0731809    .034232     2.14   0.433     .0060873    .1402745
```

```
  distancekm |  -14507.88   14879.68    -0.98   0.330    -14655.76    43671.53
dispeersed~a |   -47215.2   69811.39    -0.68   0.499    -89612.62      184043
 infrasgood1 |   144605.7   77548.29     1.86   0.062     -7386.18    296597.5
       _cons |  -44150.11   169566.5    -0.26   0.795    -376494.3    288194.1
-------------+----------------------------------------------------------------
      /sigma |   267873.7   67588.79     3.96   0.000     135402.1    400345.3
------------------------------------------------------------------------------
. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =     317400
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
  female*|  -17630.53       44779   -0.39   0.694   -105396  70135.4   .486111
  h_head*|    66755.7    105746.1    0.63   0.028   -140503   274014   .569444
h_spouse*|     -79952       73202   -1.09   0.275   -223425  63521.5   .305556
     age |   571.9984      4507.5    0.13   0.899  -8262.55  9406.55   38.6806
edu_st~1*|   142881.4    117731.6    1.21   0.225   -373631  187868.3      .75
 ed_prim*|   144348.6    104237.3    1.38   0.166  -59952.8   348650   .486111
ed_sec~d*|   412471.4    186373.7    2.21   0.027   47185.7   777757   .236111
ed_ter~y*|    1624635    348360.6    4.66   0.000    941861  2.3e+06   .083333
hh_fem~e*|  -11833.52       61510   -0.19   0.847   -132391   108724   .180556
  hh_age |  -2744.703      4305.3   -0.64   0.524  -11182.8  5693.43   42.9861
  h_ad_w |  -18579.52       53467   -0.35   0.728   -123372  86213.2   2.01389
depend~o |  -3163.353      2070.7   -1.53   0.027  -895.114  7221.82   40.3924
landho~g |   8423.423       23743    0.35   0.723  -38112.2  54959.1   .687278
livest~k |   .0731809      .03423    2.14   0.435   .006087  .140274    180172
distan~m |  -14507.88       14880   -0.98   0.330  -14655.8  43671.5   3.24167
dispee~a*|   -47215.2       69811   -0.68   0.499  -89612.6   184043   .722222
infras~1*|   144605.7       77548    1.86   0.062  -7386.18   296598   .472222
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1
. probit   nawe2 female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infras good1
if age>13, vce(cluster hhorder)

Iteration 0:   log pseudolikelihood = -189.73833

Iteration 1:   log pseudolikelihood =  -131.8458

Iteration 2:   log pseudolikelihood = -127.60582

Iteration 3:   log pseudolikelihood =  -127.4969

Iteration 4:   log pseudolikelihood = -127.49667

Iteration 5:   log pseudolikelihood = -127.49667


Probit regression                                 Number of obs   =        292

                                                  Wald chi2(17)   =      89.61

                                                  Prob > chi2     =     0.0000

Log pseudolikelihood = -127.49667                 Pseudo R2       =     0.3280


                            (Std. Err. adjusted for 100 clusters in hhorder)

------------------------------------------------------------------------------

             |               Robust

       nawe2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
```

```
-------------+------------------------------------------------------------------
      female |   .0954466   .2247256     0.42   0.671    -.3450074    .5359007
      h_head |   1.018377   .3859297     2.64   0.008     .2619691    1.774786
     h_spouse |   1.107436   .4249531     2.61   0.009     .2745428    1.940328
         age |   .0026444   .0111616     0.24   0.813    -.0192319    .0245207
edu_status~1 |   1.129061   .4781295     2.36   0.018     .1919441    2.066177
     ed_prim |   .0672759   .4918575     1.38   0.169    -1.641299    .2867472
   ed_second |   .2513958   .6089068     0.41   0.080    -1.444831    .9420397
 ed_tertiary |   1.115247    .841403     1.33   0.085    -.5338724    2.764367
   hh_female |   .4407978    .395024     1.12   0.264     -.333435    1.215031
      hh_age |  -.0183795   .0100491    -1.83   0.067    -.0380754    .0013164
      h_ad_w |  -.1159377   .2520729    -0.46   0.646    -.6099916    .3781162
dependance~o |  -.0068291   .0065913    -1.04   0.300    -.0197479    .0060897
 landholding |  -.5733305   .2159187    -2.66   0.008     .1501377    .9965234
   livestock |  -2.94e-08   1.35e-07    -0.22   0.828    -2.94e-07    2.35e-07
  distancekm |  -.0971566   .0461193    -2.11   0.035     .0067645    .1875487
dispeersed~a |   -.291874    .268024    -1.09   0.276    -.8171915    .2334434
 infrasgood1 |   .3582662   .2959329     1.21   0.076    -.2217516     .938284
       _cons |  -1.492349   .8524044    -1.75   0.080    -3.163031    .1783326
------------------------------------------------------------------------------

. mfx

Marginal effects after probit
      y  = Pr(nawe2) (predict)
         =  .08641876
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
  female*|   .0149799      .03555    0.42   0.673  -.054693  .084653    .53202
  h_head*|   .2247208      .11445    1.96   0.050     .0004  .449042   .236453
h_spouse*|   .2727535      .14238    1.92   0.055  -.006308  .551815   .152709
     age |   .0004166      .00175    0.24   0.811  -.003005  .003838   22.8892
edu_st~1*|   .1759084      .07794    2.26   0.024   .023149  .328668   .536946
```

```
 ed_prim*|   .1086377      .08293    1.31   0.190  -.271176  .053901   .502463

ed_sec~d*|   .0350994      .07504    0.47   0.040  -.182179   .11198   .150246

ed_ter~y*|   .3106216      .32096    0.97   0.033  -.318439  .939682   .019704

hh_fem~e*|   .0803097      .08957    0.90   0.370  -.095235  .255855   .256158

  hh_age |  -.0028957      .00144   -2.01   0.045  -.005725 -.000066   43.0419

  h_ad_w |  -.0182659      .03803   -0.48   0.631  -.092796  .056264   2.00985

depend~o |  -.0010759      .00101   -1.07   0.287  -.003056  .000904   43.1034

landho~g |  -.0903278      .03895   -2.32   0.020   .013993  .166663   .544647

livest~k |  -4.63e-09      .00000   -0.22   0.828  -4.6e-08  3.7e-08    162119

distan~m |  -.0153069      .00674   -2.27   0.023   .002095  .028519   3.40788

dispee~a*|  -.0481175      .04468   -1.08   0.281   -.13568  .039445   .608374

infras~1*|   .0627038      .05547    1.13   0.058  -.046007  .171414   .285714

------------------------------------------------------------------------------

(*) dy/dx is for discrete change of dummy variable from 0 to 1

truncreg   partnawe2 female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if
nawe2>0 , vce(cluster hhorder)
(note: 0 obs. truncated)

Fitting full model:

Iteration 0:   log pseudolikelihood = -1392.1457
Iteration 1:   log pseudolikelihood = -1391.8034
Iteration 2:   log pseudolikelihood = -1391.7995
Iteration 3:   log pseudolikelihood = -1391.7995

Truncated regression
Limit:         lower =       -inf                     Number of obs =     73
               upper =       +inf                     Wald chi2(17) =  53.33
Log pseudolikelihood = -1391.7995                     Prob > chi2   = 0.0001

                             (Std. Err. adjusted for 54 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
    partnawe |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |   12.30898    11.1785     1.10   0.271    -9.600466    34.21844
      h_head |   22.95682     14.228     1.61   0.007    -4.929548    50.84319
    h_spouse |  -10.99223   16.78813    -0.65   0.513    -43.89635    21.91189
         age |   .2452971   .2950886     0.83   0.406     -.333066    .8236602
edu_status~1 |   62.73629   39.48692     1.59   0.112    -140.1292    14.65666
     ed_prim |   85.98136   39.06957     2.20   0.028     9.406415    162.5563
   ed_second |   87.98277   40.74313     2.16   0.031      8.12769    167.8378
 ed_tertiary |   118.3898    61.0464     3.58   0.000     98.74102    338.0385
   hh_female |  -19.40175   10.88429    -1.78   0.175    -40.73457    1.931066
      hh_age |  -.6328103    .282896    -2.24   0.025    -1.187276   -.0783443
      h_ad_w |  -.5528653   5.752217    -0.10   0.923      -11.827    10.72127
dependance~o |  -.1725916   .1960794    -0.88   0.379    -.2117169    .5569002
 landholding |  -7.633679   4.946932    -1.54   0.123    -17.32949     2.06213
   livestock |  -1.22e-06   .0000102    -0.12   0.904    -.0000211    .0000187
  distancekm |  -1.583061    1.56662    -1.01   0.312    -4.653579    1.487457
dispeersed~a |  -4.020348   9.901865    -0.41   0.685    -23.42765    15.38695
 infrasgood1 |    26.3531   15.08115     1.75   0.081    -3.205401    55.91161
       _cons |   14.44195   25.19485     0.57   0.567    -34.93904    63.82294
-------------+----------------------------------------------------------------
      /sigma |   69.32343     7.4662     9.28   0.000     54.68995    83.95692
```

```
------------------------------------------------------------------------------

. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =  25.369919
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]       X
---------+--------------------------------------------------------------------
  female*|   12.30898      11.178    1.10   0.271  -9.60047  34.2184   .565041
  h_head*|   22.95682      14.228    1.61   0.007  -4.92955  50.8432   .390244
h_spouse*|  -10.99223      16.788   -0.65   0.513  -43.8964  21.9119   .252033
     age |   .2452971      .29509    0.83   0.406  -.333066   .82366    33.248
edu_st~1*|   62.73629      39.487    1.59   0.112  -140.129  14.6567   .731707
 ed_prim*|   85.98136       39.07    2.20   0.028   9.40641  162.556        .5
ed_sec~d*|   87.98277      40.743    2.16   0.031   8.12769  167.838   .231707
ed_ter~y*|   118.3898      61.046    3.58   0.000    98.741  338.038   .028455
hh_fem~e*|  -19.40175      10.884   -1.78   0.175  -40.7346  1.93107   .264228
  hh_age |  -.6328103       .2829   -2.24   0.025  -1.18728 -.078344   44.9675
  h_ad_w |  -.5528653     5.75222   -0.10   0.923   -11.827  10.7213   2.05285
depend~o |  -.1725916      .19608   -0.88   0.079  -.211717    .5569    36.126
landho~g |  -7.633679     4.94693   -1.54   0.123  -17.3295  2.06213   .607746
livest~k |  -1.22e-06      .00001   -0.12   0.904  -.000021  .000019    161508
distan~m |  -1.583061     1.56662   -1.01   0.312  -4.65358  1.48746   3.60325
dispee~a*|  -4.020348     9.90186   -0.41   0.685  -23.4276   15.387   .630081
infras~1*|    26.3531      15.081    1.75   0.081   -3.2054  55.9116   .284553
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1

truncreg    nawe2inc female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if
nawe2>0 , vce(cluster hhorder)
(note: 0 obs. truncated)

Fitting full model:

Iteration 0:   log pseudolikelihood = -3339.1018
Iteration 1:   log pseudolikelihood = -3338.7594
Iteration 2:   log pseudolikelihood = -3338.7555
Iteration 3:   log pseudolikelihood = -3338.7555

Truncated regression
Limit:         lower =       -inf                     Number of obs =     73
               upper =       +inf                     Wald chi2(17) = 181.07
Log pseudolikelihood = -3338.7555                     Prob > chi2   = 0.0000

                             (Std. Err. adjusted for 54 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
     naweinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |   28639.45   23137.72     1.24   0.216    -16709.65    73988.56
      h_head |   33827.26   25575.04     1.32   0.086    -16298.89    83953.41
    h_spouse |  -34588.18   37636.31    -0.92   0.358      -108354    39177.63
         age |   398.0824   630.6478     0.63   0.528    -837.9646    1634.129
edu_status~1 |   65788.79   35488.08     1.85   0.164    -135344.2    3766.571
     ed_prim |   78283.44   30019.92     2.61   0.009     19445.49    137121.4
   ed_second |   120442.1   53404.07     2.26   0.024     15772.06    225112.2
 ed_tertiary |    1329057     288905     4.60   0.000     762813.8     1895301
   hh_female |  -25750.26   23820.76    -1.08   0.280    -72438.08    20937.56
      hh_age |  -800.6658   657.8809    -1.22   0.224    -2090.089     488.757
      h_ad_w |   2909.678   12581.25     0.23   0.817    -21749.13    27568.48
dependance~o |  -768.6302   516.2118    -1.49   0.136    -243.1264    1780.387
 landholding |  -13227.84   14138.85    -0.94   0.349    -40939.48    14483.79
   livestock |  -.0098909   .0222078    -0.45   0.656    -.0534174    .0336356
  distancekm |   11.35238   3443.626     0.00   0.997     -6738.03    6760.735
dispeersed~a |  -4592.811   18008.02    -0.26   0.799    -39887.89    30702.27
 infrasgood1 |   95620.25   40692.71     2.35   0.019     15864.01    175376.5
       _cons |  -29515.75      51760    -0.57   0.569    -130963.5    71931.98
-------------+----------------------------------------------------------------
      /sigma |   189707.4   43163.67     4.40   0.000     105108.2    274306.7
------------------------------------------------------------------------------
```

```
. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =   66767.48
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
  female*|   28639.45       23138    1.24   0.216  -16709.6  73988.6   .565041
  h_head*|   33827.26       25575    1.32   0.086  -16298.9  83953.4   .390244
h_spouse*|  -34588.18       37636   -0.92   0.358   -108354  39177.6   .252033
     age |   398.0824      630.65    0.63   0.528  -837.965  1634.13    33.248
edu_st~1*|  -65788.79       35488   -1.85   0.064   -135344  3766.57   .731707
 ed_prim*|   78283.44       30020    2.61   0.009   19445.5   137121        .5
ed_sec~d*|   120442.1       53404    2.26   0.024   15772.1   225112   .231707
ed_ter~y*|    1329057      288905    4.60   0.000    762814  1.9e+06   .028455
hh_fem~e*|  -25750.26       23821   -1.08   0.280  -72438.1  20937.6   .264228
  hh_age |  -800.6658      657.88   -1.22   0.224  -2090.09  488.757   44.9675
  h_ad_w |   2909.678       12581    0.23   0.817  -21749.1  27568.5   2.05285
depend~o |  -768.6302      516.21   -1.49   0.136  -243.126  1780.39    36.126
landho~g |  -13227.84       14139   -0.94   0.349  -40939.5  14483.8   .607746
livest~k |  -.0098909      .02221   -0.45   0.656  -.053417  .033636    161508
distan~m |   11.35238      3443.6    0.00   0.997  -6738.03  6760.74   3.60325
dispee~a*|  -4592.811       18008   -0.26   0.799  -39887.9  30702.3   .630081
infras~1*|   95620.25       40693    2.35   0.019     15864   175376   .284553
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1

probit   nase2 female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary hh_female
hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if age>13 ,
vce(cluster hhorder)
note: ed_tertiary != 0 predicts failure perfectly
      ed_tertiary dropped and 8 obs not used
Iteration 0:   log pseudolikelihood =  -160.4159
Iteration 1:   log pseudolikelihood = -124.47959
Iteration 2:   log pseudolikelihood =    -123.96
Iteration 3:   log pseudolikelihood = -123.95892
Iteration 4:   log pseudolikelihood = -123.95892

Probit regression                                 Number of obs   =        284
                                                  Wald chi2(17)   =      71.37
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -123.95892                 Pseudo R2       =     0.2273

                              (Std. Err. adjusted for 100 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
       nase2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -.1191269   .2409636    -0.49   0.621    -.5914069    .3531531
      h_head |   1.152703   .4340816     2.66   0.008     .3019189    2.003487
    h_spouse |     1.0708    .504282     2.12   0.034     .0824253    2.059174
         age |   .0060804   .0117911    -0.52   0.066    -.0291904    .0170297
edu_status~1 |   .0498141   .8276144     0.06   0.050     -1.57228    1.671909
     ed_prim |  -.1256272   .8310221    -0.15   0.880    -1.754401    1.503146
   ed_second |   .0684975   .8966321     0.08   0.939    -1.688869    1.825864
ed_tertiary |  (omitted)
   hh_female |   .3646566   .3684959     0.99   0.322    -.3575821    1.086895
      hh_age |   .0036019   .0114929     0.31   0.754    -.0189237    .0261275
      h_ad_w |  -.2682346   .2078661    -1.29   0.197    -.6756446    .1391754
dependance~o |  -.0064174   .0065258     0.98   0.025    -.0063729    .0192077
 landholding |  -.9274515   .2273304    -4.08   0.000      .481892    1.373011
   livestock |  -1.27e-07   1.38e-07    -0.92   0.358    -3.96e-07    1.43e-07
  distancekm |  -.0994196   .0508646     1.95  -0.051    -.0002732    .1991124
dispeersed~a |  -.1274595   .2750753    -0.46   0.063    -.4116781    .6665971
 infrasgood1 |   .4144189    .308767     1.34   0.080    -.1907532    1.019591
       _cons |  -1.880439   .9262224    -2.03   0.042    -3.695802   -.0650765
------------------------------------------------------------------------------

. mfx

Marginal effects after probit
      y  = Pr(nase2) (predict)
         =  .32870813
```

```
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
  female*|  -.0431999      .08778   -0.49   0.623  -.215254  .128854   .565041
  h_head*|   .4164875      .14807    2.81   0.005   .126275    .7067   .390244
h_spouse*|   .4018072      .18065    2.22   0.026   .047741  .755873   .252033
     age |   .0021985      .00428   -0.51   0.067  -.010582  .006185    33.248
edu_st~1*|   .0179171      .29603    0.06   0.052  -.562298  .598132   .731707
 ed_prim*|  -.0454001      .30004   -0.15   0.880   -.63347   .54267        .5
ed_sec~d*|   .0249617      .32923    0.08   0.940   -.62031  .670234   .231707
hh_fem~e*|   .1358143      .14108    0.96   0.336  -.140693  .412321   .264228
  hh_age |   .0013024      .00416    0.31   0.754  -.006847  .009452   44.9675
  h_ad_w |  -.0969878       .0739   -1.31   0.189  -.241827  .047852   2.05285
depend~o |  -.0023204      .00236   -0.98   0.035  -.002301  .006942    36.126
landho~g |  -.3353462      .08829    3.80  -0.000   .162297  .508396   .607746
livest~k |  -4.58e-08      .00000   -0.91   0.361  -1.4e-07  5.2e-08    161508
distan~m |  -.0359479      .01848    1.94  -0.052  -.000278  .072174   3.60325
dispee~a*|  -.0457182      .09789   -0.47   0.064  -.146133   .23757   .630081
infras~1*|   .1543107       .1172    1.32   0.088  -.075401  .384022   .284553
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1


truncreg    partnase2 female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if
nase2>0 , vce(cluster hhorder)
note: ed_tertiary != 0 predicts failure perfectly
      ed_tertiary dropped and 8 obs not used
Fitting full model:

Iteration 0:   log pseudolikelihood = -1394.8262
Iteration 1:   log pseudolikelihood = -1394.4838
Iteration 2:   log pseudolikelihood = -1394.4799
Iteration 3:   log pseudolikelihood = -1394.4799

Truncated regression
Limit:         lower =       -inf                     Number of obs =     44
               upper =       +inf                     Wald chi2(17) =  32.45
Log pseudolikelihood = -1394.4799                     Prob > chi2   = 0.0132

                             (Std. Err. adjusted for 28 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
    partnase |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -12.49615   9.179784    -1.36   0.173     -30.4882    5.495892
      h_head |   29.54996   18.90058     1.56   0.011    -7.494493     66.5944
    h_spouse |   38.33777    16.2872     2.35   0.019     6.415446    70.26009
         age |   .3379392   .3845349     0.88   0.079    -.4157353    1.091614
edu_status~1 |   22.07157   17.71952     1.25   0.013    -12.65805    56.80119
     ed_prim |  -16.89501   16.95232    -1.00   0.319    -50.12095    16.33092
   ed_second |   9.560126   28.21599     0.34   0.735    -45.74221    64.86246
ed_tertiary |  (omitted)
   hh_female |   17.87603   14.13967     1.26   0.206    -9.837211    45.58928
      hh_age |   .2187048   .3318289     0.66   0.510     -.431668    .8690775
      h_ad_w |  -2.091239   8.708219    -0.24   0.810    -19.15903    14.97656
dependance~o |  -.3440135   .2037127    -1.69   0.091    -.0552559     .743283
 landholding |   9.146759   9.053866     1.01   0.312    -8.598491    26.89201
   livestock |  -2.49e-07   .0000118    -0.02   0.983    -.0000233    .0000228
  distancekm |  -.3451464   2.247405    -0.15   0.878     -4.74998    4.059687
dispeersed~a |  -14.61878   10.05641    -1.45   0.146    -5.091421    34.32897
 infrasgood1 |   24.29982    17.0141     1.43   0.053      -9.0472    57.64684
       _cons |  -48.46657   29.06355    -1.67   0.095    -105.4301    8.496947
-------------+----------------------------------------------------------------
      /sigma |   70.08292   8.936102     7.84   0.000     52.56848    87.59736
------------------------------------------------------------------------------

. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =  29.154472
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
```

```
---------+--------------------------------------------------------------------
  female*|  -12.49615     9.17978   -1.36   0.173  -30.4882  5.49589   .565041
  h_head*|   29.54996      18.901    1.56   0.011  -7.49449  66.5944   .390244
h_spouse*|   38.33777      16.287    2.35   0.019   6.41545  70.2601   .252033
     age |   .3379392      .38453    0.88   0.079  -.415735  1.09161    33.248
edu_st~1*|   22.07157       17.72    1.25   0.013  -12.6581  56.8012   .731707
 ed_prim*|  -16.89501      16.952   -1.00   0.319   -50.121  16.3309        .5
ed_sec~d*|   9.560126      28.216    0.34   0.735  -45.7422  64.8625   .231707
hh_fem~e*|   17.87603       14.14    1.26   0.206  -9.83721  45.5893   .264228
  hh_age |   .2187048      .33183    0.66   0.510  -.431668  .869077   44.9675
  h_ad_w |  -2.091239     8.70822   -0.24   0.810   -19.159  14.9766   2.05285
depend~o |  -.3440135      .20371   -1.69   0.091  -.055256  .743283    36.126
landho~g |   9.146759     9.05387    1.01   0.312  -8.59849   26.892   .607746
livest~k |  -2.49e-07      .00001   -0.02   0.983  -.000023  .000023    161508
distan~m |  -.3451464     2.24741   -0.15   0.878  -4.74998  4.05969   3.60325
dispee~a*|  -14.61878      10.056   -1.45   0.146  -5.09142   34.329   .630081
infras~1*|   24.29982      17.014    1.43   0.053   -9.0472  57.6468   .284553
---------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1
truncreg     nase2inc female h_head h_spouse age edu_statusliterate1 ed_prim ed_second ed_tertiary
hh_female hh_age h_ad_w dependanceratio landholding livestock distancekm dispeersedarea infrasgood1 if
nase2>0 , vce(cluster hhorder)
note: ed_tertiary != 0 predicts failure perfectly
      ed_tertiary dropped and 8 obs not used
Fitting full model:

Iteration 0:   log pseudolikelihood = -3147.4305
Iteration 1:   log pseudolikelihood = -3147.0881
Iteration 2:   log pseudolikelihood = -3147.0842
Iteration 3:   log pseudolikelihood = -3147.0842

Truncated regression
Limit:         lower =       -inf                     Number of obs =     44
               upper =       +inf                     Wald chi2(16) = 415.30
Log pseudolikelihood = -3147.0842                     Prob > chi2   = 0.0006

                              (Std. Err. adjusted for 28 clusters in hhorder)
------------------------------------------------------------------------------
             |               Robust
     naseinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -9697.418   10405.94    -0.93   0.351    -30092.68    10697.85
      h_head |   66457.52   24307.99     2.73   0.006     18814.74    114100.3
    h_spouse |   31211.99   19463.31     1.60   0.109    -6935.395    69359.38
         age |   637.4863   380.1687     1.68   0.094    -107.6308    1382.603
edu_status~1 |   2041.133   22542.77     0.09   0.028    -42141.88    46224.14
     ed_prim |   9364.874   21900.67     0.43   0.669    -33559.65     52289.4
   ed_second |   39093.36   29055.42     1.35   0.178    -17854.21    96040.93
ed_tertiary |  (omitted)
   hh_female |   22668.83   12384.61     1.83   0.167    -1604.553    46942.22
      hh_age |   229.2818   258.3787     0.89   0.375    -277.1312    735.6948
      h_ad_w |   8992.576    7752.22     1.16   0.246    -6201.496    24186.65
dependance~o |  -174.2951   196.0392    -0.89   0.374    -209.9346    558.5248
 landholding |   561.2929   7168.926     0.08   0.938    -13489.54    14612.13
   livestock |   .0232991   .0359342     0.65   0.517    -.0471306    .0937288
  distancekm |   -629.398   1636.742    -0.38   0.701    -3837.354    2578.558
dispeersed~a |   4767.165   8832.671     0.54   0.589    -12544.55    22078.88
 infrasgood1 |   47110.13   13658.39     3.45   0.001     20340.18    73880.09
       _cons |  -88386.34   36061.19    -2.45   0.014      -159065    -17707.7
-------------+----------------------------------------------------------------
      /sigma |   87036.85   17148.05     5.08   0.000     53427.29    120646.4
------------------------------------------------------------------------------

. mfx

Marginal effects after truncreg
      y  = Linear prediction (predict)
         =  37037.602
---------------------------------------------------------------------------
variable |      dy/dx    Std. Err.     z    P>|z|  [    95% C.I.   ]      X
---------+-----------------------------------------------------------------
  female*|  -9697.418       10406   -0.93   0.351  -30092.7  10697.8   .565041
  h_head*|   66457.52       24308    2.73   0.006   18814.7   114100   .390244
h_spouse*|   31211.99       19463    1.60   0.109   -6935.4  69359.4   .252033
```

```
     age |   637.4863      380.17    1.68   0.094  -107.631   1382.6    33.248
edu_st~1*|   2041.133       22543    0.09   0.028  -42141.9  46224.1   .731707
ed_sec~d*|   39093.36       29055    1.35   0.178  -17854.2  96040.9   .231707
hh_fem~e*|   22668.83       12385    1.83   0.167  -1604.55  46942.2   .264228
  hh_age |   229.2818      258.38    0.89   0.375  -277.131  735.695   44.9675
  h_ad_w |   8992.576      7752.2    1.16   0.246   -6201.5  24186.6   2.05285
depend~o |  -174.2951      196.04   -0.89   0.374  -209.935  558.525    36.126
landho~g |   561.2929      7168.9    0.08   0.938  -13489.5  14612.1   .607746
livest~k |   .0232991      .03593    0.65   0.517  -.047131  .093729    161508
distan~m |   -629.398      1636.7   -0.38   0.701  -3837.35  2578.56   3.60325
dispee~a*|   4767.165      8832.7    0.54   0.589  -12544.6  22078.9   .630081
infras~1*|   47110.13       13658    3.45   0.001   20340.2  73880.1   .284553
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

A-3.Generation of random sample

Two stage radom sample(by using random number generator via link bellow)
http://stattrek.com/statistics/random-number-generator.aspx

First stage: Random sample of five villages within each sector respectivery

KIMONYI: Order number of selected villages

15 18 06 09 05

Specs: First selection of 5 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 19. Duplicate numbers were not allowed.

15=kimonyi-kivumu-Nyamugari
18=kimonyi-mbizi-Gatumo
06=kimonyi-buramira-kabaya
09=kimonyi-buramira-nyiramuyenzi
05=kimonyi-Birira-Rurembo

NKOTSI:Order number of selected villages

12 14 22 05 06

Specs: Second selection of 5 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 28. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

12=Nkotsi-Gashinga-Musebeya
14=Nkotsi-Mubago-Buhamo
22=Nkotsi-Rugeshi-Mucamo
05=Nkotsi-Bikara-Kinkware
06=Nkotsi-Bikara-Kiruhura

Second stage: Random sample of ten households within each sector respectivery

Sellection of households in KIMONYI sector

KIMONYI-BIRIRA-RUREMBO(Village)
173 115 220 171 124 194 247 159 158 093

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 264. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

173= SEBUTENDE JONAS
115=MUNYAMASHARA PIERRE
220=NZAVUGWA NKIZE CELESTIN
171=NTAKABERAHO ASSINATH
124=BITARIHO KAMAHARI
194=MUKASINE CELESTIN
247=KANDINGA JUSTINE
159=MUHAWENIMANA ELIE
158=MUNYANEZA ANASTASE
093=MUKASINE CHRISTINE

KIMONYI-BURAMIRA-KABAYA(Village)
103 176 155 114 037 071 073 067 086 029

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 198. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

103= MUNYAMBONERA CLAUDE
176=MUKANOHERI
155= NKIZAYINO J PIERRE
114= SEMPAME(NYIRAMAWE SOPHIE)
037= BAGANIZI JEAN BAPTISTE
071= NYIRARUTAMBARA SPECIOSE
073= NSANZIMANA COLLETTE
067= NGIRABAKUNZI OMAR
086= KIMENYI FIDELE
029=MUNYAMPETA GASPARD

KIMONYI-BURAMIRA-NYIRAMUYENZI(Village)
302 292 008 232 189 233 102 180 176 273

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 314. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

302= NTIKAZABURA JEAN DE DIEU
292= TURIKUMWE(MANIRERE CLAUDINE)
008= NTURANYENABO(NYIRANSANZWEMBAZI)
232= NDIBESHE FRANçOIS
189= BIMENYIMANA LEONARD
233= NYIRABUNANE JULIENNE
102= NZEYIMANA J M V
180= NTAHOBARI(NYIRANDIKUBWIMANA)
176= TWAGIRAMUNGU P. CELESTIN
273=NYIRANKIRANUYE(NTAWUKIGIRUWE)

KIMONYI-KIVUMU-NYAMUGARI(Village)
124 082 094 016 136 128 110 009 155 068

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 155. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

124= HAKIZIMANA(MANIRIHO,MANITEZE DATIVA)
082=MASHANJIRE CYPRIEN
094= NYIRABAGENZI JOSEPHINE
016= MUNYANSHONGORE FABIEN
136= MAYIRA ALPHONSE
128=NYIRASUKIRANYA LAURENCE
110= MUKESHIMANA JEAN CLAUDE
009=ZIRIMWABAGABO FAUSTIN
155= UWAYEZU DEOGRATIAS
068=MUNYENTARAMA PAUL

KIMONYI-MBIZI-GATUMO(Village)
042 014 071 009 035 065 026 063 033 096

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 108. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

042= NZABONIMPA KARORI
014=NYIRAGAHOZE PELAGIE
071= MBERAHO FRANçOIS
009=UZAMUSHAKA VERENA
035= NGENDAHIMANA KIGINGI
065= BAKAMBWE JUVENAL
026= NTIBIRAMIRA CYPRIEN
063= NYIRAKAZERA FLORIDE
033= MWUMVANEZA J B
096=NYIRAMBONAGAZA BEATRICE

Sellection of households in Nkotsi sector

12=Nkotsi Gashinga Musebeya(Village)

016= NIRERE VELEDIANA
092= NYIRAHAHO ELIZABETHE
043= KURADUSENGE FLORENCE
087= MUNYENGANIZI J DE DIEU
009=BANYUZAHAYO(NIYONSABA MARIE CHANTAL)
037= NTANYUNGURA MERANIE
001= NTAMUNOZA CELESTIN
035= NSENGIYUMVA CHARLES
007= RWAMAHAME
015=HAGENIMANA VINCENT

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 103. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

14=Nkotsi Mubago Buhamo(Village)

72=NDARUHUTSE (NYIRARUKUNDO, NYIRABAGOYI)
52= BIKAMENSHI SIFORA
88= NDEBEYAHO EMMANUEL
71= NZITAKUZE CLAUDINE
55= NYIRANDIMUBANZI DONATHILE

79= UWIMANA (NYIRABAVANDIMWE)
08= BUGARE CESIE
67= UKURIBONYE (NYIRANDIMUKAGA)
45=NTANEZA OLIPA
21=MUHAWENIMANA VERONIQUE

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 89. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

22=Nkotsi Rugeshi Mucamo(Village)

073= NSHIMIYIMANA PIERRE CELESTIN
099= NSABIMANA
098= TWAGIRAYEZU ALEXIS
027= KWITONDA AUGUSTIN
034= NSANZIMANA MARCEL
039= TUYISENGE AIMABLE
023= MUNYEMPANE SYLVESTRE
072= MUNYAMPETA CLAVER
102= DUSENGIMANA JEAN BOSCO
088=BYUKUSENGE

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 103. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

05=Nkotsi Bikara Kinkware(Village)

137= NIYONSENGA DYNA
077= NYIRASINE GENEROSE
062= MUNYARUGERERO (NIRERE IRENE)
064= MANIRAKIZA CLAUDINE
059= MUZURI JEAN MARIE VIANNEY
074= NIZEYIMANA J BAPTISTE
029= HABIMANA THEONESTE
008=BARABURIYE SAVERINE
030= HABYARIMANA BERNARD
120=UWIZEYIMANA ALFRED

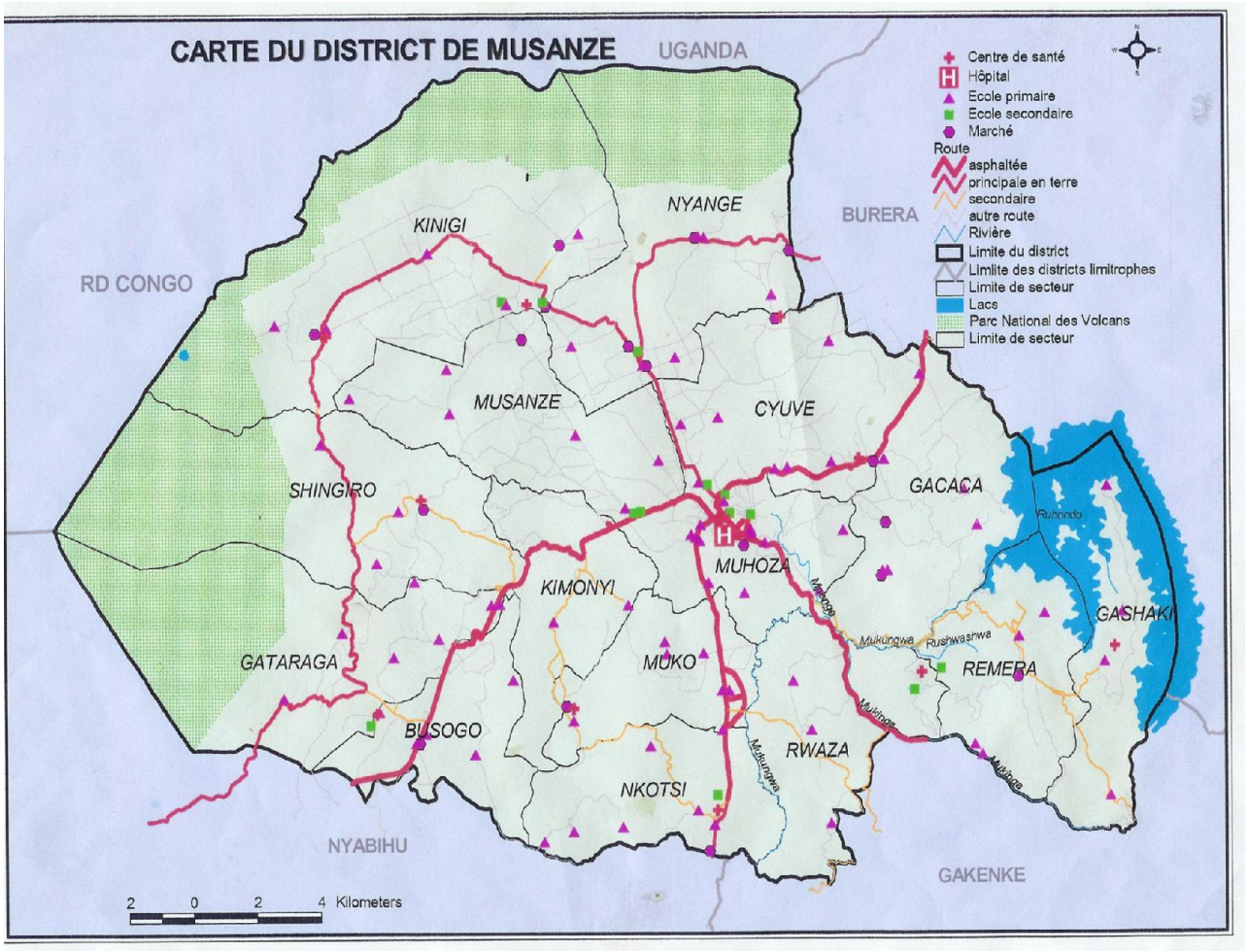
Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 155. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

06=Nkotsi Bikara Kiruhura(Village)

027= HAGUMIMANA ANONCIATA
167= NIZEYIMANA FRODUARD
080= BAKUNDA ANASTASIE
129= MANIRAGABA NEPO
105= NZAMWITAKUZE PHOCAS
054=BAZIYAKA CYPRIEN
163= ICYITEGETSE (Nyiraneza)
004= HABYARIMANA LEOPORD(LEOPARD)
070=HITIMANA HILAM
161=NIYIMPAYE JEAN CLAUDE

Specs: This table of 10 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 167. Duplicate numbers were not allowed. This table was generated on 5/01/2012.

A-4 Map of Musanze district



Source: Musanze,2011

A-5 Some handicrafts products of KIAKA cooperative demanded by tourists in Musanze and that can be manufuctured localy if Musanze inhabitants were trained










One of Musanze shop selling crafts bought at KIAKA


Greeting cards production and shoe repairing in Rubavu (association trained by KIAKA cooperative)

Bamboo product at KIAKA

Manufacturers of Brushes at KIAKA

Manufacturers squeegees at KIAKA

Successful carpentry inMuhanga (southern province)

Successful traditional basket weaving in Kamonyi (southern Province)

A-6 Questionnaire

Structured interview with Musanze households (the questionnaire will be administered by the researcher in Musanze District)

I'm NOHELI Jean Baptiste, a student at Wageningen University in Netherlands. I'm conducting a research in the framework of completing my master's degree in development Economics. In this regard, I'm conducting a research on "**factors determining non-Agriculture employment in Musanze"** as part of my dissertation leading to master's degree. The information and responses you provide will be treated with confidentiality and will be used only for research purposes. Your contribution to answer the questions included in this questionnaire is highly valuable to accomplish my research.

RESPONDENT: Preferably the head of household. If unavailable, the wife, husband or any other knowledgeable adult member of the household can provide information on other members.

Name of the RESPONDENT: _____ NO ID:/____/___/
(to refer to the list of
Members of the household)

NB: Household members normally live and take their meals under the same ceiling and recognize the authority of the household head, the same nomination includes absent persons for example persons temporarily absent due to; school, seasonal work, holiday, hospital/clinic, etc..

Abreviations

VUP: Vision 2020 Umurenge Program
UCS: Ubudehe Credit Scheme

CRITERIA OF MEMBERSHIP OF THE HOUSEHOLD

- Those who answered ''6 months'' or less on Question 8 of section 0 are household members
- If the answer on question 8 of Section 0 is "more than 6 months" only the following individuals are household members;
  - THE HEAD OF THE HOUSEHOLD
  - CHILDREN LESS THAN 6 MONTHS
  - NEW HUSBANDS OR WIVES
  - PEOPLE WHO RECENTLY JOINED THE HOUSEHOLD AND WILL RESIDE THERE PERMANENTLY

SECTION 0: Household characteristics

RESPONDENTS: FOR EACH PERSON LIVING IN THE HOUSEHOLD DURING ENUMERATION

NO ID	1. Sex M...1 F....2	2. Relationship with the head of household Household Head (HH)... .....1 Spouse of HH…….....2 Son/Daughter of HH….. .....3 Step Child /adopted/foster child of HH…….....4 Father/Mother of HH….. .....5 Brother/Sister of HH…….....6 Grandchild of HH…….....7 Parent in law to HH……. .....8 Brother/sister in law to HH.....9 Other relationship to HH…… 10 No relationship to the HH... ..... 11 Domestic worker …….. 12	3. Age(in years)	4. Can you write and read a letter? Yes=1 No=0	5. What is your level of education? (None =0, Completed P6=1, VocationalTraining=2, Completed A2 Level=3, A1level=4, A0(Bachelors) level=5, MSc level=6, PhD=7,Other (specify)	6. Occupation (none=0, student=1, worker=2)	7. Has "…" been away from home over the course of the last 12 months? Yes.....1 No….0 ⇒next section	8. How long has "…" been absent over the last 12 months? (TOTAL TIME IN MONTHS)	9. What was the primary reason for your absence? Studies…….....1 Seasonal work .....2 Working away now.....3 For health care.....4 Attend ceremony.....5 Visit friends/family.....6 Training .....7 Detention/compulsory Service .....8 Unexplained absence .....9 Other 10
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									

Section 0: Household's characteristics(continue)

Member code	10. **Main occupation** Farm self employment…1 Farm wage employment..2 Nonfarm self employment…3 Nonfarm wage employment…4	11. **Second occupation** None…0 Farm self employment…1 Farm wage employment..2 Nonfarm self employment…3 Nonfarm wage employment…4	12. **More occupations** (Codes)	13. In the last 12 months, did your Household or any of its members Receive any payments in cash or in any other form of revenue, from the followings sources? Selling harvest……1 Selling livestock……2 Rental income……3 Farm wage employment….4 Nonfarm employment…….5 Nonfarm self employment..6 Sale of assets……..7 State pension……..8 Transfers……9	14. How much did your household receive in the last 12 months from [SOURCE] including the value of any payment in the form of goods?(**estimation if possible. If not I will calculate it myself via the answers from next sections**) Amount in frw/year	15. Was this payment received by a specific household member(1) or by the household as a whole(2)?	16. Who in the household was the principal recipient of this payment? (Enter ID code of the member)

17. How far is the nearest fair/market from the household(Distance in Km)?.....(by researcher)
18. Location of household: Scattered area=1 Populated centre=0 (to be answered by researcher)

SECTION 1: ECONOMIC ACTIVITY IN LAST 12 MONTHS & LAST 7 DAYS

Section1 A: Filter Questions and all the occupations you have carried out over the last 12 months.
RESPONDENTS: All household members aged 6 years and older.
At this point I'd like us to discuss about the economic activities that you have carried out over the last 12 months i.e From (Month /Year) /__/____/

		Agricultural Activity		**Non-Farm Activity**		**VUP**	Inactivity If any of the responses are "Yes" skip to next section. Otherwise in all responses are "no" in 2-6 then ask
NO ID	1. ID No of respondent	2. During the last 12 months, has "…" worked on his/her own farm or worked on a farm belonging to a household member for no payment? Yes……1 No…….2	3. During the last 12 months, did "…." carry out any agricultural activity whether farming, livestock, fishing or forestry for salary, wages or in-kind compensation? (Excluding VUP) Yes……1 No…….2	4. During the last 12 months, has "…" worked for salary, wages or any in-kind compensation in a non-farm business owned by someone else? (includes paid apprentice, domestic but and excludes VUP) Yes……1 No……..2	5. During the last 12 months, has "…" run or operated a non-farm business for cash or profit for him/herself like a small shop or other income generating activity? Yes……1 No……..2	(6) During the last 12 months has ''…'' ever participated in a VUP Public Works Programme? Yes……1 No……2	(7). What was the main reason for "…" not working over the last 12 months? Domestic duties……1 Student……...2 Retired……..…...3 Living on returns from past investment……..4 Sickness/Health problems….5 Old age……6 Too disabled to work…….7 Too young……...8 Not employed……..9 Other, Specify:……..…..10
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							

Section 1B: Employment

RESPONDENTS: All household members aged 6 years and older.

No. ID	1. Have "…" worked at least 1 hour during the last 7 days in any of the activities mentioned above? Yes ….. 1 ⇒Q3 No …… 2	2. What is the reason that "…" didn't work in the last 7 days? Temporary absence/sick . Holiday..... No work available..... (potentially unemployed) Dismissed/terminated ..... (potentially unemployed) Student ..... Domestic duties ..... Other(specify)	3. Does ".." wish to find additional or new employment ? (work you may do now for pay or family gain) Yes…. 1 ⇒Q5 No …..2	4. Why doesn't "…" wish to to find additional or new employment? I work full time…….. ..... ⇒Part 6 C Satisfied with current situation...2 Occupied with domestic duties..3 Discouraged by failure to secure employment..... ....4 Family Reasons..... 5 Too old to work..... 6 Retired..... ....7 Too young to work.....8 Studies..... ...9 Sickness/ Incapacitation..... 10 Other..... ..11 ⇒ Q7	5. How many extra hours would "…" want to work per week?	6. What has/ is "…" done/ doing to secure work? Asked of a relation/friend to help……..1 Applied for a job..... ..... 2 Called on employers ..... 3 Listened to radio announcements..... ..... 4 Read published announcements..... ..... 5 Attempting own job creation…… 6 Other..... ..... 7 (Specify) (Two possible responses)		7. Has "…" ever had a full-time salaried position? Yes..... 1 No..... 2 ⇒Section 1C	8. What kind of employer do/did "…"work for in your last full time salaried or paid work? Govt…….1 Public non financial….. 2 Public financial……3 Private, non financial formal…….. 4 Private, non financial informal…….5 Private financial formal.....6 Private financial informal.....7 Local NGO…… 8 VUP…… 9 Household……10 International (UN agencies, Embassy, NGO)…… 11 Other (specify)……..12	9. Is "…" still employed at this full time job? Yes…1 ⇒ section 1C No…..2	(10) When did ".." stop working at this job?	
					Hours	1st Response	2nd Response				Year	Month
01												
02												
03												
04												
05												
06												
07												
08												
09												
10												

SECTION 1C: OCCUPATION (FOR MEMBERS OF THE HOUSEHOLD AGED 6 YEARS AND ABOVE WHO HAVE BEEN EMPLOYED)

LIST ALL THE WORK EACH PERSON HAS DONE IN THE LAST 12 MONTHS. (ANY HOME FARMING, PAID WORK OR PROFIT EARNING WORK)

1. Employment ID No	2. No ID of member	3. What work did "…" do?		4. Is there seasonality (relative periods of activity) in this activity? 1…..Yes 2……No =>Q6	5. What is/was the duration of your work according to season						6. Over the past 7 days, how many hours did "…" work each day? (Including the time to travel to and from work) **Hours/Minutes**							7. What was/is "…" occupational status in each activity? Wage farm……1 Wage non-farm…2 VUP scheme…….3 ==>Section 1E Independent farmer…4 Unpaid family farm worker ……..5 Independent non-farmer……..6 => Section 1G Non-farm family unpaid worker……7 Other non-paid work(Apprentice, Volunteer,TIG etc.)…..8 If the response is 4,5,7,8 =>Section F
					High Season			Low Season or No Seasonality										
					A. Months /year	B. Days /month	C. Hours /day	D. Months /year	E. Days/ month	F. Hours /day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
1.		Description of the occupation	Occupation								../…	../…	../…	../…	../…	../…	../…	
2.											../	../	../	../	../	../	../…	
3.											../	../	../	../	../	../	../…	
4.											../	../	../	../	../	../	../…	
5.											../	../	../	../	../	../	../…	
6.											../	../	../	../	../	../	../…	
7.											../	../	../	../	../	../	../…	

Section 1D: Waged or salaried Employment (Farm and Non Farm)

RESPONDENT: All household members aged 6 years and above who answered 1 or 2 to question 7,section 1C (Salaried work)

1. Employment ID No (Refer to the Employment No under Section 6C Q1	2. No ID of person	3. Industry – what is produced or made or service offered by your employer		4. In what sector does "…" work? Public.....1 Parastatal .....2 Private, formal.....3 Private informal ...4 NGO Local .....5 International .....6 Other.....7 (Specify) Doesn't know……8	5. How did ".." secure this job? Family contacts..1 Applied for vacancy. ..... 2 Requested by employers..... 3 Luck…… .....4 Offered unrequested..... 5 Other (specify).. 6	6. How long has ".." worked in this capacity?		7. How many hours did ".." work in last 7 days in this job?	8. How much was ".." last take home salary/wage (cash)? UNIT OF TIME Day…. ..1 Week …2 Month….3 Year……4		9. Does ".." receive in-kind payments as food, agricultural products, livestock products for this work? Yes.....1 No.... ……2 ⇒Q11	10. What is the value of these in-kind payments? UNIT OF TIME Day…. ..1 Week …2 Month….3 Year……4	
		Description of the industry	*observation*			Years	Months	Hours	Amount	Unit of Time		Value	Unit of time

Section 1D (Continue)

(1) ID No of employment	(2) No ID of person	11. Does ".." employer provide or subsidize his/her housing? Yes…… 1 No…….. 2 ⇒ Q13	12. What is the value of this benefit? If the value is not known, put "9" UNIT OF TIME Day…... 1 Week … 2 Month….3 Year……4		13. Does ".." receive any other benefits (transportation, communication allowances) for this work? Yes 1 No 2 ⇒ Q15	14. What is the value of this benefit? If the value is not known, put "9" UNIT OF TIME Day…....1 Week … .2 Month…..3 Year…….4		15.. Does this job provide ".." with the following?		
								A. Medical coverage Yes.....1 No.....2	B. Retirement pension Yes.....1 No..... 2	C. Paid leave Yes..... 1 No..... 2
			Amount	Unit of time		Amount	Unit of time			

Section 1F: All Other Activities

Required: All Household members aged six years and above who responded '4'. '5', '7' and '8' to question 7 section1C. (all except those receiving a wage or salary and those self employed in non-agricultural activites)

1. Employment ID No	2. No ID of person	3. Industry – what is produced or made or service offered.		4. Does "…" earn any profit in cash or in kind from his/her work? Yes…..1 No……2	(5) For whom does "…" work? Myself……..... 1 Household member.....2 Parent..... 3 Other relative……4 Association/cooperative.....5 Private sector .....6 NGO (Local)…… .....7 International … .....8 Public sector .....9 Other (specify)……10	(6) For how long has "…" been working this job?		(7) Is this permanent work? Yes.....1 No...……2 ?	(8) How many hours did "…" do this work in the last 7 days?
		Description of industry	*Code of industry*			Years	Months		Hours

Section 1G: DOMESTIC WORK

RESPONDENTS: All household members aged 6 years and older.

At this point I would like you as about the time you doing home duties in the last week.

NO ID	1. Over the last 7 days, did ".." forage for firewood for the household? Yes. ....1 No …… 2 ⇒Q3	2. How many hours did ".." spend foraging for wood over the last 7 days (to and from)? Hours	(3) Over the last 7 days, did ".." search for fodder or grazing for the household's animals? Yes. ....1 No …… 2 ⇒Q5	(4) How many hours did ".." spend caring for or searching for fodder over the last 7 days? (To and from) Hours	(5) Over the last 7 days, did ".." fetch water for the household? (include travel time to the water source) Yes.....1 No.....2 ⇒Q7	(6) How many hours did ".." spend fetching water over the last 7 days (to and from)? Hours	(7). Over the last 7 days, did ".." go to the market for the household? Yes.....1 No.....2⇒Q9	(8) How many hours did ".." spend in the market over the last 7 days (To and from)? Hours	(9). Over the last 7 days, did ".." cook for the household? (To and from) Yes.....1 No .....2 ⇒Q11	(10) How many hours did ".." spend cooking over the last 7 days? Hours	(11) Over the last 7 days, did ".." spend any time on other household chores such as laundry, cleaning, looking after children and other? Yes ..... 1 No ..... 2 ⇒ next person	(12) How many hours did ".." spend on other household chores over the last 7 days? Hours
01												
02												
03												
04												
05												
06												
07												
08												
09												
10												
11												
12												
13												
14												

SECTION 2A: NON-AGRICULTURAL ACTIVITIES (BUSINESS)

RESPONDENT: All members of the household aged 6 years and above who answered '6' on question 7 of Section 1C.(Those self -employed in Non-agricultural economic activities)

(1)	(2)	(4)		(5)			(6)		(7)		(8)		(9)
employment Id no.	ID NO. of the member	To describe the industry of the business activity carried out by each member of the household. E.g. Kiosk. Newsvendor, taxi etc.		Are there other household members that work in this business? (write the employment ID No. mentioned in part 6C Q1) If no…0			What is the labour expenditure of the business? UNIT OF TIME Daily.....1 Weekly.....2 Monthly.....3 Annually……4		What is the non labour expenditure of the business? UNIT OF TIME Daily.....1 Weekly.....2 Monthly.....3 Annually 4		What is the income (turnover) of this business? TIME UNIT Daily…….. 1 Weekly……..2 Monthly…… 3 Annually…….. 4		Is this business part of a cooperative or business association? Yes association…..1 Yes Cooperative…..2 No……..3
		Description	Activity code	No ID of employment I	No ID of employment II	No ID of employment III	Amount	Time unit	Amount	Time unit	Amount	Time unit	

SECTION 2B: NON-AGRICULTURAL ACTIVITIES (BUSINESS))
RESPONDENT: All members of the household aged 6 years and above who answered 6 on question 7of section 1C.

	(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
IDNO.OF EMPLOYMENT	ID no. of member.	ID No of the interviewed person	How long has this business been functioning?		For how many months over the last year has this business been operating?	Does the profit generated by the business belong entirely to the household? Yes..... 1 ⇒ 7 No……..... 2	What percentage the profit belongs to the household?	Is this business registered with The Rwanda Revenue Authority? Yes.....1 No .....2 Not known...3	Is this business registered with another government agency? District/Sector…1 Private Sector Federation ..2 No 3	Does this business maintain accounts? Yes..... 1 No……2	Over the last 3 months, how many people did this business employ? (exclude owners and include hhd members) If none…0 ⇒12	How many of these are household members?
			Years	Months	Number of months		%					

SECTION 2B: NON-AGRICULTURAL ACTIVITIES (Business :continue)
(RESPONDENT: All members of the household aged 6 years and above who answered 6 on question 7 of section 1C.

		(12)	(13)	(14)	(15)	(16)	(17)
IDNO.OF EMPLOYMENT	ID N0 of member	What was the greatest obstacle encountered when creating this business? No major obstacle...1 Cash availability…2 Access to credit.....3 Administrative procedures..4 Premises .....5 Finding staff .....6 Finding customers.....7 Others (specify).....8	What was the primary source of money used to create this business? Household savings.....1 Commercial bank loan.....2 State fund .....3 Borrowed from family .....4 Cooperative loan .....5 Tontine (community).....6 Informal lenders.....7 VUP loan .....8 Other source(specify) 9	Over the last 12 months, has this business sought a loan at a bank or other modern lending institution? Yes, with success.....1 Yes, no success……... 2 ⇒ next business No..... 3 ⇒ next business	Over the last 12 months, what was the main source of credit for this business? Commercial bank loan ..... 1 State fund..... 2 Borrowed from Family or friends ..... 3 Cooperative loan..... 4 Tontine (community) ..... 5 Informal lenders ..... 6 VUP loan ..... 7 Other source (specify) 8	Over the last 12 months, how much has this business borrowed? Amount	Over the last 12 months, how much has this business reimbursed (paid equity) on the loans? Amount

SECTION 3: AGRICULTURE

1. Over the last 12 months has any household member grown food or other agricultural produce to eat or sell, or raised cattle or poultry?

Yes..... 1 No....2 ⇒ Part B (but check section 1C, question 7to be sure) ☐

PART A1: LIVESTOCK

2. Over the last 12 months has any household member raised animals or poultry? ☐

Yes..... 1 No....2 ⇒ Part B

	(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
TYPE OF LIVESTOCK	CODE	Over the last 12 months has any household member raised ".....”? Yes..... 1 No..... 2 ⇒ go to the next type	How many ".....”do you actually own? If the answer is “0” go to Q.6	Over the last 12 months, how many “..”were born ?	Do you stable these animals? Yes, all .1 Yes, some… 2 No…… 3	How much would you sell one “....” on the average in today’s prices?	Over the last 12 months have you sold or killed for consumption any “....”? Yes..... 1 No..... 2 ⇒ Q9	How many heads were slod or slaughtered?	What was the value of the animals sold or slaughtered?	Over the last 12 months have you bought any “....”? Yes.. 1 No... 2 ⇒Q12	How many?	What was the value of these purchases?	Have you lost (lost, stolen or dead) ".....”over the last 12 months? Yes..... 1 o..... 2 ⇒ Q15	How many heads?	What was the main reason for the loss? Lack of water ... 1 Sickness.....2 Theft..... 3 Strayed..... 4 Predators... 5 Other..... 6	Have you rented out any "....." over the last 12 months? Yes.... 1 Not.... 2 ⇒ the Next type	How much did you earn from the rental?
			Number	Number		Value		Number	Amount		Number	Amount		Numbers			Amount
Cattle	1																
Sheep	2																
Goats	3																
Pigs	4																
Rabbits	5																
Chickens	6																
Other Poultry	7																
Other animals (Specify)	8																

PART A2: LIVESTOCK (Continued) One cow per poor family policy, animals and pasture

(1)	(2)	(3)	(4)		(5)
Have you ever received a cow from the Government's 'one cow per poor family policy'? Yes..... 1 No..... 2 => Q3	Do you still keep this animal? Yes .....1 No.....2	Have you ever received any animal from an NGO or other social protection scheme'? Yes..... 1 No..... 2 => Q5	What kind of animal was it? Cattle.....1 Sheep.....2 Goat .....3 Poultry.....4 Pig……5 Other 6		Has the number of these animals changed? (including "one cow policy") Yes, increased……. 1 Yes, reduced…….2 No, the same……. 3 Not applicable……4
			1st Animal	2nd animal	
(6)	(7)		(8)		(9)
Do you use a maintained pasture? Yes..... 1 No..... 2 => Part A3	To whom does this pasture belong? Household's own..... 1 Other person/ private company..... 2 State owned..... 3 District land……4		What was the cost of using this pasture over the last 12 months?		How many months in the last 12 months did you use this pasture?
			Amount		Number of months

PART A3: LIVESTOCK (Continued) Sale of livestock products

	(1)	(2)	(3)	(4)	(5)		(6)	(7)
LIVESTOCK PRODUCTS	CODE	Have you sold any "..."over the last 12 months? Yes..... 1 No..... 2 ⇒ go to next product	For how many months in the last 12 months did you sell '…..'	Have you sold any "…" over the last 4 weeks? Yes…..1 No……2 => Q7	How much '……' did you sell in the last 4 weeks?		In the last 4 weeks how much income did you make from the sale of "..."?	On average, how much did you sell in each month?
			Months		Quantity	Unit of Measure	Amount	Amount
Fresh milk	1					Liter		
Curdled/sour milk	2					Liter		
Butter	3					Kg		
Cheese	4					Kg		
Eggs	5					Unit		
Manure	6					Kg		
Meat from animals	7					Kg		

SECTION 3: AGRICULTURE

PART B: Land

(1) Does any household member currently own any agricultural land

(including any lands located outside of this vicinity)?

Yes.....1 ⇒ Q3, No.... 2

(2) Has any member of the household owned land over the last 12 months?

Yes.....1 No...2 ⇒ Part C1

(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Have you bought land over the last 12 months? Yes..... 1 No..... 2 ⇒ Q 5	How much did you pay to acquire this land (including any payments in kind)? Amount	Have you bought land in the last 4 years Prior to the last 12 months? Yes..... 1 No..... 2 ⇒ Q 7	How much did you pay to acquire this land (including any payments in kind)? Amount	Have you sold any land over the last 12 months? Yes..... 1 Not..... 2 ⇒ Q 9	How much did you receive from the sale of this land (Including payments in kind)? Amount	Have you sold land in the last 4 years Prior to the last 12 months? Yes..... 1 Not..... 2 ⇒ Q 11	How much did you receive from the sale of this land (Including payments in kind)? Amount	Have you rented out any land over the last 12 months? Yes..... 1 Not..... 2 ⇒ Q 13	How much did you receive from the rent of this land (Including the payment in kind)? Amount

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
Have you sharecropped any land over the last 12 months? Yes..... 1 Not..... 2 ⇒ Q 15	How much did you receive from this sharecropping of this land? (including the payment in kind) Amount	Did you lend any land to a person outside the household over the last 12 months? Yes..... 1 No..... 2	Have you received any land as a gift, inheritance, or dowry or otherwise over the 12 last months? Yes..... 1 No..... 2	Have you given any lands to persons outside the household as gift, inheritance, or dowry or otherwise over the last 12 months? Yes..... 1 No.....2	Has anyone in the household tried to get a loan or borrow money to make agricultural improvements in the last 12 months? Yes ..... 1 No..... .... 2 =>Q22	Did the loan get approved? Yes.....1 No 2	How much was requested? Amount	What was the purpose of the loan? Terracing.....1 Irrigation.....2 Animal purchase.3 Equipment.....4 Inputs (seeds/fertilizers) 5 Purchase of land.6 Farm buildings ....7 Other(Specify).....8	**Have you been exposed to LTR Program?** **Yes.....1** **No.....2** **=> Part B2**	**Where are you in the process?** Demarcation.....1 Adjudication.....2 Claims receipt issued.....3 Recording objections and disputes.....4 Publication of records in the objection and correction period.....5 Mediation period.....6 Registration.....7 Title issued.....8

SECTION 3: AGRICULTURE
PART C1: DETAILS OF HOLDING PARCELS/BLOCS

Make the list of all holding parcels that were owned or exploited by the members of the household during the last 12 months (except those that were given out in hiring, share-cropping or freely lent). All parcels should be measured.

0. Over the last 12 months, has anyone in the household owned or cultivated a plot of land?
Yes 1
No..... 2 ⇒ Part E

Enumerate all fields for each owner, while starting with those which were under use before the last 12 months ago, then adding those put to use during the last 12 months, finally by those remained in fallow during the last 12 months.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Owner' S ID No.	Respondent ID No	Field/bloc No.	Surface area of the field	How did "…" obtain the plot or if not yours what arrangement is there for cultivating? Inherited.....1 Purchase……..2 Gift……..3 Free use or loan...4=>Q8 Appropriation…..5 ⇒Q8 Share cropped….6⇒Q7 Leased……..7⇒Q7 Other (specify)….8⇒Q8	Does your household have the right to sell/use the land as guarantee for a loan? Yes, to sell……. 1 Yes, Guarantee. 2 No…… 3 === >8	What was the cost of renting this land over the course of the last 12 months (Including payments in kind)?	Has the field been cultivated over the last 12 months? Yes……1 No…….2 ⇒ next part	Has this plot been affected by land consolidation? Yes…..1 No……2	Is this plot irrigated at any time in the growing season? Yes……1 No…….2	Is this parcel protected from erosion? Yes……1 No…….2 ⇒ Q13	What is the main kind of protection is used? Terracing .....1 Erosion fence .....2 Erosion ditch .....3 Planting trees .....4 Other (specify) 5
			Number of ares of parcel			Amount					
		01									
		02									
		03									
		04									
		05									
		06									
		07									
		08									
		09									
		10									

SECTION 3: AGRICULTURE (Continue)
PART C2: DETAILS OF HOLDING PARCELS/BLOCS AND AGRICULTURAL POLICY CHANGES

(1)	(2)	(3)	(13)								(14)	(15)		(16)	(17)	
Owner' S ID No.	Respondent ID No	Field/bloc No.	What crops (including fruit) were grown during the last 12 months (1st and 2nd season)? (The two most important crops in terms of income fetched)								Have you planted any new crops in this parcel due to regionalization of crops? Yes ..... 1 No ..... 2 => Q16	Which was the main crop planted due to regionalization?		Have you removed any crops from this parcel due to regionalization of crops? Yes ..... 1 No……2 => Next Plot	Which was the main crop removed due to regionalization?	
			1st season (September -February)				2nd season (March to August)									
			Crop	CODE	Crop	CODE	Crop	CODE	Crop	CODE		Crop	Code		Crop	CODE
		01														
		02														
		03														
		04														
		05														
		06														
		07														
		08														
		09														
		10														
		11														

PART D: INCOME FROM AGRICULTURE

0. Over the last 12 months, are there any agricultural incomes you have obtained?
   Yes…….1
   No……..2⇒PART E

	(1)	(2)	
SOURCE	CODE	Sales during the …….	
		Last 4 weeks	Last 12 months
		Amount	Amount
Hunting	1		
Mushrooms	2		
Honey and wax	3		
Fish	4		
Firewood	5		
Charcoal	6		
Wooden planks	7		
Construction timber	8		
Hides and skins	9		
Cash crops	10		
Food crops	11		

PART E: Transformation (processing) of agricultural products.

0. Over the course of the last 2 weeks, are there any agricultural products (own product, purchased or given other household member) that have been processed or fish that has been smoked?

Yes.....1, No.....2 ⇒ SECTION 4

(1)	(2)	(3)		(4)			(5)			(6)	(7)	(8)	(9)	(10)		(11)	
ID of responsible person	ID of Respondent	Over the last 12 months, what products have you made by processing your crops?		Which other household members usually help out with this processing task? If no put 0			What quantity did you process? (see measuring units codes) Day..... 1 Week..... 2 Month..... 3 Year..... 4 (Use unit codes)			What was your labor costs in cash or in kind (respond using the time unit as recorded in Q5)?	What was the source of supply of the goods you have transformed (processed) Own production 1 Purchases..... 2 Gifts..... 3 Other.....4	What other production costs did you have? (Use unit of time in Q5)	Have you sold any "....."? Yes..... 1 No..... 2 ⇒ Next product	How much of "....." did you sell? Day.....1 Week..... 2 Month..... 3 Year..... 4		What was the amount of sales of "....."? Day.....1 Week..... 2 Month..... 3 Year..... 4	
		Product		ID	ID	ID	Time unit	No. Of Units	Unit of measurement	Amount		Amount		Time unit	No. of units	Time Unit	Amount

SECTION 4: TRANSFERS OF INCOMES

PART A: TRANSFERS MADE BY HOUSEHOLD (OUT)

RESPONDENT: HEAD OF THE HOUSEHOLD OR INFORMED MEMBER OF THE HOUSEHOLD

NOTE: PAYMENTS IN CASH OR IN KIND RECORDED HERE REFFER TO ONLY TRANSFER PAYMENTS BY THE HOUSEHOLD AND THEY DO NOT INCLUDE/NOT TO BE UNDERSTOOD AS PAYMENTS CARRIED OUT IN EXCHANGE OF GOODS AND SERVICES BY THE HOUSEHOLD.

1. During the last 12 months, has this household sent money or goods in kind to an absent member of the household or other people?

Yes 1

No..... 2 ⇒Part B

		If not a member of the household								
(List the names of the beneficiaries of these transfers)	2. Write the ID No. of the absent member of the household or 00 if not a member of the household if member of the household ⇒Q5	3. Relationship with the head of household Head of household(HH)…… 1 Wife of the HH..... 2 Daughter/son of HH ..... 3 Child in care of HH..... 4 Parent of HH ..... 5 Brother/sister HH ..... 6 Grandchild HH ..... 7 Other relative of HH ..... 8 Not a relative of HH..... 9 NGO 10	4. Sex M..... 1 F..... 2 N/A 3	5. Where does the beneficiary live? Same village/town.... ..... 1 Kigali…..... 2 Other towns.....3 Other countryside..... 4 Bordering Countries..... 5 Other African countries..... 6 Out of Africa……..... 7	6. How frequently has your household sent these transfers (in kind or cash) to this person? Unit declared Day..... 1 Week…..... 2 Month..... 3 Year..... 4 Period More than a year…….5		7. Will these payments require reimbursement? Yes..... 1 No..... 2	8. What is the total amount of cash sent to "…" in the last 12 months? IF NOTHING, PUT "0"	9. What is the total value of food products sent to "…" over the course of the last 12 months? IF NOTHING, PUT "0"	10 What is the value of any other in-kind transfers made to"…" over the course of the last 12 months? IF NOTHING, PUT "0"
Name					number of times	Time unit		Amount	Value	Value

SECTION 4: TRANSFERS OF INCOMES
PART B: TRANSFERS RECIEVED BY THE HOUSEHOLD (IN)
RESPONDENT: HEAD OF THE HOUSEHOLD OR INFORMED MEMBER OF THE HOUSEHOLD

1. During the last 12 months, has this household received money or goods in kind from an absent member of the household or from another person?

Yes..... 1
No..... 2 ⇒Part C

NOTE: PAYMENTS IN CASH OR IN KIND RECORDED HERE REFFER TO ONLY TRANSFER PAYMENTS BY THE HOUSEHOLD AND THEY DO NOT INCLUDE/NOT TO BE UNDERSTOOD AS PAYMENTS CARRIED OUT IN EXCHANGE OF GOODS AND SERVICES SOLD OR WORK BY THE HOUSEHOLD.

		If not a member of the household										
(List the names of people who made transfers to the household)	2. Write the ID No. of the absent member of the household or 00 if not a member of the household if member of the household ⇒Q5	3. Relation with the head of household Head of household(HH)……1 Wife of the HH……..2 Daughter/son of HH…….3 Child in care of HH……..4 Parent of HH……5 Brother/sister HH……6 Grandchild HH……7 Other relative of HH……8 Non relative-Rwandan…….9 Non relative Not Rwandan……...10 NGO/Charity ……11	4. Sex M..... 1 F..... 2 N/A 3	5. Where does the sender live? Same village/town.....1 Kigali…….....2 Other towns.....3 Other countryside..... 4 Bordering Countries..... 5 Other African countries. 6 Out of Africa…….....7	6. How frequently has your household received these transfers (in kind or Cash) to this person? UNIT DECLARED Day..... 1 Week..... 2 Month..... 3 Year..... 4 Period More than a year…….5		7. Will these payments require reimbursement? Yes..... 1 No..... 2	8. What is the total amount of cash received from this person in the last 12 months? IF NOTHING, PUT "0" ⇒Q10	9. By which means do you receive this cash? Bank……1 Non Bank……2 Both Bank & Non bank……3	10. What is the total value of food products received by this person over the course of the last 12 months? IF NOTHING, PUT "0"	11. What is the value of any other in-kind transfers received by this person from your household over the course of the last 12 months? IF NOTHING, PUT "0"
Name					number of times	Time unit		Amount		Value	Value

SECTION 4: TRANSFERS OF INCOMES, OTHER REVENUES AND EXPENDITURES
PART C: INCOME SUPPORT PROGRAMMES & OTHER REVENUES (excluding all incomes accrued from saving).

1. Over the last 4 weeks and the last 12 months, what is the value of the benefits received by the household in cash or in kind from the following public sources?

PUBLIC INCOME SUPPORT	Code	Income Received	
		Last 4 weeks	Last 12 months
		Amount	Amount
Social Security/Caisse Sociale du Rwanda	01		
VUP Direct Support	02		
Old Age Grant	03		
FARG	04		
Local government education support	05		
Educational scholarships (primary, secondary, university, TVET)	06		
Food relief	07		
Allowance for dismissal or termination of employment	08		
Government donations (Telephones, bicycles, mosquito nets e.t.c)	09		
Other benefits to the household (Specify)	10		

2. Over the last 4 weeks and the past 12 months, what are the incomes received by the household in cash or in kind from the following private sources (not private individuals which should be entered in Section4 B?)

OTHER PRIVATE INCOME SOURCES	Code	Income Received	
		Last 4 weeks	Last 12 months
		Amount	Amount
Pension from the private sector	11		
Private savings fund (private sector)	12		
Insurance dividends	13		
Dowry or inheritance	14		
Gambling – Lottery - Tombola	15		
Sale of land	16		
Sale of fixed / non fixed assets	17		
Contribution of other people taking their meals in the household	18		
Property rent (Fixed or non-fixed assets)	19		
NGO/ Charity contribution to education costs	20		
Private contribution for health treatment	21		

THANK YOU FOR TAKING YOUR TIME TO ANSWER ABOVE QUESTIONS

Codes for section 0Q12, 1F&2A

Metalworking,.....01
Ceramics.....02
Painting.....03
Artisan.....04
Tailoring.....05
Repair work.....06
Processing and selling outputs from crops.....07
Owned a shop.....08
Trading business.....09
Sewing.....10
Basket handcraft.....11
Builder.....12
Tourist guide.....13
knitting.....14
Bread baking.....15
Mechanic.....16
Engine Driver.....17
Shopkeeper.....18
A sales rep.....19
Other(specify).....20

Crops codes(section 3 ,Part c2)

Cereal

Rice.....1
Mais.....2
Sorghum.....3
Wheat.....4

Tuberculous

Cassava.....5
Sweet potatoes.....6
potatoes.....7
Yam.....8

Legume

Soya.....9
Peanut.....10
Beans.....11
Peas.....12
Sunflower.....13

fruit

Banana.....14
Passion.....15
Mango.....16
Guava.....17
Papaya.....18
Avocado.....19
Pineapple.....20
Citrus.....21
Grapefruit.....22
Orange.....23

Cash crops

The.....24
Coffe.....25
pyrethium.....26