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Agriculture and Food Security in Gicumbi District, Northern Province of Rwanda

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Abstract

This study presents a micro-analysis of agriculture and food security in Gicumbi District in Rwanda using secondary data from National Institute of Statistics of Rwanda, Ministry of Agriculture and district's reports. Data were analysed using SPSS and MS Excel. Findings indicated that environmental characteristics favour agricultural activities in this district. Land is highly fragmented with 44% of the population owning plots of less than 0.3ha. Most of the population (78%) own livestock mainly cows. Main crops include Irish potato, beans, banana, and maize whereas the production of wheat and sorghum was seen to have declined. The share of vegetables and fruits is small with 0.4% and 1% respectively. Additionally, the proportion of households using agricultural inputs is still low where 11% used organic manure, 16.5% applied chemical fertilizers, 27% used pesticides and 35% used improved seeds. Further, results indicated that, within a household, most of adult people (82%) take meals twice a day while it is thrice a week for a half of children (50%) and 58.3% of them had to rely on less preferred food in case of inability to get enough food. Dietary needs are not met as food composition is unbalanced and largely composed of food energy, moderately with proteins and poorly with lipids. This resulted in reduced status of health and nutrition: anemic women (17%), anemic under-five children (37%), and stunted and malnourished under-five children (47%). Findings suggest necessary programs on increasing the use of agricultural inputs. It informs intervention aimed at improving on intakes of food like meat, dairy products, legumes, vegetables and fruits in Gicumbi District.

Keywords: Agriculture, food security, households, Gicumbi, Rwanda

I. Introduction

Agriculture in Rwanda continues to significantly contribute to poverty alleviation as Rwanda aspires to become a middle income country by 2020. Smallholder farmers dominate production and land distribution is highly fragmented where the productivity is well below the potential and associated with low income levels in agriculture (Kathiresan, 2012, MINAGRI, 2012; Booth and Golooba-Mutebi, 2012).

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The farming sector occupies 73% of active population out of which 82% are women in rural areas. According to EICV3 report (NISR, 2012), most of households in Rwanda own livestock which include goats (53%), cattle (47%), and 46%). Self-employment in agricultural sector accounts for 60% whereas (63%) obtain more than half of their income from agricultural sector (NISR and GMO, 2013; NISR and MINECOFIN, 2014).

In recent years, there has been much improvement in agriculture sector. For example, farm mechanized operations increased up to 13% in 2013; 83.7% of the farmers used fertilizers; and the total consolidated land area, under crop intensification program, increased by 18-fold between 2008 and 2011. These have resulted in increase, when compared to the base levels in 2007, in total production of maize by about 5 fold; wheat and cassava by about 3 fold; Irish potato, soybean and beans by about 2-fold; and rice by 30% (Kathiresan, 2012).

Rwanda has reduced the proportion of the population below the poverty line from 59% in 2001 to 45% in 2011 due to the above performance in agriculture sector. However, despite government efforts to promote the agriculture sector, high poverty coupled with poor food consumption, which represents an extremely insufficient and unbalanced diet as well as prevalence of chronic malnutrition among children still remain daunting challenge for economic development in Rwanda. The extreme poverty is still high at a rate of 24.1% and highest among households who obtain more than half of their income from farm wage work (NISR, 2012, and MINECOFIN, 2014).

The combination of improved production in crop and animal related products has improved the availability of both food and increased nutrition intake and energy gains. For instance, in Rwanda, an increase in kcal/person per day since 2008 throughout the 2010 agricultural seasons was observed. The estimated energy intake (kcal/ capita per day) was 2,675 and 2,938 for the respective seasons A and B of 2011 (NISR and WFP, 2012).

The food insecure households are typically poor, rural, living in small crowded homes and always providing casual farm labour. According to NISR (2012), 64% of households are poor with borderline food consumption, with 4% having an extremely insufficient and unbalanced diet. At district level, Ngaruroro District is ranked the highest among households with unacceptable consumption with 44% whereas Gakenke, and Nyaruguru Districts are among districts whose households (at least 70%) are poor or have borderline food consumption. The prevalence of chronic malnutrition among children still stands at 43% (NISR and WFP, 2012; NISR, 2012; NISR and MINAGRI, 2014).

There is inadequate empirical research on agriculture and food security in Rwanda and especially at district level. Existing studies focused on macro and regional perspectives and did not deepen their analysis at household and community levels. These include the Comprehensive Food Security and Vulnerability Analysis and Nutrition (NISR and WFP, 2012); study on agriculture situational analysis (IPAR, 2009); EICV 3 Thematic Report Agriculture (NISR, 2012). The aim of this paper is to assess the current trends in agricultural production and food security in Gicumbi District, Northern Province in Rwanda. The remainder of the paper is organized as follows. Section 2 presents data sources and analysis. The context of the study area is presented in Section 3, Section 4 presents conclusion.

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II. Data Sources and Analysis

This paper relies on secondary data from the National Institute of Statistics of Rwanda (NISR), the Ministry of Agriculture (MINAGRI) and district's reports. Data are presented in two ways: (1) data from published reports and (2) raw data from the NISR on Comprehensive Food Security and Vulnerability Analysis and Nutrition in Rwanda. The raw data were collected in 2012 during survey on 864 households from Gicumbi District. The assessment of food security is based on some indicators such as poverty, agricultural productivity, calories per capita, diet diversity and nutrition of children as these indicators are interrelated (FAO, 2008; Headey and Ecker, 2012). Agriculture is involved for its contribution to reducing hunger and food insecurity through increasing the availability of food at prices that poor people can afford and providing improved jobs and incomes that give poor people the means to access food (Wiggins, 2004; Nile Basin Initiative, 2012). Data were analyzed using SPSS and MS Excel.

III. Perspective of Gicumbi District

This section provides key findings of this research in the context of the study area. It presents (i) land and environmental characteristics; (ii) social, economic, and demographic characteristics of the population; (iii) agricultural production features; and (iv) the status of food security and nutrition of the population with emphasis on women and under-five children.

3.1 Land and Environmental characteristics

Gicumbi District is characterized by a relief with steep slopes and a mountainous topography. The area is hilly with lateritic soils and granites in difference to Eastern part which is composed of valleys with altitudes between 1,500 and 1,800 m. These environmental characteristics are meant to favour agricultural activities in Gicumbi District (Table 1).

Land is an important asset in Rwanda. The total cultivated land area in Gicumbi District is 54,000 ha equivalent to 4.4% of the national cultivated land area. Land is highly fragmented. For example, the average arable land per household is 0.49 ha in Gicumbi District while about 44% of its population own plots with less than 0.3 ha per household (NISR, 2012). About 90% of land in this district is protected against erosion. Some of the techniques used to control erosion include terraces, ditches and trees planting (Gicumbi District, 2013). However, the proportion of land irrigated and land affected by land use consolidation is still low (Figure 1).

Table 1: Environmental characteristics in Gicumbi District

	Gicunbi District	Rwanda
Altitude	1,500-1,800 m	900- 4,507 m
Average Temperature	15-16°C	16° - 23°C
Main soil type	Lateritic soils and granites	-
Climate	Tropical	Tropical temperate
Rainfall	1,200-1,500mm	700-2,000 mm

Source: Gicumbi District (2012; 2013), MINERENA (2011)

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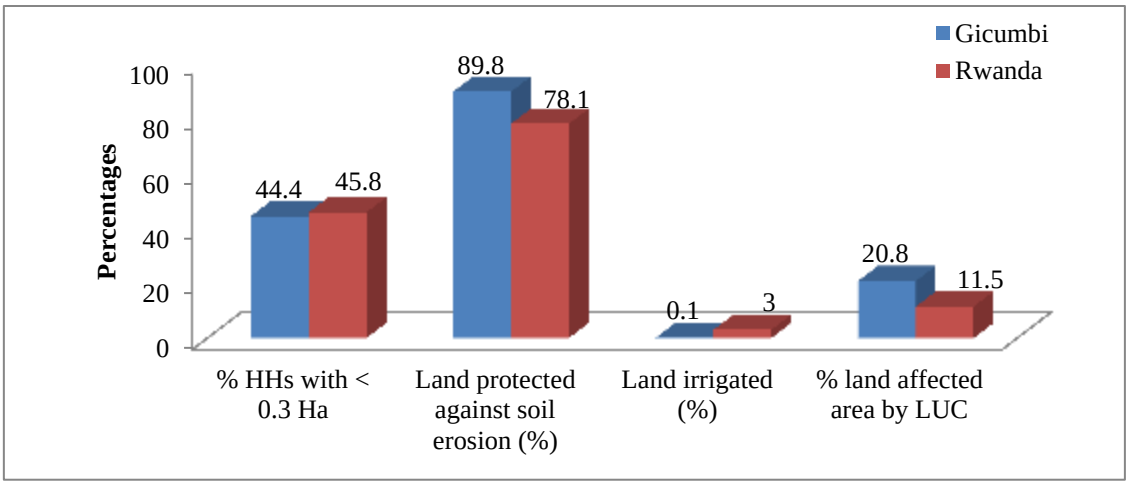


Fig 1. Land characteristics in Gicumbi District
Source: NISR (2012)

3.2 Socio-Economic and Geographical Characteristics

Gicumbi District is one of 5 districts composing the Northern Province of Rwanda. It is located in the East of the province with a surface area over 867 Km^2. It has 397,871 inhabitants of whom 52.5 % are women, with a population density of 480 inh./sqkm above national average (416 inh./sqkm), while its population growth (1.0%) is below the national average of 2.6% (Gicumbi District, 2013). Figure 2 presents Gicumbi District's population by poverty category and indicates that though poverty has declined between 2002 (44.8%) and 2012 (31%), the majority (68.7%) of the population still live in poverty.

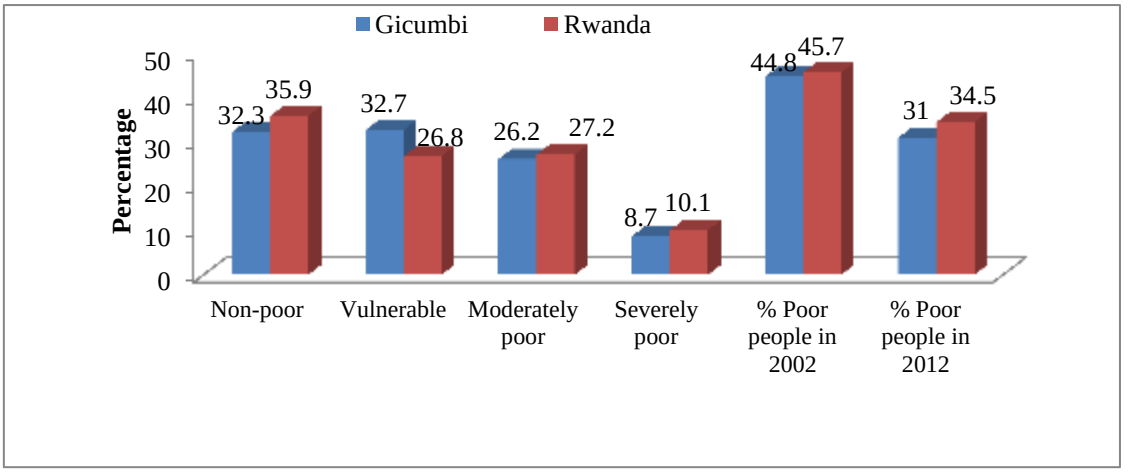


Fig 2. Poverty status in Gicumbi District
Source: NISR and MINECOFIN (2012)

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With regard to employment, the employment rate is 86% (Figure 3a). The majority of the population (67%) earns their income form small scale agriculture farmers compose. They are followed by those earning their income in non-farm sector (16.5%) as indicated in Figure 3b.

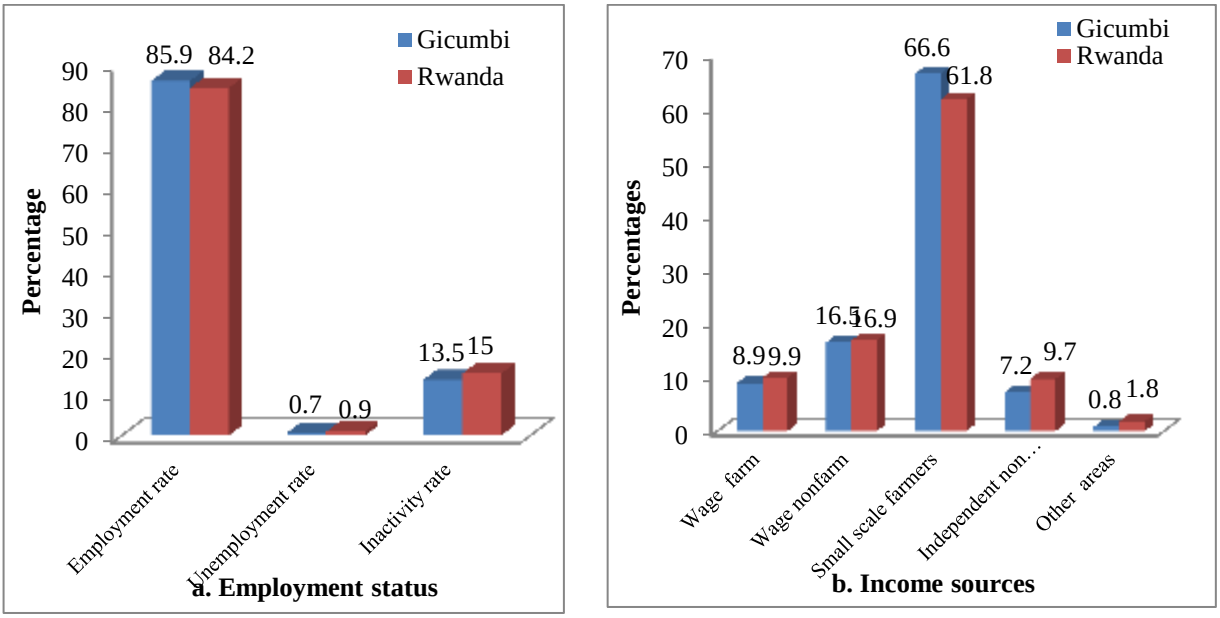


Fig 3. Employment and income sources in Gicumbi District
Source: NISR (2012), Gicumbi District (2013)

3.3 Agricultural production

Like other districts of Rwanda, Gicumbi District's economy depends on agriculture. It occupies about 95% of population and contributes nearly 85% of the total produce in the district. Based on their shares, the main crops found in this district include Irish potato, beans, banana, and maize. Figure 4 indicates crop shares after the 2012 agricultural season A (2012A) and it shows that Irish potatoes and beans are the most important crops for the population. Gicumbi District is known to produce great quantities of wheat and sorghum but their production has considerably declined as their shares remain 4% and 0% respectively. Further, the share of vegetables and fruits is 0.4% and 1% respectively (NISR, 2012; Gicumbi District, 2013).

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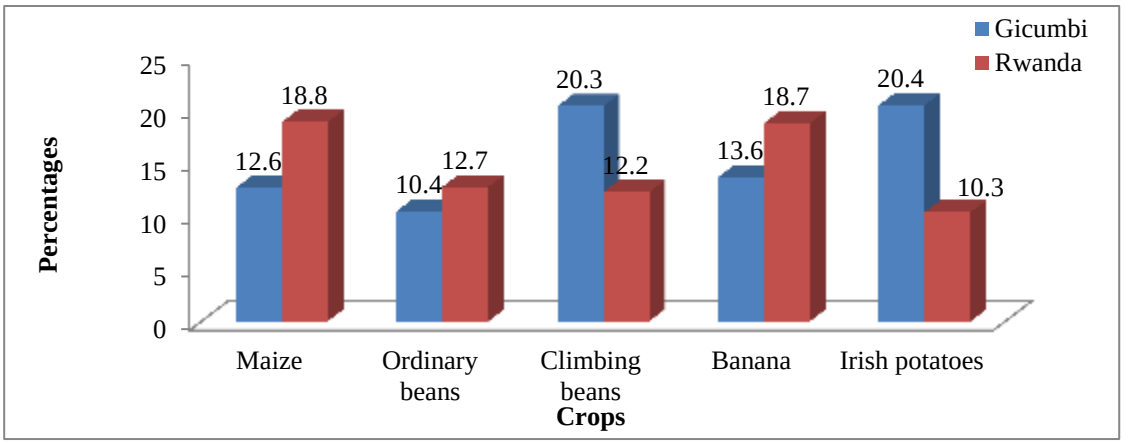


Fig 4. Crop shares (%) in Gicumbi District
Source: MINAGRI (2013)

Regarding crop production, the agriculture sector is dominated by food crops (beans, maize, sorghum, potatoes, wheat, vegetable, maracuja, sweet potatoes, cassava, bananas, soybeans, etc.) as well as cash crops namely, coffee and tea. The most important challenge for the country is to bring agricultural productivity closer to its potential (Booth and Golooba–Mutebi, 2012); the same situation applies in Gicumbi District (Table 2). The average yields for major crops in this district exceed the national averages but are by far less than their expected optimal levels.

Table 2: Crop Yield in Gicumbi District compared to national and potential yields

	Actual Yield (t/ha)		**Potential Yield (t/ha)**
	Gicumbi	**Rwanda**	***(Rwanda only)***
Maize	2.67	2.41	6.5
Ordinary beans	0.81	0.61	2.5
Climbing beans	1.61	1.59	4.6
Banana	13.90	9.78	33.0
Irish Potatoes	14.88	14.12	40.0

Source: MINAGRI (2013); RAB (2014)

Of the total population, 77.8% of the households own farm animals that contribute largely to the dairy production and to the welfare of the population in Gicumbi District. According to NISR (2012), the majority of the households own cattle (65.4%), followed by poultry (47.4%), goats (41.8%), and sheep (29.6%). Regarding the use of agricultural inputs in Gicumbi District, Figure 5 indicates that the proportion of the households that apply different types of fertilizers and use of improved seed is still low. There is a room for improving the application of fertilizers (mainly inorganic fertilizers) and use of improved seeds in this district in particular and in the country in general in order to increase agricultural productivity.

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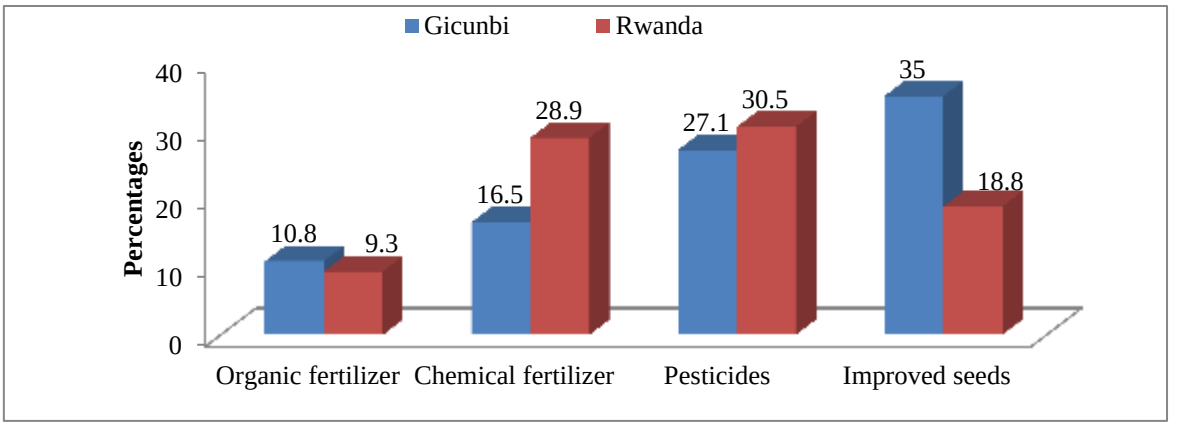


Fig 5. Use of agricultural inputs in Gicumbi District
Source: NISR (2012)

3.4 Food security and nutrition

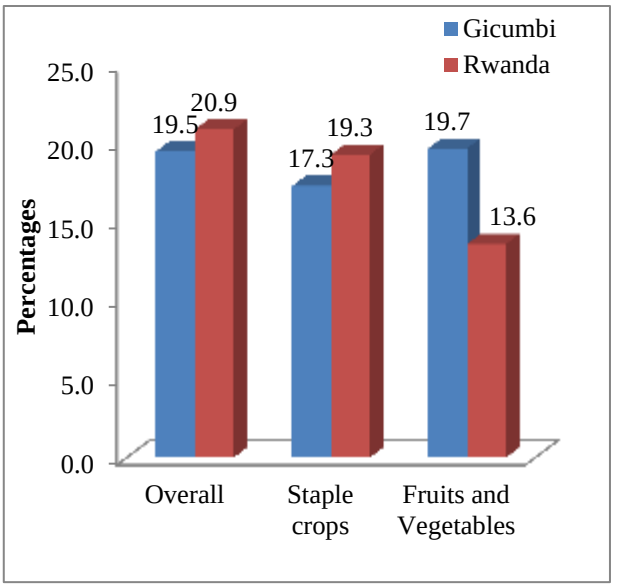
Food security is defined as the state where all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and health life (Clay, 2003; FAO, 2008). It can be measured by different approaches such as prevalence of undernourishment, household consumption and expenditure and dietary diversity (Nanama and Souli, 2007; Jones *et al.*, 2013). The following sections describe access to food, dietary diversity and nutrition status in Gicumbi District.

Food availability and access

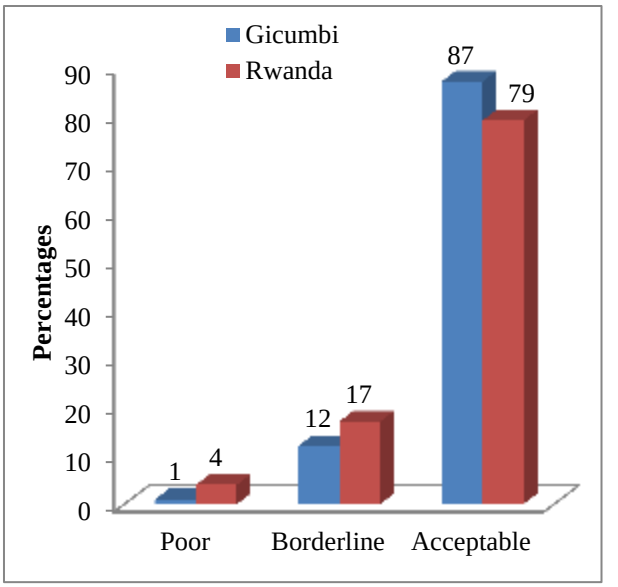
About 35% and 33% of the district's population are respectively poor and vulnerable (Figure 1) and about 44% have small land parcels of size less than 0.3 ha (Figure 3), this situation can reflect a limited physical, social and economic access to sufficient food in Gicumbi District. On the other hand, the diversity in food crop production can be an indication that the district's population's preferences can be met (Annex 1).

Considering the number of household cultivating land for crop production in Gicumbi District, the share of harvest sold (including households selling zero crops) is 19.5% and below the national level (20.9%). Also, the share of harvest sold for fruits and vegetables (19.7%) is above that of staple crops (17.3%). Statistics, in Figure 6a, indicate food insufficiency in this district. Thus, food production is largely for home consumption. As a result, the majority of households are households with acceptable food consumption (NISR and WFP, 2012). Figure 6b indicates that about 13% of the households in Gicumbi District are food insecure compared to 21% at national level.

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a. **Mean shares of harvest sold**



b. **Food consumption categories***

Fig 6. Food availability and accessibity in Gicumbi District
Source: NISR (2012); NISR and WFP (2012)

Food consumption

Results from the survey by NISR and WFP (2012) indicated that among the sample of 864 households from Gicumbi District, the majority of them (82%) declared that adult people take meals twice a day, while a half of them (50%) indicated that children take meals thrice a day (Figure 7). About 90.4% said that this is the normal situation.

Table 3 indicates that the majority of households (58.3%) had to rely on less preferred food in case they were unable to get enough food or money to buy food. On the other hand, at least 43% of the households had to borrow food, reduce the portion size of the meal or reduce the number of daily meals. Further, 35.5% of the households had to reduce food consumption in favor of their children.

* For description of food consumption categories, see Annex 2

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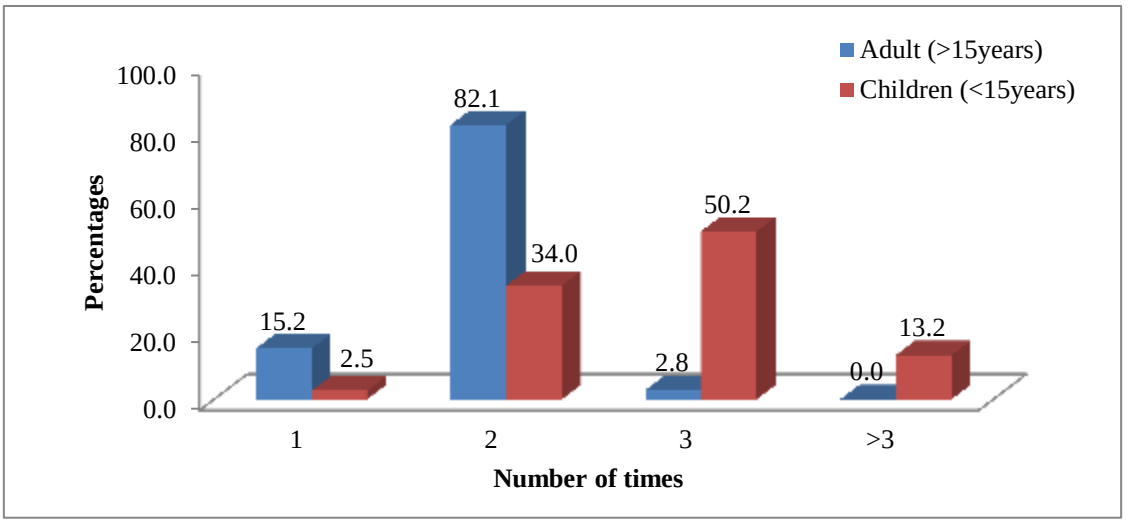


Figure 7: Household daily meal intakes in Gicumbi District
Source: NISR and WFP (2012)

Table 3: Household behaviors in case of food shortage

	Number of days								
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Rely on less preferred and less expensive foods	41.7	6.1	9.0	8.8	8.6	3.0	2.0	20.8	100.0
Borrow food, or rely on help from a friend/relative	56.8	11.6	9.0	6.1	4.9	2.5	0.5	8.6	100.0
Limit portion size at meal times	57.1	5.9	8.6	7.9	5.8	1.9	0.1	12.8	100.0
Restrict consumption by adults in favour of children	64.5	9.3	7.2	6.6	3.4	1.4	0.3	7.4	100.0
Reduce number of daily meals	57.8	8.1	6.7	4.7	5.4	1.7	0.3	15.2	100.0
Other	89.2	0.9	0.1	1.3	0.9	0.1	0.2	7.2	100.0

Source: NISR and WFP (2012)

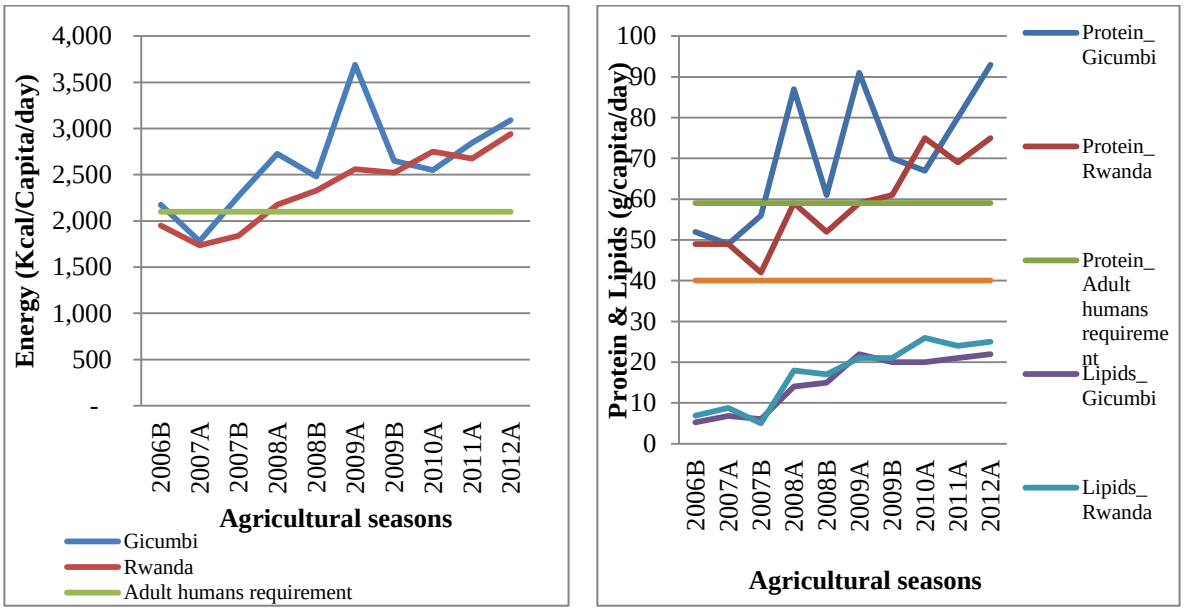
Dietary diversity

According to MINAGRI (2013) an adult person should consume a diet composed of food energy (2,100 kcal/capita/day), proteins (59 g/capita/day) and lipids 40g/capita/day). The production of food energy in Gicumbi District, between 2006 and 2012, is indicated in Figure 8a. It indicated that, generally, the level of food energy production in this district (2,625.8 Kcal/capita/day) exceeds the national production level (2,347.7 Kcal/capita/day) with a statistically significant difference at 5% ($Pr^{\dagger}$=0.0189), and all above the

† Pr means p-value

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standard level of 2,100 Kcal/capita/day. The difference between district's level of food energy production and standard level was statistically significant at 1% (Pr=0.0057).



a. Production of Food Energy (Calories) **b. Production of Protein & Lipids**

Figure 8: Production of food energy, protein and lipids in Gicumbi District (2006-2012)
Source: MINAGRI (2013)

Figure 8b indicates levels of production of proteins and lipids in Gicumbi District between 2006 and 2012. It indicated that, generally, the level of production of proteins in this district (70.6 g/capita/day) exceeds the national and standard production levels (59 g/capita/day at each level) with a statistically significant difference at 1% (Pr=0.0074), and at 5% (Pr=0.0258) respectively. However, the production level of lipids in Gicumbi District (15.2 g/capita/day) was below the national level (17.3 g/capita/day) and by far below the standard level (40 g/capita/day). There was a statistically significant difference between district's lipid production level and national level at 1% (Pr=0.0067), and standard level at 1% (Pr=0.0000).

In view of the above, dietary needs are not met in Gicumbi District. Food composition is not balanced and is largely composed of food energy, moderately composed of proteins and poorly composed of lipids. There is a need to improve on intakes of foods such as meat, dairy products, legumes, vegetables and fruits.

Shocks and Food security

Prior to the survey, 28.6% the total sample households, in Gicumbi District, declared that they experienced unusual situations that affected their households' ability to provide for themselves food in the

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manner they were accustomed to or affected what their households owned. Some of these situations are highlighted in Figure 9 and they include droughts, serious illness or accident of household member, and unusual high level of human diseases.

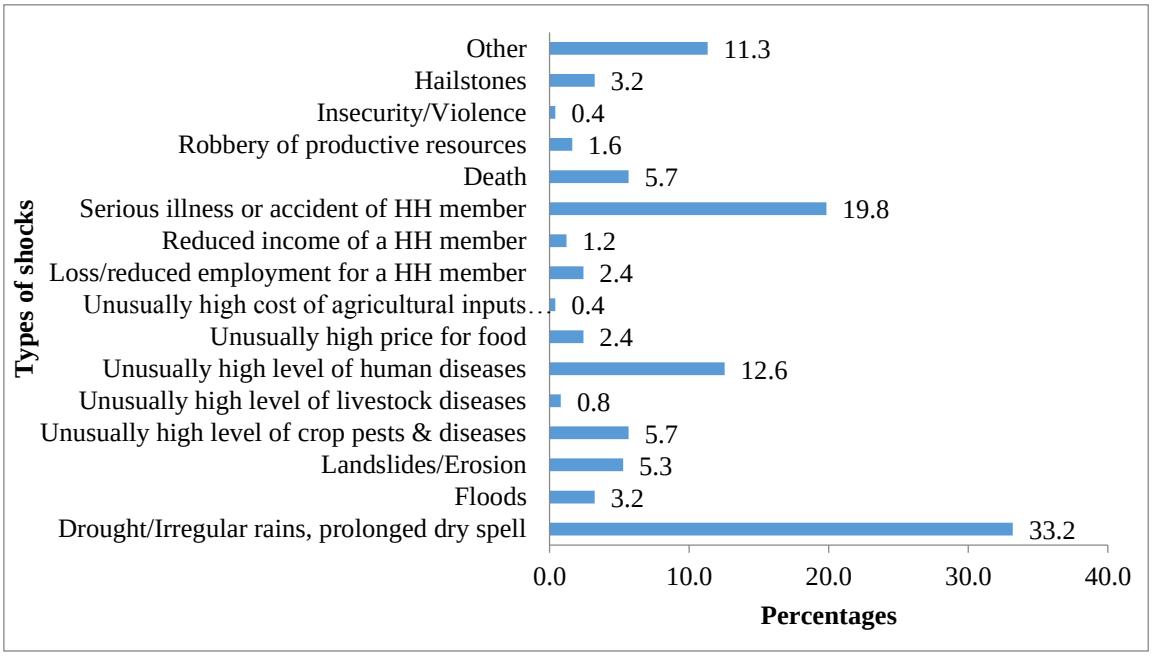


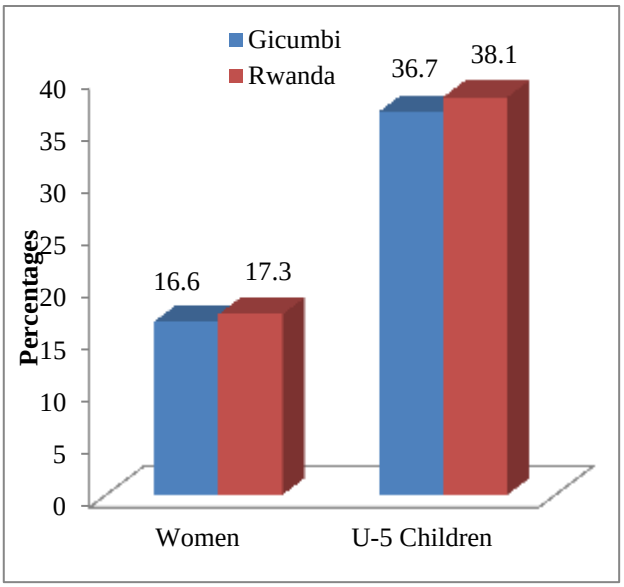
Figure 9: Shocks to household food security in Gicumbi District
Source: NISR and WFP (2012)

Though it is like that, only 3.1% of the sample households indicated that they received food assistance while 6.4% of them received non-food assistance.

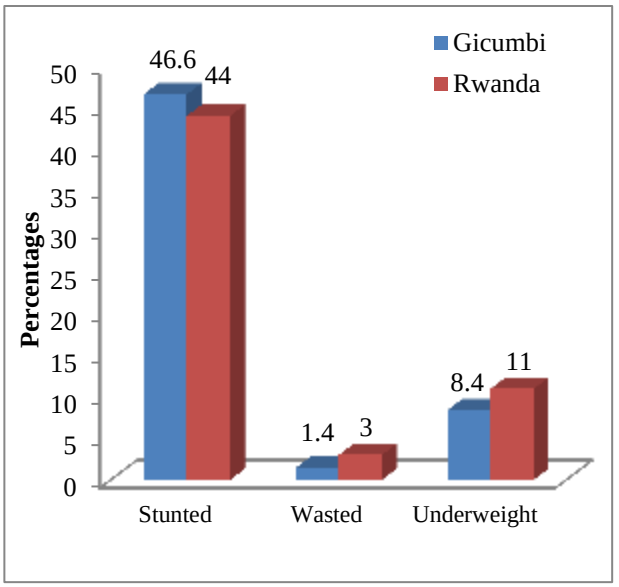
Nutrition

The nutrition status in Gicumbi District is discussed based on nutrition indicators from the 2010 demographic and health survey (NISR, 2010), emphasizing on anemia prevalence among women (aged between 15 and 49 years) and under five (U-5) children (6-59 months) as well as the nutritional status of under five children. Figure 10a indicates that about 17% of women were anemic, while the anemia prevalence rate among U-5 children was 37%. These rates were below national rate for both categories. On the other hand, a high proportion of U-5 children who were stunted and chronically malnourished was observed at 46.6%, followed by underweight children at 8.4% and wasted at 1.4% (Figure 10b). Gicumbi District is one of the 12 districts with more than half (an estimated 52%) of under-fives are stunted. Furthermore, Gicumbi District was the first district that received large livestock in Girinka Program, with 7% of the households, in order to improve nutrition and soil productivity (NISR and WFP, 2012). In this context, there is a need for necessary measures to improve on nutrition in Gicumbi District.

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a. Anemia Prevalence



b. Nutritional status of U-5 children

Figure 10: Nutritional Status in Gicumbi District
Source: NISR (2012)

IV. Conclusion

The aim of this study was to present a micro-analysis of agriculture and food security in Gicumbi District located in Nothern Province of Rwanda. Environmental characteristics favor agricultural activities in this district. Though land is highly fragmented with about 44% of its population having plots with less than 0.3 ha per household, the main crops found in this district include Irish potato, beans, banana, and maize. The production of crops such as wheat and sorghum has considerably declined as their shares remain 4% and 0% respectively. Further, the share of vegetables and fruits is too small (0.4% and 1% respectively). Of the total population, 77.8% of the households own farm animals, mainly cattle, which contribute largely to the daily production and to the welfare of the population in Gicumbi District. The proportion of the households that apply different types of agricultural inputs is still low. There is a room for improving the application of fertilizers (mainly inorganic fertilizers) and use of improved seeds in this district.

The diversity in food crop production indicates that the district's population's preferences can be met. However, dietary needs are not met in Gicumbi District. Food composition is not balanced and is largely composed of food energy, moderately composed of proteins and poorly composed of lipids. There is a need to improve on intakes of foods such as meat, dairy products, legumes, vegetables and fruits.
The unbalanced diet had affected negatively health and nutrition status of the population. About 17% of women were anemic, while the anemia prevalence rate among under-five children was 37%. Further, the proportion of under-five children who were stunted and chronically malnourished was high at 47%, followed by underweight children at 8.4% and wasted children at 1.4%. Findings suggest necessary measures to improve on nutrition in Gicumbi District.

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Annex

Annex 1: Production of various crops for season 2013 A in Gicumbi District

	Harvested area (ha)		Crop share (%)		Crop production (MT)		Crop yield (kg/ha)	
Crops	Gicumbi	Rwanda	Gicumbi	Rwanda	Gicumbi	Rwanda	Gicumb	Rwanda
Sorghum	-	9,664	0%	1%	-	12,835	-	1,328
Maize	4,225	210,191	10%	18%	11,292	505,887	2,672	2,407
Wheat	1,682	9,405	4%	1%	3,303	14,392	1,964	1,530
Rice	-	8,507	0%	1%	-	41,787	-	4,912
Ordinary beans	3,796	105,905	9%	13%	3,091	64,589	814	610
Climbing beans	8,924	119,226	22%	13%	14,345	189,362	1,607	1,588
Peas	1,535	20,762	4%	2%	1,429	16,271	931	784
Groundnuts	45	14,048	0%	2%	24	7,597	539	541
Soybeans	329	20,346	1%	1%	228	11,717	693	576
Banana	5,564	169,180	14%	18%	77,338	1,654,150	13,899	9,777
Irish Potatoes	8,143	90,162	20%	8%	121,160	1,432,045	14,879	14,119
Sweet Potatoes	3,395	52,784	8%	5%	27,196	500,049	8,011	9,474
Taro	177	8,476	0%	1%	1,152	56,027	6,522	6,610
Yam	-	452	0%	0%	-	1,371	6,489	3,030
Cassava	2,397	95,771	6%	9%	32,529	1,306,014	13,571	13,637
Vegetables	201	18,850	0%	0%	2,200	197,149	10,954	10,459
Fruits	434	10,078	1%	0%	7,183	123,789	16,543	12,283

Source: Gicumbi District (2013)

Annex 2: Description of food consumption groups

Food consumption group	Description	FCS cut-off point
Poor	These households are extremely food insecure: they consume starches (cereals, roots and tubers) five days a week, vegetables twice and pulses one day a week. Oil is consumed once a week on average and the rest of the food groups (especially animal protein) are barely consumed.	≤ 21
Borderline	These households are moderately food insecure: they have starches and vegetable based diets with vegetable protein intake around four days a week. Compared to households with poor food consumption, they consume starches, vegetables and oil one more day a week, and pulses three more days a week.	21.5-35
Acceptable	These households are food secure: they have sufficient diversity and potential for adequate nutrient intake through regular consumption of foods with nutrient density and quality. They are the only households to consume some animal proteins (on average one day of meat and one day of milk a week). They also consume starches and pulses every day, and vegetables and oil five days a week.	> 35

Source: NISR and WFP (2012)

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