REPUBLIC OF RWANDA

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES

CROP ASSESSMENT – 2010B SEASON

PRELIMINARY REPORT

31 July 2010

1. Introduction

The Ministry of Agriculture and Animal Resources (MINAGRI), in collaboration with RADA, the National Institute of Statistics of Rwanda (NISR), FAO and WFP organizes, each agricultural season, a crop assessment survey. One of the objectives of this survey is to estimate the food balance and plan for food requirements within the next six months. Also, results from this exercise are used in the estimation of the gross domestic product (GDP) and the contribution of the sector in the national economy.

Data are collected by enumerators recruited by MINAGRI, under the supervision of staff from MINAGRI, RADA, NISR, FAO and WFP. Field activities are organized in two phases. The first phase began with the beginning of season 2010 B with the objective of measuring cultivated areas and expected production for each crop (done in march 2010). The second phase occurred during the third week of may and aimed at collecting the production of the season.

2. Sampling methodology.

The methodology used in the crop assessment exercise is the one used for the National Agriculture Survey (ENA 2008) organized by the National Institute of Statistics of Rwanda (NISR), in collaboration with the Ministry of Agriculture and Animal Resourses. The sample size for the crop assessment survey respresents 25% of the National Agriculture Survey. At the first stage, 210 primary sampling units (PSU) or enumeration areas (EA) have been selected using the simple random sampling methode and then 15 households (12 for interview and 3 households for replacement) per EA have been selected. In fact, the same housholds selected for the ENA have been covered by the crop assessment exercise, which represent 2,520 sample households.

The sampling frame of the ENA is described in Gashaka Jacques « Sampling frame and estimation procedures », Novembre 2007. The summary of the sampling methodology is presented in annex 1.

3. Data collection methodology.

3.1. Area measurement

The shape of cultivated areas is not always of the regular form (triangle, rectangle…), but most of the fields under cultivation have rectangular shape (square or rectangle), others are triangular (triangle). We encounter also fiels that have irregular shape, having 5 sides or abore. In one or other case, the area measurement has been done by triangulation method (splitting the plot in triangles or rectangle). Hence, the area of the plot is the total sum of the surface areas of the triangles (or rectangle, square) created in that plot.

3.2. Density estimation and crop areas.

It's a common in Rwanda to have intercropping practice. In one parcel, it can be planted beans, sweet potato and sorghum. The question that arises is to estimate the area allocated to each of these crops, i.e, which area is allocated to a particular crop planted in this parcel in the absence of intercropping (one single crop in the parcel)?

Dessity of each crop in the parcel are roughly estimated de visu and standardized by dividing density for particular crop by the sum of the densities of all crops (the standardized densities sum up to 100). The area for each crop is equal to the standardized density multiply by the area of the parcel. These densities are used to estimate the percentage of land allocated to each crop by district. These estimates are applied to the total area under cultivation by district to obtain the total land for each crop.

3.3. Estimation of Production.

Under each particular piece of land, the enumerator asks the head of household what quantity of each crop present in that parcel, to be harvested during season 2010B. The expected production includes the quantity harvested before the interview and the quantity to be harvested until december 2010.

He production can be expressed in differeent units of measurement (Kg, bag, basket, bucket, …). It is asked to the enumerator to convert theses units in Kg.

3.4. Data processing and analysis.

Data entry mask has been designed using CsPro (Census and Survey data Processing). Data editing included the checking of range, structure, and a selected set of checks for internal consistency. All errors detected during the editing procedure were corrected. Statistical tables have been prepared using SPSS. These tables were transferred to Excel spreadsheet for further calculations.

All crop and animal products were converted to their equivalent Kcal, proteins and lipids using the appropriate weights of each commodity. The population was estimated at mid seasonal time, August 31st, 2010. Assuming a daily adult requirement of 2100 kcal/capital/day, 59 g of proteins and 40 g of lipids (source ENA/MINAGRI), the total Kcal was shared among the Rwandan population for six months (181 days) calculated at August 31st, 2010.

Losses through cooking and post-harvest handling were estimated at 15% since most of the produce in Rwanda is consumed almost immediately.

Comparisons were made between production in 2009B and 2010B for the different crops and products. The food balance sheet was then computed using the following formula:

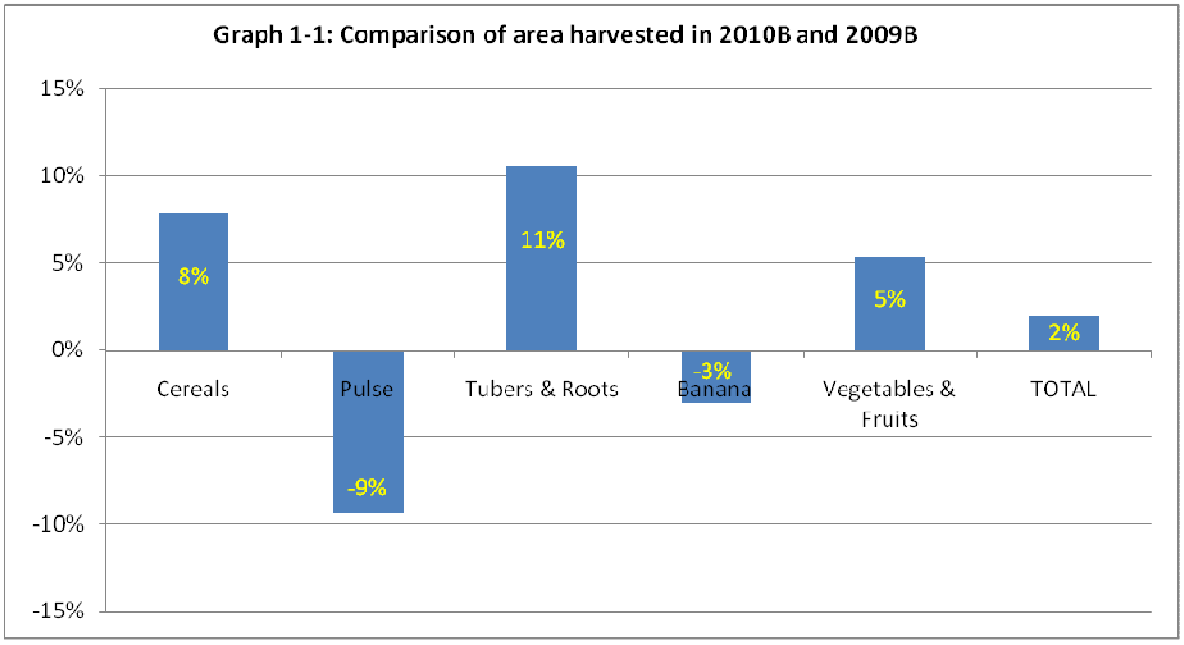
1. Available food for human consumption=1+2+3
2. Amount available in stock=7000 T
3. Production (x 1000 MT)=Energy (Kcal/Capital/day)/equivalent Kcal for maize (i.e. 3225.32 Kcal/Kg) x 1000
4. Losses= -0.2 x crop production
5. Needs= 4
6. Consumption=2100x181daysxestimated population/3225.32/1000000
7. Balance/Deficit=1-5

4. Key Results.

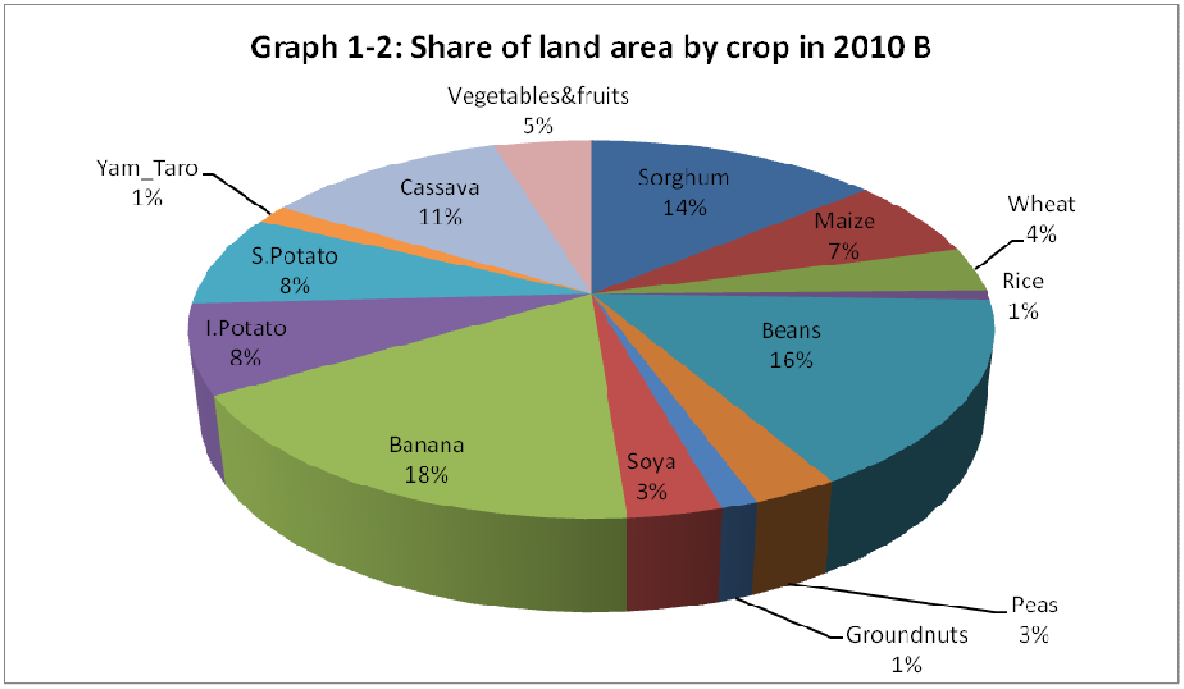
4.1. Area under crop.

The land area measured in the crop assessment exercise consists of the land under cultivation and of which the planted crops will be harvested within the next six months following the end of the season.

Graph 1-1 shows that in comparison with 2009B, harvested area increased by 8% for cerealas, 11% for tubers, 5% for vegatables and fruits. In general, land area went up by 2%; while land area for pulses and banana dimished by 9% and 3% respectively.



As regard the share of land occupied by each crop, the distribution of the share of land in 2010B for each individual crop is as follows: 16% for beans, 1% for rice, 4% for wheat, 7% for maize, 14% for sorghum, 11% for cassava, 8% for sweet potato, 8% for Irish potato and 18% for banana.



4.2. Expected production in 2010C (Maize and vegetables in marshlands).

In its efforts to promote horticulture in Rwanda, the MINAGRI has distributed improved vegetable seeds to be planted in 2010, in marshlands. It's worthnoting that the production of the season C occurs between july and the end of the year and therefore, it must be included in the food availability of the second half of the year (July – December).

During season 2010C, MINAGRI/Rhoda distributed 2,479 Kgs of improved (against 2,030 Kg distributed in 2009C) vegetable seeds to be planted on 2,601 Ha. Vegetable crops for which seeds have been distributed are Cabbage, Eggplant, Carrot, Tomato, Sweet pepper, Amaranthus, Red Onoins, White onions, French beans, Lettuce, Cauliflower, Zucchini, Celery, Chili pepper and beterave (Table 1-1). The expected production of vegetables in 2010C is estimated at 78,598 MT, which is equivqlent to 12 tons of cereal equivalent.

Table 1-1: Vegetable seeds distribution in marchland, season 2010C

	Cabbage	Eggplant	Carrot	Tomato	Sweet pepper	Amaranthus	Red Onoins	White onions	Frenchbeans	Lettuce	Cauliflower	Zucchini	Celery	Chili pepper	beterave
Kigali City															
Kg	12.17	24.90	25.50	6.00	1.38		0.65		154.00					0.43	31.50
Ha	40.56	31.13	12.75	15.00	4.60		6.50		22.00					1.72	12.60
Yield	56	35	16	20	5	3	23	23	8	2	15	15	30	9	40
South															
Kg	52.52	55.50	76.32	85.55	5.55	13.00	0.30	0.70	504.00						15.00
Ha	175.05	69.38	38.17	213.88	18.50	15.25	3.00	7.00	72.00						6.00
Yield	56.00	35.00	16.00	20.00	5.00	3.00	23.00	23.00	8.00	2.00	15.00	15.00	30.0	9.00	40.00
West															
Kg	43.92	84.55	75.73	35.98	7.70	37.00	6.47		212.00			0.02			12.50
Ha	146.40	105.69	37.87	89.95	25.60	43.52	64.70		30.28			0.10			5.00
Yield	56	35	16	20	5	3	23	23	8	2	15	15	30	9	40
North															
Kg	41.65	63.68	57.12	18.06	6.17	6.54	2.00		89.60	0.57	3.45			0.25	0.25
Ha	138.80	79.60	28.57	45.15	20.57	7.69	20.00		12.76	0.57	11.50			1.00	0.10
Yield	56	35	16	20	5	3	23	23	8	2	15	15	30	9	40
East															
Kg	71.46	90.76	67.07	109.96	32.86	49.87			132.30			4.05	15.31		35.63
Ha	238.23	114.36	33.54	274.90	109.52	58.66			18.90			20.25	38.27		14.25
Yield	56	35	16	20	5	3	23	23	8	2	15	15	30	9	40
Total															
Kg	222	319	302	256	54	106	9	1	1,092	1	3	4	15	1	95
Ha	739	400	151	639	179	125	94	7	156	1	12	20	38	3	38
Yield	56	35	16	20	5	3	23	23	8	2	15	15	30	9	40

Source: MINAGRI/Rhoda

The planned area of maize to be planted in 2010 C is estimated at 13,563 Ha. Maize to be planted is a new variety called SC514 which can produce between 5 and 9 tons per hectare (According to MINAGRI/CIP). Expected yield for this variety of maize is at least 5 tons per hectare, meaning that maize production in 2010 C will amount to 67,815 Tons.

In summary, crop production in 2010C is presented in the following table.

Crop	Area planned	Yield (Kg/Ha)	Production in Tons	Production in Kcal (10^6)	Production (in cereal-equivalent) in Tons
Maize	13,563	5,000	67,815	218.7	67,815
Vegetable	2,601	30,218	78,598	41.1	12.7

Quantity in stock is estimated at 7,000 tons of maize, according to CIP.

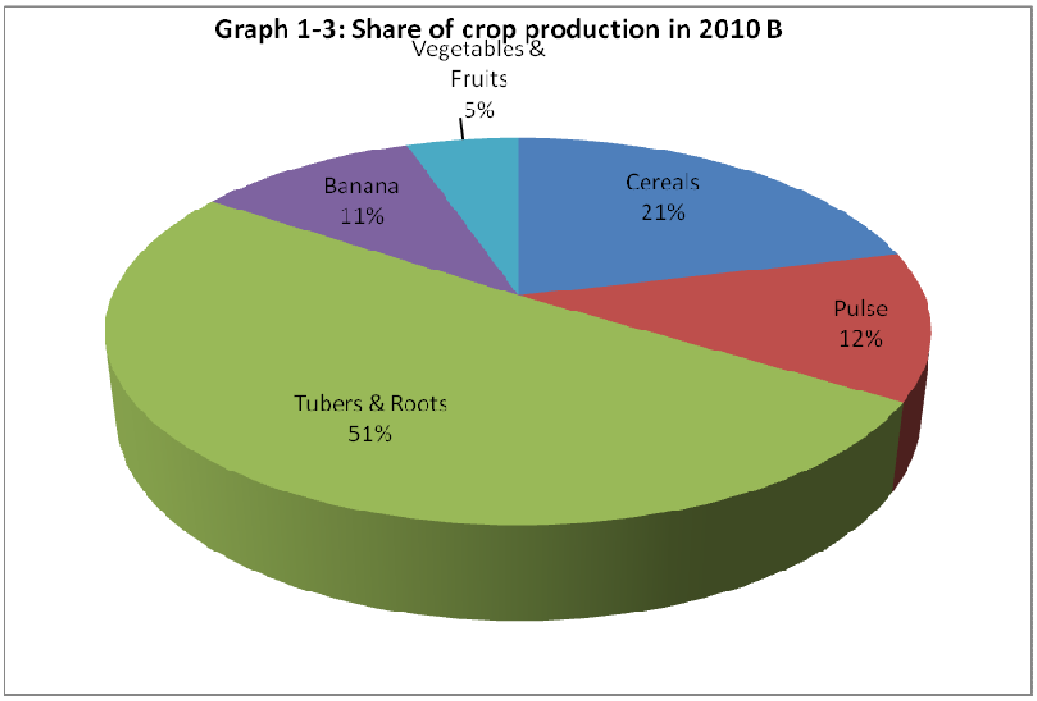
The overall agricultural production of the season 2010B increased by **10%** in terms of cereal equivalent (or in terms of energy) in comparison with the same season in 2009B. Sorghum, beans groundnuts and banana production fell by 3%, 2%, 8% and 2% respectively. Some of the reason why the production of sorghum and beans decresed are outlined below:

- Sowing during 2nd season has been delayed and so planted area reduced as season A corn was still in the fields.
- Abundant rains at the time of flowering damaged beans in drought-prone zones of the Eastern and Southern Province.
- Strong rains, flooding and landslides damaged crops in the Northwestern region.

Most importantly, maize, wheat, irish potato, sweet potato and cassava production recorded an increase of 62%, 32%, 26%, 10% and 9% respectively.

Banana production registered a fall of 2%, in comparison to 2009B. Area harvested for banana decreased by 3% as an impact of banana wilt %, which led to the decline of banana production.

The following graph shows that the share of tuber production is estimated at 51% like in 2009B. The share of cereal production stood at 21% in 2010B, from 6% in 2009B. This shift reflects the increase of maize and wheat production in the framework of CIP. The share of pulses and banana is 12% and 11% respectively.



The main cause of the production of cereals is the increase in area under cultivation, the use of chemical fertilizers and the improvement of the yield, especially for maize and wheat.

From 2009B to 2010 B, maize yield increased by 20%, from 1,551 kg/ha to 1,853 Kg/ha. Yield for sorghum increased by 2%, while yield for beans rose by 15%, due especially to climbing beans, while banana yield increased by 1%. In the category of tubers, sweet potato and cassava benefited from the prevailing rain during season 2010B. Detailed tables are presented in annex II.

Table 1-2: Harvested area, yield and production, 2009B and 2010B.

Crops	Harvested area by Crop (ha)			Yield (Kg/Ha)			Production (MT)		
	2009B	2010B	Change	2009B	2010B	Change	2009B	2010B	Change
Sorghum	132,835	125,321	-6%	1,162	1,189	2%	154,376	149,056	-3%
Maize	45,362	61,319	35%	1,551	1,853	20%	70,344	113,632	62%
Wheat	24,923	33,945	36%	1,371	1,329	-3%	34,164	45,125	32%
Rice	7,868	6,929	-12%	4,159	5,137	24%	32,727	35,593	9%
Beans	167,040	142,760	-15%	843	970	15%	140,853	138,458	-2%
Peas	23,245	25,915	11%	762	728	-4%	17,706	18,875	7%
Groundnuts	12,624	11,150	-12%	745	772	4%	9,404	8,612	-8%
Soya	26,976	28,473	6%	672	799	19%	18,139	22,745	25%
Banana	162,939	157,951	-3%	7,997	8,068	1%	1,302,942	1,274,302	-2%
I.Potato	57,100	68,353	20%	10,537	9,563	-9%	601,644	759,517	26%
S.Potato	65,989	69,962	6%	7,139	7,409	4%	471,103	518,374	10%
Yam_Taro	11,451	14,178	24%	6,620	6,554	-1%	75,809	92,931	23%
Cassava	97,358	103,997	7%	12,345	12,609	2%	1,201,902	1,311,312	9%
Vegetables	19,959	20,784	4%	11,071	11,454	3%	220,964	238,049	8%
Fruits	19,938	21,246	7%	10,942	11,233	3%	218,168	238,665	9%

4.3. Rainfall situation, season 2010B.

During the crop assessment, qualitative questions have been asked on the development of the season.

4.3.1. Perception of the farmers on rainfall, season 2010B.

In all Provinces, at least 75% of farmers declared that rains came on time, for only 11% saying that it was early. In general, 43% of the farmers said that rain has been too much. The distribution of farmers saying that rain has been too much is as follows: South (53%), West (51%), Kigali City (32%), North (31%) and East (27%). In Kigali City,

North and East, 63% to 66% said that rain has been enough. Less that one fifth (16%) of the farmers declared that rain caused much damage. In general, 60% of the farmers said that rain caused no damage (Table 1-3).

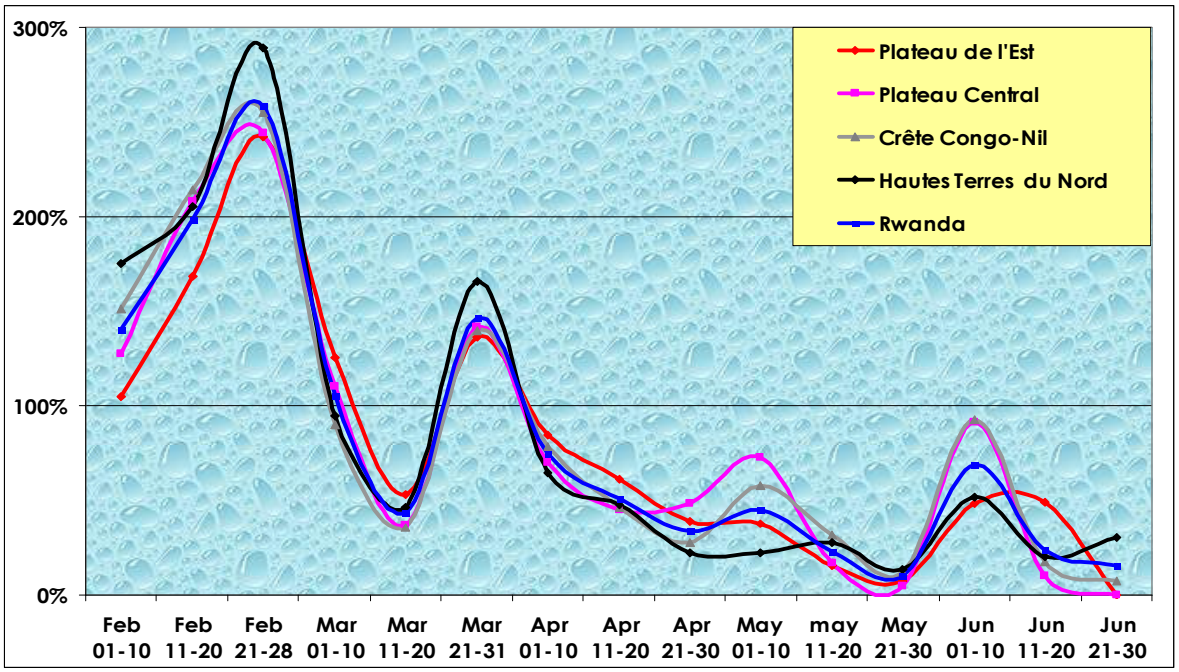
Table 1-3: Distribution of farmers (%) according to rain period, quantity and damages

	Kigali City	South	West	North	East	Rwanda
Rain period						
On time	79	87	85	80	75	82
Early	9	5	13	19	14	11
Late	12	9	2	1	11	7
Total	100	100	100	100	100	100
Quantity of rain						
Too much	32	53	51	31	27	43
Enough	63	44	37	63	66	50
Not enough	5	4	12	5	6	7
Total	100	100	100	100	100	100
Damages						
Much damages	20	18	18	11	9	16
Little damages	47	20	27	20	25	24
No damage	33	62	54	69	66	60
Total	100	100	**100**	100	100	100

4.3.2. Decadal rainfall estimates by natural region.

The monthly bulletin produced by MINAGRI shows that at the start of the season (February), rainfall was above 100% of the long-term average. It went up since then and reaced a pick of almost 300% in the third decad of fabruary and suddenly decreased and in the second decad of March, it was les than 50% of the long term average. During April, there was a consistent downward of rainfall. Though it increased during the first decad of may and june, it was still below the long term average. The long-term average is calculated for the period 1920 – 1980.

Graph 1-4: decadal rainfall trend by natural region, February - June 2010.



Source: MINAGRI monthy bulletin

4.3.3. Insects and diseases.

Nearly 90% of the farmers said that no insects affected crops. The distribution of farmers saying that no insects affected crops is as follows: Kigali City (100%), South (88%), West (89%), North (92%), East (98%). Also, 88% of the farmers declared that no diseases affected crop. The distribution, by provinces, of farmers reporting that no diseases affected crop is as follows: Kigali City (100%), South (87%), West (85%), North (87%) and East (95%)

Table 1-4: Distribution of famers (%) according to the presence of insects and diseases, by Province.

	Kigali City	South	West	North	East	Rwanda
Insects						
Yes	0	12	11	8	2	9
No	100	88	89	92	98	91
Total	100	100	100	100	100	100
Diseases						
Yes	0	13	15	13	5	12
No	100	87	85	87	95	88
Total	100	100	100	100	100	100

4.3.4. Use of fertilizers and improved seeds.

In general, 3% of the farmers used chemical fertilizers. No farmer used chemical fertilizer in Kigali City. In other provinces, the number of farmers that used chemical fertilizer is distributed as follows: South (2%), West (5%), North (7%) and East (1%). In Rwanda as a whole, 62% of the farmers declared that they used organic fertilizers.

The fermers saying that they used improved seeds erepresent 4% in Rwanda. The distribution of farmers declaring that they have used improved seeds is as follows: Kigali City (1%), South (6%), West (5%), North (4%) and East (2%).

Table 1-5: Distribution of famers (%) according to the use of fertilizers and improved seeds, by Province.

	Kigali City	South	West	North	East	Rwanda
Chemical fertilizers						
Yes	0	2	5	7	1	3
No	100	98	95	93	99	97
Total	100	100	100	100	100	100
Organic fertilizers						
Yes	86	69	60	80	29	62
No	14	31	40	20	71	38
Total	100	100	100	100	100	100
	Kigali City	South	West	North	East	Rwanda
Improved seeds						
Yes	1	6	5	4	2	4
No	99	94	95	96	98	96
Total	100	100	100	100	100	100

4.3.5. Crop production in comparison to season 2009B.

Finally, it was aked to farmers to compare the production of 2010 season A with that of season 2009 A. The table below shows that 71% of the respondents reported that the production of 2010 A was normal to good, in comparison to season 2009 A. In Eastern Province, 57% of the farmers declared crop production was good, while in other provinces this proportion ranges from 24% to 31%.

Table 1-6: Crop production in comparision to 2009B, by Province.

	Kigali City	South	West	North	East	Rwanda
Comparison with 2009B						
Good	24	24	26	31	57	32
Normal	47	39	40	51	26	39
Bad	29	37	35	18	16	29
Total	100	100	100	100	100	100

4.4. Season 2010B development by selected crops.

Beans: in Rusizi, Nyamasheke, Kayonza and Nyagatare Districts, 55% to 64% of the respondents said that rain came on time for beans. In other Districts, at least 80% of farmers declared that rain came on time for this crop. Rain has been too much in Ngoma, Musanze, Gicumbi, Nyabihu, Ngororero, Karongi, Nyamagabe, Huye, Nyaruguru and Nyanza. In Gatsibo District, all the farmers said that rain was not enough, while in Nyamasheke and Rusizi, 33% to 46% of the farmers said that rain was not enough. In Nyaruguru and Huye, 73% to 79% of farmers said that rain caused much damages. This proportion is 54% in Nyamasheke, 69% in Gicumbi, 48% in Ngoma and 49% in Nyagatare.

Climbing beans: In the majority of the Districts, farmers said that rain came on time for climbing beans. It was too much in Nyanza, Gisagara, Huye, Nyamagabe, Muhanga, Karongi, Nyabihu, Rutsiro, Musanze, and Ngoma. It caused damage in most of the Southern Province, Rutsiro, Nyamasheke, Musanze and Gicumbi

Sorghum: In Southern and Eastern Provinces, rain came on time for this crop. In Rusizi District, farmers declared that rain came early. Rain was too much in South (except in Muhanga where it was not enough), in Kayonza and Nyagatare. It was not enough in Rusizi and Ngoma. Much damage has been declared in Nyaruguru, Muhanga, and Nyagatare.

Maize: In general, rain came on time for maize. It was too much in Nyanza, Huye, Nyamagabe, Nyabihu, Rutsiro, Musanze and Ngoma. It was not enough in Rusizi and to some extend, in Ruhango and Gakenke. It caused much damage in Gicumbi, Rusizi, Nyabihu and Muhanga.

Wheat: In general, rain came on time for this crop, except in Rusizi where it was early. It was too much in Nyaruguru, Huye, Ngororero, Nyabihu and Ngoma. In Nyaruguru, Karongi and Nyabihu District, 44% and 25% of the farmers said that it has cauded too much damage for this crop.

Cassava:For almost all the Districts, rain came on time for this crop, except in Nyabihu and Nyagatare where 65% and 33% respectively said that it came early. For this particular crop, rain too much in Nyanza, Gisagara, Huye, Nyamagabe, Muhanga, Ngororero, Nyabihu, Rutsiro, Nyamasheke and Musanze. In the area where it caused much damaga, the proportion of farmers is distributed as follows: Nyanza (16%), Nyaruguru (26%), Nyabihu (32%) and Musanze (40%).

Sweet potato: in general, rain came on time, except in Nyagatare. It was too much inNyanza, Huye, Karongi, Nyabihy, Rutsiro, Nyamasheke, Rulindo, Musanze and Nyagatare. Elsewhere, it was enough. The proportion of farmers declaring that rain

caused too much damage in some districts is distributed as follows: Nyagatare (40%), Gicumbi (23%) and Nyaruguru (23%). In other districts, it caused little damage.

Irish potato: in almost all the districts, with the exception of Nyagatare and Rutsiro, rain came on time for this crop. It was too much in Nyanza, Gisagara, Muhanga, a great part of Western and Northern Provinces, in Kirehe, Ngoma and Nyagatare. In Karongi, Gakenke and Ngoma, the proportion of farmers saying that rain was not enough is 20% and 33% respectively. The rains caused much damage in Northern Province and to some extend, in the Western Province.

4.5. Food Security

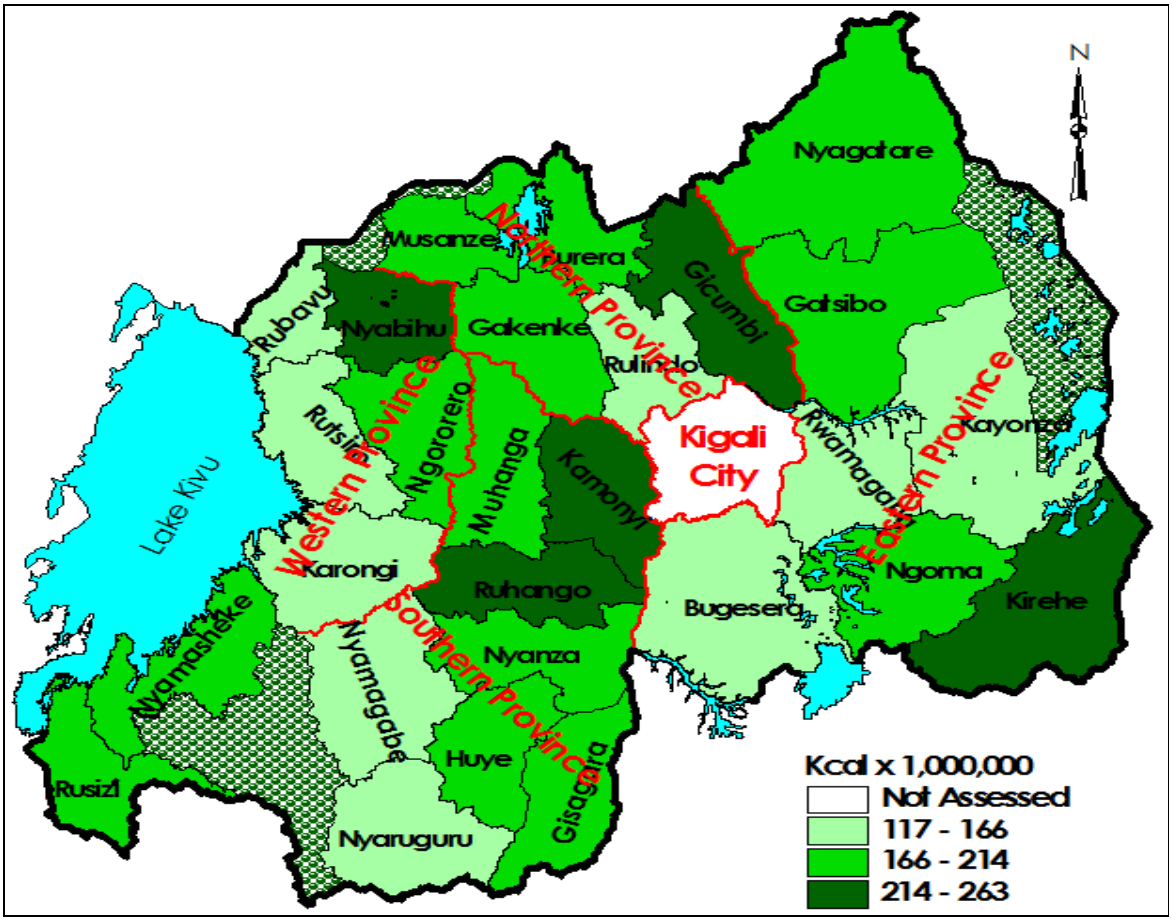
The production of the 2010B season led to the improvement of national food security. Carolific needs are calculated for the production of the season only. In all provinces, carolific needs are covered at a rate greater than 100%. In the Southern Province, the lowest carolific coverage is encountered in Nyaruguru District, with a maximum of 183% in Ruhango District. In the Western Province, carolific coverage ranges at 108% (Rutsiro) and 165% (Nyabihu). In the North, the minimum carolific coverage is estimated at 104% (Rulindo) and the maximum at 150% (Gicumbi). In Eastern Province, carolific needs are covered at a minimum rate of 126% (Rwamagana and Bugesera) and 233%(Kirehe) (Table 1-7).

Table 1-7: Estimated energy availability in percent of the requirement (2100 kcal/person/day) from local food production in Rwanda by Province, Season 2010B

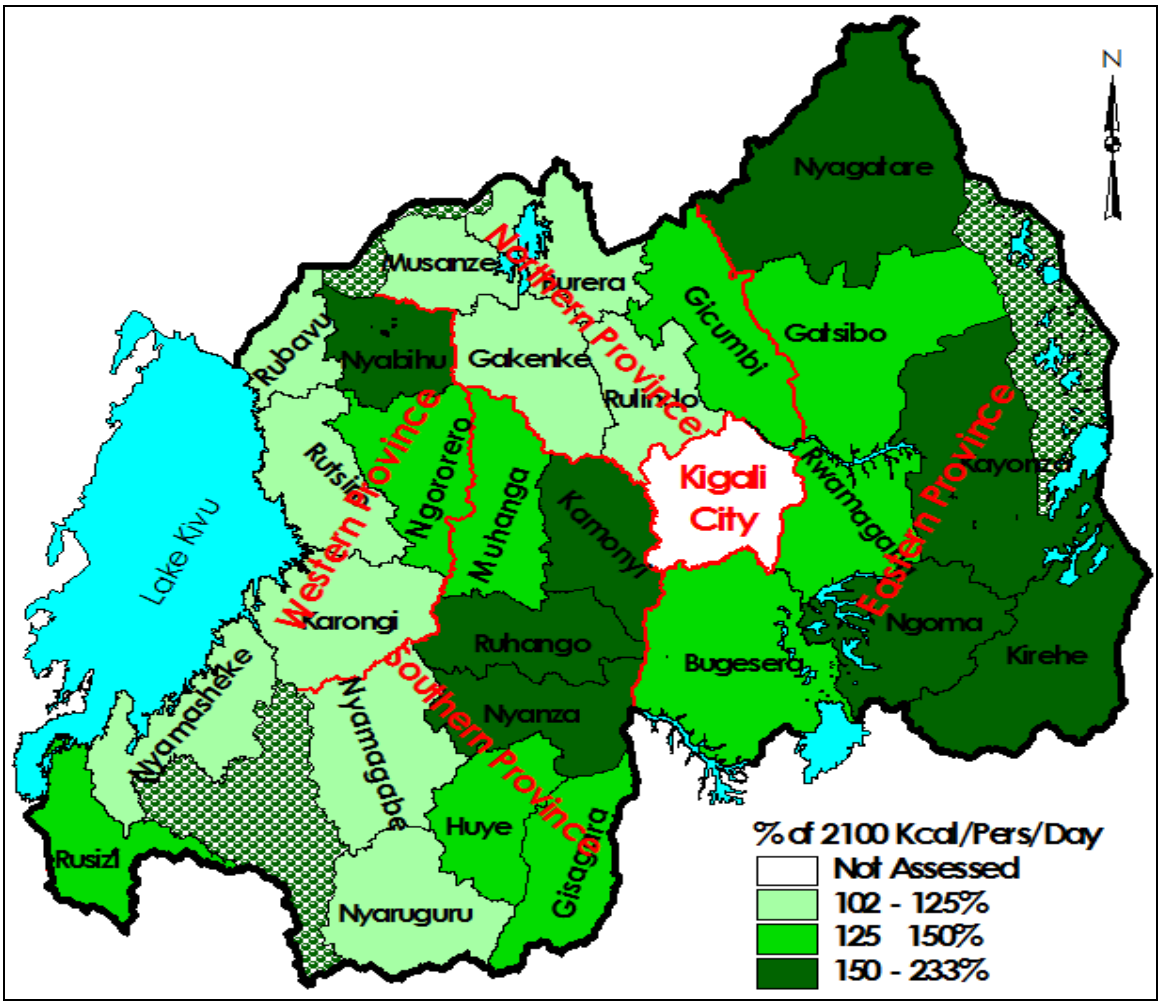
Province	Min	Max
South	103	183
West	108	165
North	104	150
East	126	233

The total and per capita production of energy is shown in figures 1-5 and 1-6. In terms of kcal production (both from crop and anima), only five districts, namely Kamonyi and Ruhango (South), Nyabihu (West) Gicumbi (North) and Kirehe (East) produced more Kcal than other districts (figure 1-5). In terms of energy coverage per personne per day, these districts, except Gicumbi, have also the highest coverage, while Nyanza moves from light green (graph 1-5) to dark green (graph 1-6). The fact is that the population of the districts is taken in consideration in the second map.

Graph 1-5: Total Crop and animal production in energy (Kcal) by district, season 2010B.



Graph 1-6: Energy coverage per person day in percent of recommended 2,100 Kcal/per/day, season 2010B.



Total roduction in Kcal increased by 12%, in comparison with 2009B. Protein and lipid production increased by 15.2% and 12.5% respectively. Kcal from animal production

decreased by 0.4% while protein and lipid production from livestoch inceased by 3.8% and 0.7% respectively.

Table 1-8: Production in Kcal, proteins and lipids

	2008B	2009B	2010B	%age change	
				2009B/08B	2010B/09B
Kcal (1 000 000 000)	3,897.10	4,338.3	4,993	11%	12.8%
Proteins (1 000 T.)	81	92.2	105	14%	15.2%
Lipids (1 000 T.)	12.6	16.1	20	27%	12.5%
Kcal from animals (1 000 000 000)	235	271.4	260	16%	-0.4%
Proteins from animals (1 000 T.)	12.8	14.9	15	17%	3.8%
Lipids from animals(1 000 T.)	17.3	19.9	19	15%	0.7%
Energie (Kcal/Capital/day)	2,327.30	2,523	2,746	8%	3.8%
Protein (g/capital/day)	52	61	64	18%	9.1%
Lipids (g/capita/day)	16.7	21	21	25%	1.5%

N.B. : Adult humans require 2100 kcal/capital/day, 59 g of protéins and 40 g of lipids (source ENA/MINAGRI)

The national food balance sheet shows a surplus of 158,000 MT of cereal equivalent. The balance sheet includes estimated production of maize and vegetables for season 2010 C. When season C is excluded, the balance sheet shows a surplus of 89,000 MT of cereal equivalent. Data on Imports and food aid are not available and hence not included in this balance (Table 1-9).

Table 1-9: Rwanda Food Balance for 6 months from July to December 2010

	(*1000 MT)
I. AVAILABILITY =1+ 2+3+4+5	**1403**
1. Stock	7
2. Crop production 2010B	1,467
3. Expected crop production, 2010 C	81
4. Animal production	81
5. Losses (15%)	(232)
II. NEEDS = 6	**1,246**
6. Consumption	1,246
III. Balance/Deficit = I-II	**158**

Annex I: Development of season 2010 B for selected crops by District

	Nyarugenge	Gasabo	Kicukiro	Nyanza	Gisagara	Nyaruguru	Huye	Nyamagabe	Ruhango	Muhanga	Kamonyi	Karongi	Ngororero	Nyabihu	Rubavu	Rutsiro	Rusizi	Nyamasheke	Rulindo	Gakenke	Musanze	Burera	Gicumbi	Bugesera	Rwamagana	Gatsibo	Kayonza	Kirehe	Ngoma	Nyagatare
Beans, rain period																														
On time	100	100	0	80	100	100	100	100	97	91	87	100	100	100	100	100	63	64	89	90	100	100	78	98	100	100	62	100	85	55
Early	0	0	0	7	0	0	0	0	3	0	4	0	0	0	0	0	37	28	11	10	0	0	22	2	0	0	1	0	0	45
Late	0	0	100	13	0	0	0	0	0	9	8	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	37	0	15	0
Beans, quantity of rain																														
Too much	100	98	0	82	60	80	98	100	63	66	30	85	82	100	50	25	9	52	36	10	100	38	72	10	0	0	47	50	84	58
Enough	0	2	55	15	40	20	2	0	11	28	63	15	18	0	50	75	46	15	53	90	0	63	28	90	100	0	51	43	13	41
Not enough	0	0	45	4	0	0	0	0	26	6	7	0	0	0	0	0	46	33	11	0	0	0	0	0	0	100	3	7	3	1
Beans, damages																														
Much damage	75	78	0	29	31	73	79	36	57	44	24	27	18	0	0	25	27	54	19	0	0	13	69	5	0	0	3	2	48	49
Little damage	25	20	100	53	30	0	18	64	34	31	7	50	64	100	80	0	27	8	19	10	100	13	23	11	0	100	25	54	46	43
No damage	0	2	0	18	40	27	4	0	9	25	69	23	18	0	20	75	47	38	61	90	0	75	8	84	100	0	73	43	7	9
Climbing beans, quantity of rain																														
On time	100	100	0	79	100	91	100	100	90	96	97	97	96	70	100	100	70	75	96	94	57	98	84	100	0	0	0	100	81	50
Early	0	0	0	0	0	6	0	0	7	0	0	0	4	21	0	0	30	19	2	6	24	2	16	0	0	0	0	0	4	50
Late	0	0	0	21	0	2	0	0	3	4	3	3	0	9	0	0	0	6	2	0	19	0	0	0	0	0	0	0	15	0
Climbing beans, quantity of rain																														
Too much	0	40	0	79	68	47	98	95	48	65	50	69	50	82	41	78	10	57	46	21	79	45	36	13	0	0	0	47	78	50
Enough	100	60	0	9	33	53	2	5	41	25	50	22	50	15	59	22	90	16	44	74	21	55	64	88	0	0	0	37	7	50
Not enough	0	0	0	12	0	0	0	0	10	10	0	8	0	3	0	0	0	26	10	5	0	0	0	0	0	0	0	16	15	0
Climbing beans, damages																														
Much damage	100	20	0	24	38	36	65	44	24	38	23	24	7	15	6	46	5	41	8	10	38	2	33	0	0	0	0	5	19	0
Little damage	0	30	0	55	20	4	23	52	34	27	13	46	46	67	44	30	10	24	36	16	26	38	33	25	0	0	0	58	78	100
No damage	0	50	0	21	43	60	13	3	41	35	63	31	46	18	50	24	85	35	56	73	36	60	33	75	0	0	0	37	4	0
Sorghum, rain period																														
On time	100	100	0	92	100	96	100	100	100	100	97	92	0	0	0	0	25	0	84	0	0	98	100	99	100	100	73	98	100	53
Early	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	75	0	16	0	0	0	0	1	0	0	0	0	0	45

Late	0	0	100	4	0	4	0	0	0	0	3	8	0	0	0	0	0	0	0	0	0	2	0	0	0	0	27	2	0	3
Sorghum, quantity of rain																														
Too much	0	11	0	54	37	61	92	71	18	0	12	63	0	0	0	0	0	0	34	0	0	25	14	4	0	0	33	24	8	38
Enough	100	89	0	42	62	39	8	29	68	0	85	32	0	0	0	0	25	0	48	0	0	73	86	96	100	100	66	73	8	55
Not enough	0	0	100	4	1	0	0	0	15	100	3	5	0	0	0	0	75	0	18	0	0	2	0	0	0	0	1	4	83	8
Sorghum, damages																														
Much damage	0	0	0	8	4	52	2	7	3	100	3	18	0	0	0	0	25	0	8	0	0	0	0	0	0	0	4	0	4	56
Little damage	0	60	100	24	3	0	8	59	18	0	9	18	0	0	0	0	50	0	13	0	0	8	0	5	0	8	10	9	79	28
No damage	100	40	0	68	93	48	90	34	79	0	88	63	0	0	0	0	25	0	79	0	0	92	100	95	100	92	86	91	17	17
Maize, rain period																														
On time	100	100	0	91	100	100	100	100	100	100	93	92	96	56	100	100	50	76	97	84	55	100	85	98	100	100	79	100	71	74
Early	0	0	0	9	0	0	0	0	0	0	0	8	4	38	0	0	50	16	3	11	29	0	12	2	0	0	0	0	0	23
Late	0	0	100	0	0	0	0	0	0	0	7	0	0	7	0	0	0	8	0	5	16	0	4	0	0	0	21	0	29	4
Maize, quantity of rain																														
Too much	0	12	0	55	43	38	86	76	9	17	20	58	54	92	15	68	8	50	24	0	68	9	8	2	0	0	26	0	79	21
Enough	100	88	55	36	58	62	14	21	45	67	77	42	46	5	85	32	33	32	33	74	32	79	81	98	100	0	65	100	7	68
Not enough	0	0	45	9	0	0	0	3	45	17	3	0	0	3	0	0	60	18	42	26	0	12	12	0	0	100	9	0	14	11
Maize, damages																														
Much damage	0	0	0	9	5	15	17	3	9	33	18	0	0	30	0	19	33	3	15	5	13	0	83	0	0	0	5	0	14	6
Little damage	0	65	91	9	3	23	0	52	55	17	5	8	11	59	23	24	40	21	30	21	32	15	0	3	13	100	14	0	79	72
No damage	100	35	9	82	93	62	83	45	36	50	77	92	89	11	77	57	28	76	55	74	55	85	17	97	88	0	82	100	7	22
Wheat, rain period																														
On time	0	100	0	94	100	100	100	100	100	0	0	100	100	100	0	0	38	70	100	100	0	100	0	100	100	0	0	100	100	0
Early	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	23	0	0	0	0	0	0	0	0	0	0	0	0
Late	0	0	100	6	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Wheat, quantity of rain																														
Too much	0	0	0	50	35	75	100	54	14	0	0	50	100	75	0	0	0	25	0	0	0	25	0	3	0	0	0	0	67	0
Enough	0	100	100	50	65	25	0	46	59	0	0	50	0	25	0	0	92	27	100	100	0	63	0	97	100	0	0	100	33	0
Not enough	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	8	48	0	0	0	13	0	0	0	0	0	0	0	0
Wheat, damages																														
Much damage	0	0	0	0	0	44	0	8	2	0	0	25	0	25	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Little damage	0	20	100	6	12	0	0	23	12	0	0	0	33	38	0	0	8	11	0	0	0	0	0	3	0	0	0	0	0	0
No damage	0	80	0	94	88	56	100	69	86	0	0	75	67	38	0	0	92	86	100	100	0	100	0	97	100	0	0	100	100	0
Cassava, rain period																														
On time	100	100	0	92	100	99	100	100	100	100	98	98	100	29	100	100	88	78	100	97	80	0	100	95	100	0	100	100	92	67

Early	0	0	0	3	0	1	0	0	0	0	1	0	0	65	0	0	13	15	0	3	20	0	0	2	0	0	0	0	8	33
Late	0	0	100	5	0	0	0	0	0	0	1	2	0	6	0	0	0	8	0	0	0	0	0	2	0	0	0	0	0	0
Cassava, quantity of rain																														
Too much	0	29	0	59	50	32	90	72	29	48	4	43	78	91	0	71	0	49	9	0	100	0	20	0	0	0	0	5	23	33
Enough	100	71	50	38	50	68	10	27	66	52	95	55	22	6	100	29	97	23	91	100	0	0	80	100	100	0	100	95	77	67
Not enough	0	0	50	3	0	0	0	1	5	0	1	2	0	3	0	0	3	29	0	0	0	0	0	0	0	0	0	0	0	0
Cassava, damages																														
Much damage	0	13	0	16	6	26	11	4	11	0	0	4	0	32	0	0	0	3	7	0	40	0	0	0	0	0	0	0	0	0
Little damage	0	60	83	8	5	4	14	52	13	0	5	4	44	32	0	41	6	14	7	3	60	0	0	2	0	0	0	0	15	100
No damage	100	27	17	76	89	69	75	44	76	100	95	91	56	35	100	59	94	84	86	97	0	0	100	98	100	0	100	100	85	0
Sweet potatoes, rain period																														
On time	100	100	0	100	100	100	100	100	100	100	97	96	100	84	100	100	74	78	100	100	86	100	98	82	0	100	100	100	67	29
Early	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	26	22	0	0	0	0	2	18	0	0	0	0	0	71
Late	0	0	100	0	0	0	0	0	0	0	3	4	0	8	0	0	0	0	0	0	14	0	0	0	0	0	0	0	33	0
Sweet potatoes, quantity of rain																														
Too much	0	5	0	40	23	35	100	61	25	38	11	53	30	71	0	45	0	59	80	1	43	30	18	0	0	0	0	6	33	57
Enough	100	95	100	60	77	65	0	39	75	62	88	45	70	26	100	55	100	20	20	99	57	70	82	100	0	100	100	94	67	43
Not enough	0	0	0	0	0	0	0	0	0	0	2	2	0	3	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0
Sweet potatoes, damages																														
Much damage	0	0	0	0	0	24	4	5	0	3	0	2	0	3	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	40
Little damage	0	52	50	20	2	0	4	43	0	0	3	2	27	61	6	26	0	17	0	7	0	3	23	0	0	0	0	6	0	60
No damage	100	48	50	80	98	76	93	52	100	97	97	96	73	37	94	74	100	83	100	93	100	97	54	100	0	100	100	94	100	0
Irish potatoes, rain period																														
On time	100	100	0	100	100	0	100	100	100	100	84	90	100	78	94	37	0	100	100	67	79	100	55	100	0	100	100	100	100	0
Early	0	0	0	0	0	0	0	0	0	0	0	0	0	22	6	63	0	0	0	33	21	0	45	0	0	0	0	0	0	100
Late	0	0	0	0	0	0	0	0	0	0	16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Irish potatoes, quantity of rain																														
Too much	0	100	0	100	50	0	100	0	0	75	16	70	60	98	72	74	0	25	67	33	100	62	64	15	0	0	0	50	67	100
Enough	100	0	0	0	50	0	0	100	100	25	84	10	40	2	22	26	0	75	33	33	0	36	27	85	0	100	100	50	0	0
Not enough	0	0	0	0	0	0	0	0	0	0	0	20	0	0	6	0	0	0	0	33	0	2	9	0	0	0	0	0	33	0
Irish potatoes, damages																														
Much damage	0	100	0	33	8	0	0	0	0	25	16	40	53	43	22	26	0	0	67	33	74	0	88	0	0	0	0	0	33	50
Little damage	0	0	0	33	25	0	0	50	0	50	5	20	13	51	56	47	0	0	0	33	26	55	13	15	0	0	4	25	67	50
No damage	100	0	0	33	67	0	100	50	100	25	79	40	33	6	22	26	0	100	33	33	0	45	0	85	0	100	96	75	0	0

Annex II: Detailed tables

Cultivated area per District (Ha)

Crop	Huye	Gisagara	Nyamagabe	Nyaruguru	Ruhango	Nyanza	Kamonyi	Muhanga	Rusizi	Nyamasheke	Rutsiro	Karongi	Ngororero	Nyabihu	Rubavu
Sorghum	6,642	5,909	4,239	3,879	4,265	4,799	4,928	5,016	3,323	725	1,288	5,839	2,828	3,103	2,717
Maize	474	1,041	891	1,454	2,216	1,044	1,039	1,083	2,043	2,455	3,266	1,904	1,446	5,494	5,434
Wheat	0	0	2,866	2,122	0	0	0	25	0	0	3,245	1,543	2,545	1,428	1,085
Rice	422	1,350	0	0	667	208	217	135	1,073	47	0	0	22	0	0
Beans	4,360	4,549	4,029	3,668	4,574	3,467	4,618	6,673	7,459	5,364	4,551	4,842	4,139	6,946	7,046
Peas	759	1,539	1,495	653	597	126	625	1,245	2,884	960	1,466	1,109	1,529	2,891	0
Groundnuts	552	331	0	0	500	816	1,022	0	667	465	0	0	0	0	0
Soya	1,316	1,902	999	1,995	1,402	828	1,905	1,466	1,991	3,594	633	1,998	1,209	0	0
Banana	5,707	5,153	4,633	3,442	5,493	4,271	5,332	6,244	8,522	8,918	6,443	5,279	6,677	3,572	2,976
Irish Potato	1,181	912	2,093	1,610	1,095	1,701	1,185	1,563	505	93	3,688	1,684	5,400	7,026	4,683
Sweet Potato	2,051	1,583	4,660	1,892	3,238	2,438	1,767	3,091	1,958	3,331	2,269	3,492	4,819	1,498	831
Yam & Taro	364	93	319	739	280	337	1,008	2,024	465	591	1,969	90	1,710	314	394
Cassava	5,407	5,867	2,462	2,830	7,319	5,375	7,281	5,424	5,496	5,228	1,773	5,452	5,621	703	569
Vegetables	726	301	696	313	627	668	856	766	750	779	808	847	1,442	773	938
Fruits	726	451	696	363	627	863	571	1,125	1,903	389	808	692	962	731	626
Total cultivated area	**30,687**	**30,982**	**30,078**	**24,960**	**32,902**	**26,941**	**32,355**	**35,880**	**39,039**	**32,939**	**32,208**	**34,770**	**40,348**	**34,478**	**27,300**

Cultivated area per District (Ha) (Cont'd)

Crop	Gakenke	Musanze	Gicumbi	Burera	Rulindo	Bugesera	Rwamagana	Kayonza	Ngoma	Kirehe	Gatsibo	Nyagatare	Kigali City	Total
Sorghum	4,568	5,666	3,596	6,663	3,515	4,091	4,381	4,967	6,055	6,523	6,830	6,551	2,413	125,321
Maize	4,187	5,370	3,694	1,870	1,145	2,280	1,065	1,329	1,281	1,094	1,735	4,229	757	61,319
Wheat	3,741	816	5,992	5,751	2,786	0	0	0	0	0	0	0	0	33,945
Rice	0	0	0	0	0	331	308	71	331	608	394	517	226	6,929
Beans	7,557	5,863	5,487	6,901	3,420	3,645	3,528	4,302	5,988	6,512	5,301	6,175	1,799	142,760
Peas	134	0	257	963	2,350	663	0	1,028	1,010	1,014	234	203	181	25,915
Groundnuts	0	0	106	0	367	1,156	464	688	492	1,392	1,184	619	329	11,150
Soya	803	0	0	0	758	671	844	109	1,047	482	652	1,268	600	28,473
Banana	7,399	3,311	5,364	3,839	4,397	5,585	6,136	8,627	6,258	9,347	8,535	4,468	2,022	157,951
Irish Potato	1,072	4,841	7,853	4,432	2,254	1,646	3,350	463	1,180	984	2,501	2,533	823	68,353
Sweet Potato	4,761	1,608	4,107	1,214	1,758	626	1,274	3,744	1,137	5,678	1,404	2,796	939	69,962
Yam & Taro	342	0	277	240	122	249	282	220	319	858	84	0	488	14,178
Cassava	947	489	1,531	1,153	2,153	7,306	2,486	3,059	5,111	5,737	3,583	2,860	774	103,997
Vegetables	986	928	1,177	414	705	450	661	733	706	1,067	320	1,001	344	20,784
Fruits	1,478	928	1,177	1,098	768	266	441	489	1,026	711	320	667	344	21,246
Total cultivated area	**37,977**	**29,821**	**40,619**	**34,537**	**26,498**	**28,964**	**25,220**	**29,829**	**31,940**	**42,008**	**33,077**	**33,888**	**12,036**	**892,284**

Yield per District (kg/ha)

Crop	Huye	Gisagara	Nyamagabe	Nyaruguru	Ruhango	Nyanza	Kamonyi	Muhanga	Rusizi	Nyamasheke	Rutsiro	Karongi	Ngororero	Nyabihu	Rubavu
Sorghum	1,100	1,150	917	800	803	1,712	1,492	1,350	674	1,035	1,194	850	750	800	1,071
Maize	2,275	2,423	2,178	1,838	1,664	1,271	2,243	1,100	2,261	2,271	1,387	2,115	1,609	1,785	2,215
Wheat			2,287								1,011	1,039	1,642	2,510	1,063
Rice	5,000	4,050			5,500	4,100	6,000	5,000	7,000	4,000			4,000		
Beans	700	700	650	673	959	900	800	1,200	1,100	1,212	950	800	1,100	1,000	1,200
Peas	835	877	811	1,080	667	358	853	596	406	457	848	718	911	788	
Groundnuts	777	626			659	863	864		667	610					
Soya	649	945	700	848	559	619	644	577	1,142	956	192	742	605		
Banana	5,589	5,496	5,322	5,383	4,716	4,610	6,500	7,000	11,238	8,388	6,809	5,500	5,494	7,500	10,038
Irish Potato	6,025	5,564	7,468	10,430	5,177	12,243	4,632	6,023	7,634	6,108	7,622	5,493	7,811	14,095	9,759
Sweet Potato	7,073	6,215	7,405	8,316	6,749	9,293	6,435	7,002	7,282	6,231	7,086	7,001	5,889	9,161	6,439
Yam & Taro	7,376	5,541	6,149	8,152	12,564	4,768	4,248	7,969	6,909	5,483	5,873	6,353	5,706	12,066	9,832
Cassava	15,000	15,000	10,000	10,000	15,000	15,000	15,000	12,000	10,000	10,000	8,000	8,500	8,500	5,000	5,000
Vegetables	10,000	10,000	12,000	12,000	10,000	10,000	10,000	10,000	12,000	12,000	10,000	10,000	9,500	16,000	16,000
Fruits	12,000	12,000	10,000	10,000	10,000	10,000	10,000	10,000	12,000	12,000	9,500	9,000	9,500	16,000	16,000

Yield per District (kg/ha) (Cont'd)

Crop	Gakenke	Musanze	Gicumbi	Burera	Rulindo	Bugesera	Rwamagana	Kayonza	Ngoma	Kirehe	Gatsibo	Nyagatare	Kigali City	Average
Sorghum	222	1,000	1,226	1,708	1,426	860	1,401	1,302	1,424	1,935	1,417	1,167	1,255	1,189
Maize	1,739	1,673	1,731	2,592	1,909	2,117	1,627	1,287	2,857	682	2,783	1,398	1,128	1,853
Wheat		2,771	2,068	1,760							1,737			1,329
Rice						6,000	4,000	4,000	4,000	5,000	6,000	5,000	4,000	5,137
Beans	1,100	1,295	1,114	1,200	1,150	834	750	725	850	750	900	881	1,030	970
Peas	909		630	843	1,046	488		368	791	487	688	503	698	728
Groundnuts			742		728	778	425	925	1,111	659	975	597	799	772
Soya	1,758				984	683	684	1,053	1,014	374	1,348	456	468	799
Banana	7,707	4,743	7,500	7,500	7,649	3,667	9,856	9,850	14,999	12,131	12,000	9,945	7,257	8,068
Irish Potato	10,808	13,845	14,477	12,237	7,234	4,061	5,074	5,004	5,246	5,934	6,339	7,027	5,354	9,563
Sweet Potato	8,528	9,312	10,264	8,046	9,441	6,828	5,324	6,765	11,464	6,379	8,153	6,784	3,338	7,409
Yam & Taro	11,015		5,930	8,470	10,966	4,616	4,545	3,323		7,205	1,817		3,932	6,554
Cassava	10,000	6,000	10,000	6,500	12,000	12,500	15,000	15,000	15,000	15,000	15,000	15,000	10,000	12,609
Vegetables	12,000	15,000	15,000	15,000	5,650	10,000	11,000	10,000	10,000	11,000	11,000	11,000	13,000	11,454
Fruits	12,000	12,000	15,000	15,000	11,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	11,233

Production per District (MT)

Crop	Huye	Gisagara	Nyamagabe	Nyaruguru	Ruhango	Nyanza	Kamonyi	Muhanga	Rusizi	Nyamasheke	Rutsiro	Karongi	Ngororero	Nyabihu	Rubavu
Sorghum	7,306	6,795	3,887	3,103	3,425	8,214	7,353	6,772	2,239	751	1,539	4,963	2,121	2,482	2,911
Maize	1,079	2,523	1,941	2,673	3,688	1,327	2,331	1,191	4,619	5,575	4,531	4,025	2,326	9,806	12,036
Wheat	0	0	6,552	0	0	0	0	0	0	0	3,281	1,604	4,179	3,584	1,154
Rice	2,110	5,466	0	0	3,671	854	1,304	677	7,513	190	0	0	87	0	0
Beans	3,052	3,185	2,619	2,469	4,385	3,120	3,694	8,007	8,205	6,501	4,323	3,874	4,552	6,946	8,455
Peas	633	1,349	1,213	705	398	45	533	741	1,170	439	1,244	796	1,393	2,278	0
Groundnuts	429	208	0	0	329	704	883	0	445	283	0	0	0	0	0
Soya	854	1,797	699	1,692	784	513	1,227	846	2,273	3,436	121	1,482	731	0	0
Banana	31,899	28,321	24,659	18,529	25,907	19,692	34,659	43,709	95,773	74,807	43,873	29,035	36,687	26,788	29,878
Irish Potato	7,117	5,075	15,631	16,788	5,669	20,824	5,490	9,414	3,859	569	28,112	9,247	42,181	148,551	68,555
Sweet Potato	14,504	9,837	34,506	15,733	21,854	22,655	11,371	21,639	14,259	20,753	16,081	24,444	28,381	13,719	5,351
Yam & Taro	2,688	515	1,964	6,021	3,518	1,606	4,283	16,132	3,210	3,240	11,563	570	9,755	3,791	3,878
Cassava	81,110	88,007	24,620	28,302	109,791	80,625	109,222	65,089	54,957	52,282	14,187	46,343	47,775	3,514	2,845
Vegetables	7,260	3,009	8,352	3,761	6,266	6,682	8,559	7,660	9,003	9,347	8,079	8,473	13,703	12,371	15,013
Fruits	8,712	5,415	6,960	3,633	6,266	8,632	5,706	11,248	22,840	4,673	7,675	6,229	9,135	11,702	10,009

Production per District (MT)

Crop	Gakenke	Musanze	Gicumbi	Burera	Rulindo	Bugesera	Rwamagana	Kayonza	Ngoma	Kirehe	Gatsibo	Nyagatare	Kigali City	Total
Sorghum	1,013	5,666	4,408	11,379	5,010	3,520	6,138	6,470	8,620	12,619	9,680	7,644	3,027	149,056
Maize	7,283	8,983	6,395	4,846	2,185	4,826	1,733	1,710	3,661	746	4,827	5,913	854	113,632
Wheat	0	2,262	12,388	10,120	0	0	0	0	0	0	0	0	0	45,125
Rice	0	0	0	0	0	1,989	1,231	284	1,323	3,041	2,365	2,584	904	35,593
Beans	8,313	7,593	6,112	8,281	3,933	3,039	2,646	3,119	5,090	4,884	4,771	5,440	1,852	138,458
Peas	122	0	162	811	2,458	323	0	379	799	494	161	102	126	18,875
Groundnuts	0	0	78	0	267	900	197	636	547	917	1,155	370	263	8,612
Soya	1,412	0	0	0	746	458	578	115	1,062	180	878	578	281	22,745
Banana	57,028	15,707	40,232	28,794	33,634	20,477	60,474	84,974	93,856	113,389	102,423	44,430	14,669	1,274,302
Irish Potato	11,588	100,526	113,691	54,237	16,308	6,683	16,999	2,318	6,189	5,839	15,854	17,799	4,404	759,517
Sweet Potato	40,604	14,977	42,159	9,766	16,595	4,273	6,782	25,326	13,035	36,219	11,449	18,972	3,134	518,374
Yam & Taro	3,767	0	1,642	2,032	1,343	1,149	1,282	732	0	6,181	152	0	1,917	92,931
Cassava	9,473	2,935	15,313	7,493	25,831	91,326	37,289	45,890	76,669	86,050	53,743	42,894	7,736	1,311,312
Vegetables	11,827	13,922	17,661	6,216	3,983	4,503	7,276	7,328	7,063	11,735	3,520	11,008	4,470	238,049
Fruits	17,741	11,137	17,661	16,472	8,450	2,391	3,969	4,397	9,231	6,401	2,880	6,004	3,095	238,665

Production in Kcal, protéins and lipids

	Huye	Gisagara	Nyamagabe	Nyaruguru	Ruhango	Nyanza	Kamonyi	Muhanga	Rusizi	Nyamasheke	Rutsiro	Karongi	Ngororero	Nyabihu	Rubavu
Kcal (1 000 000 000)	169.9	177.1	140.5	105.3	204.5	179.7	203.0	190.0	200.9	170.2	128.0	150.6	183.8	206.7	152.2
Proteins (1 000 T.)	2.7	3.2	3.1	2.4	3.1	2.8	3.2	3.9	4.6	4.0	3.1	3.2	3.8	5.5	4.3
Lipids (1 000 T.)	0.5	0.7	0.5	0.5	0.6	0.6	0.8	0.5	1.0	1.0	0.4	0.6	0.5	0.7	0.7
Kcal from animals (1 000 000 000)	6.9	4.5	10.6	11.5	14.0	7.0	12.0	10.5	6.5	9.1	10.5	6.1	11.2	8.8	7.6
Proteins from animals (1 000 T.)	0.4	0.2	0.6	0.6	0.8	0.4	0.6	0.6	0.4	0.5	0.6	0.4	0.6	0.5	0.4
Lipids from animals(1 000 T.)	0.5	0.4	0.8	0.8	1.0	0.5	0.9	0.8	0.5	0.7	0.7	0.5	0.8	0.6	0.5
Energie (Kcal/Capital/day)	**2,879**	**3,026**	**2,334**	**2,158**	**3,844**	**3,585**	**3,557**	**3,019**	**2,702**	**2,385**	**2,265**	**2,428**	**2,986**	**3,471**	**2,360**
Protein (g/capital/day)	51	57	57	55	68	62	63	67	65	61	60	55	67	97	69
Lipids (g/capita/day)	17	17	20	25	29	21	29	20	19	23	19	17	21	22	18

N.B. : Adult humans require 2100 kcal/capital/day, 59 g of protéins and 40 g of lipids (source ENA/MINAGRI)

Production in Kcal, protéins and lipids (Cont'd)

	Gakenke	Musanze	Gicumbi	Burera	Rulindo	Bugesera	Rwamagana	Kayonza	Ngoma	Kirehe	Gatsibo	Nyagatare	Kigali City	Rwanda
Kcal (1 000 000 000)	158.1	171.4	248.5	179.0	119.7	157.9	122.3	153.7	204.3	253.6	189.5	166.7	46.0	4,733.1
Proteins (1 000 T.)	4.1	4.6	5.8	5.1	2.9	2.4	2.2	2.5	3.7	4.0	3.6	3.5	1.1	98.4
Lipids (1 000 T.)	0.8	0.6	0.8	0.6	0.5	0.7	0.4	0.5	0.7	0.7	0.9	0.7	0.2	17.6
Kcal from animals (1 000 000 000)	13.0	7.2	14.4	7.2	7.3	4.8	12.6	9.5	5.1	6.0	13.0	22.1	1.2	260.0
Proteins from animals (1 000 T.)	0.7	0.4	0.8	0.4	0.4	0.3	0.7	0.6	0.3	0.4	0.7	1.3	0.1	14.5
Lipids from animals(1 000 T.)	1.0	0.5	1.0	0.5	0.5	0.3	0.9	0.7	0.4	0.4	0.9	1.6	0.1	19.1
Energie (Kcal/Capital/day)	**2,297**	**2,515**	**3,159**	**2,510**	**2,184**	**2,636**	**2,645**	**3,364**	**3,850**	**4,891**	**3,088**	**3,201**	**225**	**2,610**
Protein (g/capital/day)	64	70	79	74	57	44	56	63	73	83	67	81	6	63
Lipids (g/capita/day)	23	16	22	15	17	17	25	24	21	21	28	38	1	21

N.B. : Adult humans require 2100 kcal/capital/day, 59 g of protéins and 40 g of lipids (source ENA/MINAGRI)

Annex III: Methodology.

1.1. Sampling methodology

1.1.1. Target population

The target population for the crop assessment survey is commposed of all rural and urban households where there exist strong agricultural activities.

1.1.2. Stratification

A stratified two-stage sample design has been used for the ENA. The sampling frame was stratified by Province (City of Kigali), urban and rural. The urban strata consisted of Kigali-City and other urban, while the rural part of each province was treated as a separate stratum. Data are representative at District level.

1.1.3. Sample selection procedure.

Within each stratum, the sample enumeration areas were selected systematically with probability proportional to size (PPS), where the measure of size for each enumeration area was based on the number of households from the sampling frame. Within each enumeration area, 12 households have been selected with simple random sampling, meaning that all households had the same probability to be selected.

1.1.4. Estimation procedure

In order for the sample estimates from a particular survey to be representative of the population, it is necessary to multiply the data by a sampling weight, or expansion factor. The basic weight for each sample household would be equal to the inverse of its probability of selection (calculated by multiplying the probabilities at each sampling stage).

1.2. Estimation of area under cultivation.

1.2.1. Area measurement

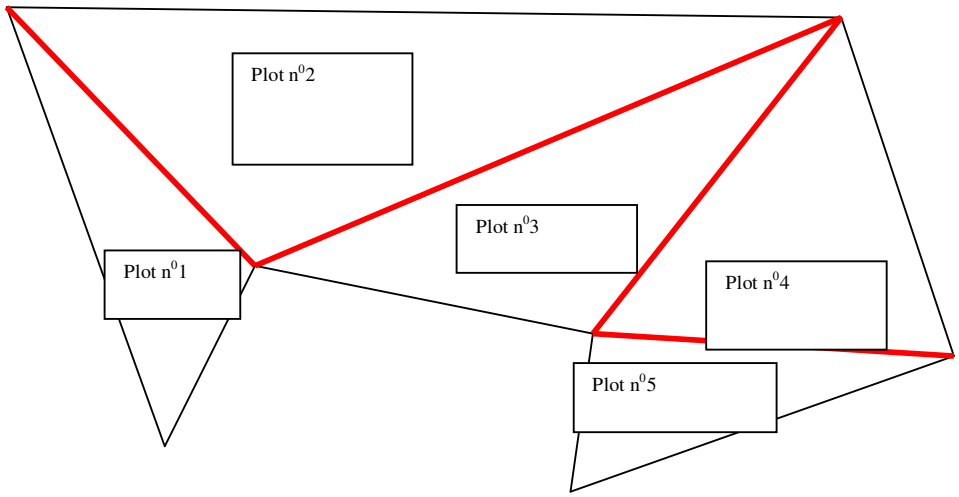
The shape of cultivated areas is not always of the regular form (triangle, rectangle…), but most of the fields under cultivation have rectangular shape (square or rectangle), others are triangular (triangle). We encounter also fiels that have irregular shape, having 5 sides or abore. In one or other case, the area measurement has been simplified as follows:

a) **Field of rectangular shape**: area is obtained by multiplying the length and the width.

b) **Triangular fields.** The enumerator measures the length of the base side and that of the height, and the area is equal to the base multiply by the height divide by 2.

c) **<u>Fields of irregular shape.</u>** In this case, a field of such shape has been divided into several plots of regular shape, in order to facilitate the calculation of the area of the entire field, as shown in the following figure.

Example : A field of irregular shape with 7 sides.



The perimeter of the above fiel is shown by the thin black lines. The field is not a rectangle, nor a triangle, neither of a known geometric form. In this case, area measurement has been done using procedure described in b, since the fiel dis composed of triangle. The total area of the fiels is the sum of the areas of the triangles that constitute the field. One or more plots were randomly selected for the purpose of estimating the yield.