

# **CIAT-ATDT/ISAR/IITA-FOODNET And PEARL Project - Rwanda**

Maize sub-sector market survey

**Rwanda**

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## Acronyms and abbreviations

DRC	Democratic Republic of Congo
DS/MINECOFIN	Statistical Department, Ministry of Economy and Finance
FAO	United Nations Food and Agriculture Organisation
FSRP	Food Security Research Programme
Frw	Rwandan francs
Ha	Hectare
HLCS/EICV	Household Living Condition Survey/Enquête Intégrale sur les conditions de vie des ménages
Kg	Kilogramme
MINAGRI	Ministry of Agriculture, Livestock and Forestry
MINIPLAN	Planning section of MINECOFIN
MT	Metric ton
PASAR	Projet d'Appui à la Sécurité Alimentaire au Rwanda (Food Security Support Project to Rwanda )
US\$	United States dollar

## **Executive Summary**

This report provides a quick analysis of maize marketing in Rwanda, identifying opportunities and constraints to growth. It gives an overview of the maize sector, exploring the current market status and investment options for increased commercialization of maize in Rwanda. It also aims to achieve market-oriented research.

The methodology used was based on a rapid assessment technique using primary and secondary data. Primary data was obtained through interviews with agents along the marketing chain while secondary data was acquired by literature review and analysis of available statistics. The study focussed on a two-tier approach comprising both demand and supply analyses.

According to the current survey the national per capita demand (quantity purchased) for maize in 2000 is estimated to be about 7 kg, ranging from 6.4 kg for rural areas to 6.9 kg in urban areas. Umutara province has the highest per capita demand at approximately 20kg per annum. This province has a large population of Rwandese formerly leaving in Uganda where maize is a more prominent staple. Other areas with a high per capita demand include Cyangungu and Gisenyi which border countries where maize is a major food crop.

Maize is increasingly becoming an important food and cash crop for small-scale farmers in Rwanda. According to an earlier survey carried out in 1990, volume traded for the rural areas was estimated at about 5,000 tonnes while in 2000 this figure had risen to nearly 50,000 tonnes.

The total quantity of maize purchased has surpassed internal supply, making Rwanda a net importer of maize. While the approximate quantity demanded (marketed) of maize in Rwanda is in the order of 55,000 tonnes per annum, only about 30,000 of this is from internal production, implying a deficit of about 25,000 tonnes per annum, which is met by imports from Uganda and Tanzania.

Domestic demand for maize is driven by changes in the traditional markets of food and feed. The food market is currently the most important accounting for about 55,000 tonnes of marketed output and about 30,000 tonnes of subsistence output. On the other hand the major feed producer in Rwanda is expected to consume about 480 tonnes per month (5,760 tonnes per year) once full production is achieved.

Quality is an important market variable with uniformity, cleanliness dryness and color being the main parameters. This survey found that although Rwandan maize is clean, it contained grain of different color increasing the costs of sorting and grading by about 25%. The current poor market integration of maize farmers could be the primary socioeconomic explanation for this.

Available data indicates that there has been a decline in maize production. While average production during the pre-war period (86-90) was about 90,000 tonnes per annum, that for the post war period average (97-00) averaged 60,000 tonnes per annum, implying a decline of about 39% over the period 1987-2000.

While maize production has generally decreased, the population has been increasing leading to a sharp fall in per capita maize production. Per capita production has declined from about 16 kg per person in 1987 to about 8 kg per person in 2000, representing a decline of about 50 %.

Constraints facing maize production include both biotic and abiotic factors. However, the latter combined with marketing problems are more responsible for limiting maize exploitation and utilization in the country.

There is insufficient production of good quality seed while the multiplication and distribution system is not effective at getting the seeds to the poor farmers in the country. Less than 2% of the farmers use quality seed mainly from NGOs, leaving the majority of farmers with own seed saved from previous harvests.

There is lack of market and marketing information for all the stakeholders in the maize sector.

## **Recommendations**

Need to establish and support maize market information systems. There should be regular collection and analysis of maize data on supply, demand, relief, import prices and tariffs for the benefit of all maize stakeholders. ISAR scientists could handle this issue along with Foodnet, a regional postharvest and marketing network.

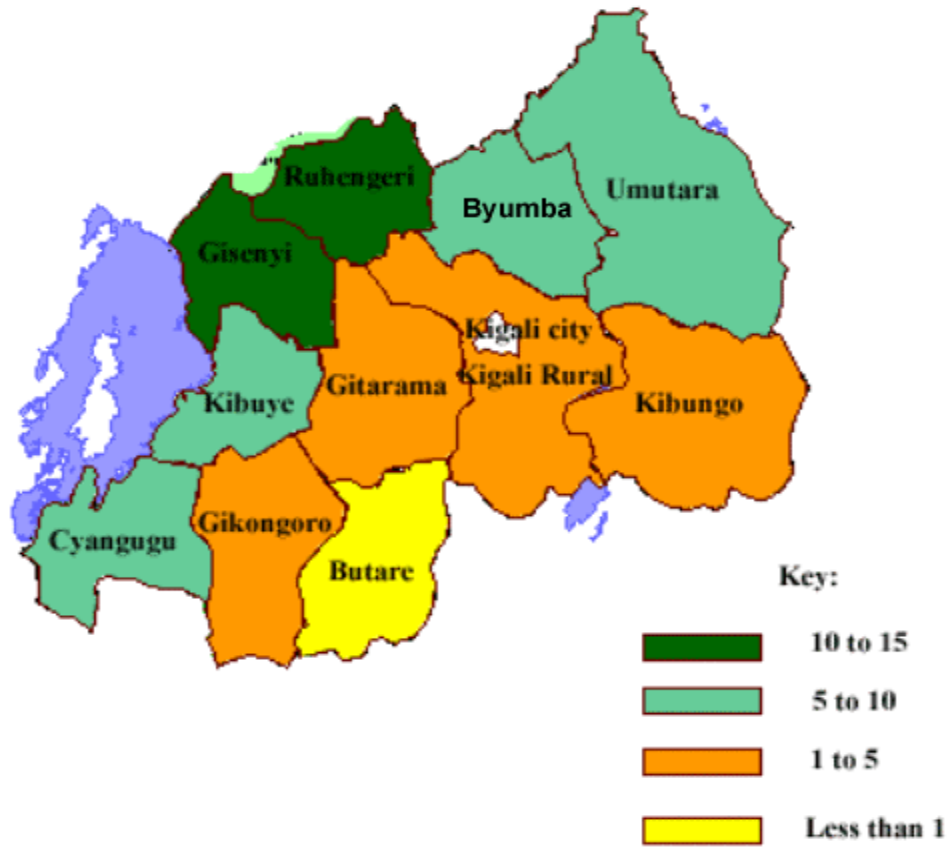
Although there is evidence pointing to increased commercialization of maize production in the near future, most producers may not benefit from this due to lack of vertical linkages and integration. There is hence a need to develop methodologies for linking producers to commercial outlets like produce dealers, millers etc.

Related to the issue above there is need for a three-tier production and marketing system bringing producers, extension staff/researchers and traders.

There is need for the public sector to invest in improvements in roads, transport, and communications to reach subsistence communities in order to improve market accessibility.

As market accessibility improves and farmers become more market-oriented, there is increased demand for productivity-enhancing technologies such as improved seed and fertilizer. There is thus need to liberalize the seed sector in order to increase accessibility of farmers to improved seeds.

Figure 1.1: Maize production by province '000 tonnes, Rwanda, 2000



## **1. Introduction**

### **1.1 Background**

Rwanda relies heavily on agriculture for its income, employment opportunities and the economic well-being of its people of whom about 90% live in the rural areas. In spite of steady economic progress since the genocide, poverty is widespread with Gross National Product currently standing at USD 260 per person.

The economic outlook for Rwanda is in many ways challenging. The country is struggling with several major policy level agendas such as how to compete in a more globalised economy, privatisation, market liberalization, decentralisation, overcoming tribal conflict and at the same time showing real gains in equity, income, education and health of the people.

A major part of the economic reform is the privatisation of the two main income generating sectors, coffee and tea. Unfortunately, at this time coffee, the major foreign exchange earner has fallen from 66 m in 1990 to 22 million in 2000, causing a fall in income of 66%.

At the same time the country has experienced one of the fastest growing population rates in the world. Rural density is 929 persons per km<sup>2</sup> of arable land reducing the average farm size to approximately 0.71 hectares and per capita arable land to about 0.10 hectares. These are levels, which are placing severe strains on the resource and social capacity of the land.

Consequently, food security and poverty alleviation issues have become more critical than ever before with farmers increasingly becoming involved with issues of income generation from their land.

Achieving food security and increased rural incomes will depend on increased productivity in this sector but more so on the proper functioning of agricultural markets in order to improve access by the poorest. As a result, there is a pertinent and ever-growing interest in economic diversification and also in understanding and developing both the internal and new export markets for novel or improved products.

This study aimed to evaluate the market options for maize, which is a major food crop in the country. It specifically aims to assess the importance of the crop in terms of:

- Food security; economic growth; potential market growth in relation to identified markets;
- Comparative/competitive advantage for Rwanda in developing the maize crop;

- Key interventions needed in order to transform maize from a subsistence to a more commercially oriented sector; and
- The potential of the commodity or sub-products in regional and overseas markets.

## **1.2 Methodology**

The methodology used for this market review is that developed by Holtzman. This method relies on rapid reconnaissance to conduct a diagnostic study of the bean sub-sector in Rwanda with the objective of identifying possible improvements in existing practices and recommendations on how these might be achieved are also highlighted. It also identifies issues for follow-up research.

Data were collected through informal interviews with key informants (**Appendix 52**) and through direct observation of critical stages in the production and distribution sequence. In addition sources for secondary data were also identified and used during the survey.

The sample was purposively selected to include respondents from each of the following major categories along the production-marketing chain i.e. producers, travelling, traders, transporters, wholesalers and retailers.

## **1.3 Rationale of the method**

From a methodological point of view, this study has several advantages. The broad conceptual framework used to identify key study issues and to organize data collection activities enabled the researchers to distinguish factors that decisively influence market performance.

Flexibility is another important aspect of the informal interview method. Structured informal interviews can generate valuable information about food system participants' behaviour, motivations, intentions, and planned future behaviour.

Apart from providing qualitative data, this approach, if designed properly, can also generate precise quantitative data, albeit from small samples. Structured informal interviews can generate precise, reliable information on marketing costs, purchase and sale prices, transacted volumes, processed output, and other continuous variables over relatively short recall periods.

This approach is practical and in spite of limited time, money and personnel, studies can still be carried out.

## **1.4 Analysis**

Most of the quantitative analysis was conducted using secondary data from Government departments, NGOs and International Development institutions. Primary data on costs and margins was carefully sifted and averaged to create a realistic picture of profitability within the trading chain.

## 2. The Marketing Environment

### 2.1 Rwandan economy status

Rwanda's per capita income is currently US\$ 260. The population living below the poverty line is estimated at 65%. Life expectancy is 49 years while the literacy rate is 48% (*Rwanda Development Indicators, 2000*).

Economic growth has declined in the past 1-2 years to 6.0% in real terms, having grown at an average of 12% per annum during the reconstruction period (1995-1998). Although the year 2000 marked the complete economic recovery to the prewar 1990 level, with growth in some sectors surpassing the 1990 level, growth was still below the vision 2020 target of 8.5%. Factors such as the localized drought, high oil prices and low commodity prices explain this situation.

Agriculture contributed the largest share of this growth at 7.7%, industry (mainly mining and construction) 7.2% while the services sector (mainly hotels, restaurants, banking and insurance) accounted for 4.2% (**Table 1.1**)

**Table 1.1: Selected growth rates**

Growth rates (%)	2000	2001(projected)
Agriculture sector	9.1	7.7
Industry sector	3.6	7.2
Service sector	3.5	4.2
GDP	6.0	6.0
GDP price deflator	1.8	4.9
CPI	2.1	4.0

Source: *Rwanda Development Indicators, MINECOFFIN*

The Inflation rate substantially increased to 2.1% in 2000 in response to external shocks (mentioned above) that caused higher food and fuel prices, while the country's parallel market exchange rate stood at Frw 495 to the US\$ at the time of the survey, thereby making imports more expensive.

The balance of payments deficit reduced to US\$ 234 million in 2000 due partly to the depreciation of the currency, which reduced imports and increased the resultant cheaper exports. For the first time the country exported, among others, maize to Uganda averaging 20 tonnes per day since December 2000.

The country's international reserves as months of imports (cif) declined from 8.1 months in 1999 to 7.5 months in 2000, which is still high while the fiscal overall deficit (excluding grants) was significantly larger than programmed, amounting to 9.2% of GDP, compared with the programmed 7.8% of GDP. This shortfall was due to a 10% drop in

the programmed revenue performance, which translated into revenue realization of Frw 68 billion instead of the targeted Frw 76 billion.

The country has few exploitable natural resources and suffers from high transport costs due to its landlocked position. Thus, given this particularly narrow economic base, external trade integration is vital for Rwanda in order to reduce its large trade deficit and also decrease reliance on donor funds.

## 2.2 Macro-economic Developments

The new government of Rwanda in December 1994 announced its economic agenda, which is committed to creating a liberal, market-based economy with a reduced role for the state. Macro-economic and structural policies broadly focused on reviving economic activity, restoring macro-economic stability and rebuilding the capacity for macroeconomic and budget management. Several structural reforms to liberalize trade, develop the private sector, privatize public enterprises, and improve public administration and governance have been implemented.

The country's trade regime has been progressively liberalized. Surrender requirements for coffee and tea export receipts were eliminated, and the maximum tariff rates reduced from 100 percent to 40 percent. Consequently, Rwanda's trade restrictiveness index fell from 8 in 1995 ("restrictive") to 3 in early 1998 ("relatively open"). The country continued to pursue trade liberalization, further reducing the maximum tariff rate from 40 to 25 percent. The coffee tax was eliminated in early 1999 and exchange regulations were further simplified and liberalized as were import taxes on fertilizers.

**Table 1.2: Indicators of structural reform**

Indicator	1993	1996	1998	1999
Non zero trade tariff range (25)	(10-100)	(10, 20,40)	(10, 20, 40)	(5, 15,
Average tariff rate	34.8	31.9	18.1	11.3
Tax restrictiveness index	10	8	3	2
Surrender requirements for tea & coffee export proceeds	100	50	0	0
Civil service employment	42,027	34,882	37,353	37,694
Govt. wage bill in percent of GDP	5.7	4.4	4.6	5.3
Cumulative number of public enterprises Privatised or brought under liquidation	0	0	3	25

Source: World Bank, Rwanda data

Formerly state-owned enterprises have been privatized. The state-controlled Chamber of Commerce was abolished while the Rwanda Private Sector Federation was formed as an apex body of various private sector organizations to articulate private sector interests.

In an effort to promote the private sector, business licensing was made easier and the labor code was revised to remove restrictions on the movement of labor and the employment of females. Also, the Rwanda Investment Promotion Agency was set up to facilitate investment and business development.

The key fiscal measures for increasing revenues included improved tax administration by the Rwanda Revenue Authority (established at end of 1997 with technical and financial support from the UK-DFID). Import duty exemptions were progressively eliminated while the turnover tax was increased from 10% to 15%. Excise tax rates were also increased.

In response to the revenue shortfalls, the Government implemented significant expenditure reductions in both 1998 and 1999 (and with the mid-2000 budget review), but could not avoid the resort to large domestic bank financing in late 1999.

Within the financial sector, the foreign exchange market was liberalized. But, efforts to build a leaner civil service were hampered by new recruitment to replace those lost in the genocide.

Currently the government is endorsing the Vision 2020 document. This focuses on the aim to exit the category of the “least developed countries” by the year 2020 through the eradication of widespread poverty and assurance of equitable growth. Vision 2020 aims to average a GDP growth rate of 8.5% per annum, which will enable the country to attain Vision 2020 targets of:

- A GDP per capita increase to US\$ 960 at the present value (currently US\$ 260);
- Reducing population living below the poverty line to 25% (currently 65%);
- Increasing life expectancy to 65 years (currently 49 years); and
- Increasing literacy rate to 90% (currently 48%).

To achieve 8.5% GDP growth per annum requires high investment rates, which can be realized in the context of social, political and macroeconomic stability.

### **2.3 Trade and Export Competitiveness: Recent Reforms and Performance**

Rwanda still faces an unfavorable trade balance, relying on imports for most of her needs. It has mainly relied on two primary products i.e. coffee and tea for export earnings.

Rwanda has been heavily reliant on coffee for most of its export earnings and the recent collapse in international coffee prices has cost the country more than 30% of its terms of trade. In 1990 coffee earnings were worth US\$ 66 million but are now worth less than

US\$ 20 million, (**Table 1.3**). This major loss in revenue is having a catastrophic effect on the economy making it ever more reliant on donor support.

While the tea market has been less affected by the current problem of oversupply in the key commodities, growth has also been negligible with income increasing from US\$ 20 million to US\$ 24 million over the past decade.

Trade or export of products is virtually non-existent due mainly to high costs of production and poor quality of locally manufactured goods. Essentially the country is a net importer of consumer goods. **Table 1.3** below indicates trends in the country's trade balance.

**Table 1.3: Balance of payments (trade competitiveness) million of US\$**

Item	1990	1995	1996	1997	1998	1999	2000(est)
Exports (fob)	103	51.2	61.7	93	64.1	62	66.2
Coffee	65.7	38.2	43	45.3	28.1	26.5	22.5
Tea	21	3.8	9.3	20.6	22.9	17.5	24.3
Imports (fob)	227.7	198.1	218.7	277.4	232.6	202	195.7
<b>Trade balance</b>	<b>-124.7</b>	<b>-146.9</b>	<b>-156.9</b>	<b>-184.4</b>	<b>-168.5</b>	<b>-140</b>	<b>-129.5</b>
Services (net)	-104.6	-118.4	-143.1	-160	-148.3	-116.8	-135.6
Non factor services	-93.4	-123.8	-128.5	-145.6	-141.5	-106.3	-119.3
Credit	42.5	16.2	21.5	51	46.9	51.1	61.7
Debit	135.9	140	150	196.6	188.4	157.4	181
Factor service	-11.2	5.4	-14.6	-14.4	-6.8	-10.5	-16.3
Credit	4.1	21.9	5.5	9.2	9.9	7.8	11
Debit	15.3	16.5	20.1	23.6	16.7	18.3	27.3
Private transfers(net)	5.9	15.8	26.5	25	18.3	18.1	11
Credit	23.9	15.8	28.9	48.8	33.7	29.7	27.3
Debit	18	0	2.4	23.8	15.4	11.6	16.3
<b>Current account balance (excl.official transfers)</b>	<b>-223.4</b>	<b>-249.5</b>	<b>-273.5</b>	<b>-319.4</b>	<b>-298.5</b>	<b>-238.7</b>	<b>-254.1</b>

Source: Rwanda Development Indicators, 2001, MINECOFIN

In the past 5 years the country has made persistent efforts to promote trade competitiveness through macro-economic reforms (**Table 1.2**) aimed at opening up the economy, increasing efficiency and promoting private entrepreneurship. Liberalization of the exchange rate regime has made the country more competitive by reducing the price of its exports.

As a result the country has made positive developments in its trade balance position, reducing the deficit to an estimated 129 million US\$.

### **3. Overview of the Maize sub-sector**

#### **3.1 Importance of the sub-sector to earnings, livelihoods, poverty alleviation and economic growth**

Maize is one of the major crops in Rwanda. Maize ranks fifth among food crops and second among cereals after sorghum. Maize occupied about 32% of the land allocated to cereal production in 2000. Maize is currently cultivated in the whole country and is essentially intercropped with beans.

Consumption of maize has been increasing and maize is becoming an important cash crop for small-scale farmers especially in the maize growing regions. According to an earlier survey by the Department of Statistics, MINAGRI (1990), volume traded for the rural areas during that period was estimated at about 5,000 tonnes while in 2000 this figure was estimated to be about 50,000 tonnes.

Maize supplies a high quantity of carbohydrates to the population. The crop has become popular especially in urban areas amongst manual laborers and is targeted by MINAGRI to contribute to the nutritional status of the population.

Data in **Appendices 1 and 2** summarize the economic and nutritional importance and shows the national mean yield estimates of major crops during the six seasons of 1989-1991. All yields are expressed per six-month seasons so as to have cross-crop comparability. Maize was fourth after bananas, sweet potato and white potato in providing energy per capita.

Maize has multiple uses than any other cereals. It is used mainly as a food for human consumption. It is also the number-one feed grain in the country, being the main source of calories in animal feeding and feed formulation.

#### **3.2 Principle production and marketing constraints limiting the sub-sector export expansion**

Maize is one of the priority crops that have been chosen by the Government of Rwanda in its effort to increase household incomes and the nutritional status of the Rwandan people through increased production and marketing. This, however, presents a challenge to all of the stakeholders in the maize industry as a number of constraints face maize production and marketing. These include not only biotic and abiotic constraints but also socio-economic factors that make Rwanda less competitive in the regional maize markets.

Biotic constraints include tropical insects, diseases, and weeds while some of the major abiotic factors include climatic conditions (temperature, rainfall regimes, and season length) and soil-related factors such as fertility, acidity, and susceptibility to erosion with the latter (abiotic) being more challenging.

Poor soil fertility is an important abiotic constraint to maize production in Rwanda. Declining soil fertility has resulted from intensified land use coupled with declining fallow periods and the extension of agriculture into marginal lands. Consequently Nitrogen (N) and phosphorus (P) deficits are a severe and widespread biophysical limitation to smallholder maize productivity, thereby affecting the long-term food security of the resource poor in Rwanda.

In some cases, soils are acidic. Such soils are characterized by low PH, deficiencies of phosphorus, calcium, and magnesium, and also toxic levels of aluminum, further reducing the yield. Although lime application is the most widely used remedy for high acidity, it is financially prohibitive for resource poor farmers and is not a viable solution to the problem in Rwanda.

There is low use of fertilizers, pesticides and other inputs. This contributes little to long-term fertility management. Rwanda's chemical application is lower than that in the region. It has been estimated that the average fertilizer application in Sub-Saharan Africa is a mere 7kg/ha compared to levels of 200 kg of N/ha in most OECD countries.

Maize production in Rwanda is produced under rain fed conditions, implying drought stress is a major production problem in particularly in drought prone areas such as Umutara. Drought at any stage of the crop development affects production with maximum damage being inflicted during tasselling. While during seedling stage farmers may replant the crop and still at later stages some yield may be salvaged, drought at tasselling can only be mitigated by irrigation, which not available in the country. Moreover, drought and low soil fertility are intertwined. Crop failure due to drought influences farmers' decision to apply fertilizer.

Access to high quality maize seed is a prerequisite for high maize productivity and genetic improvements in tropical maize have resulted in significant shifts in the yield frontier, with economically exploitable yield levels of around 5 t /ha for the tropical lowlands and the highlands. However, at the moment there are insufficient supplies of good quality seed in the country. There is only one seed company in the country and production of seed is low while multiplication and distribution system is not effective at getting seeds to the poor farmers in the country. It is estimated that less than 2% of the farmers use quality seed, which is mainly from NGOs. The majority of farmers use seed saved from previous harvests while about 40% either buy from local markets or neighbours. This is exacerbated by the fact that majority of maize farmers continue to grow maize to meet their subsistence requirements and may have little need for and /or poor access to improved technologies. However, the yield from local seeds or retained hybrid is low as such types of seeds are neither certified nor cleaned from weeds or other seed contaminants.

Mixing of grain varieties is a hindrance to marketing. The majority of farmers use a mixture of varieties without any genetic identity. This affects the color of flour after

milling and according to traders it increases marketing costs, as the crop has to be cleaned and graded prior to marketing.

Among the biotic stresses taricum leaf blight and polysora rust have become increasingly dangerous while striga sp, is invading Umutara province, one of the production zones being targeted in production programs.

Poor agronomy is widespread among the farming communities. It includes inappropriate density of planting or inappropriate planting system such as broadcasting. Also, intercropping with beans is done without any scientific guidance

The backbone of maize production in the country is based on small-scale farmers. However, these farmers currently lack access to investment credit. Consequently, this contributes to low productivity through low use of inputs.

One major constraint pointed out by traders is the fact that supply prices are predetermined. With increasing prices due to high demand, it is increasingly becoming difficult for traders to obtain local supplies and hence opt for cheaper foreign supplies.

Marketing costs are high accounting for the major share of food costs to the consumer. The figure for maize flour is estimated at about 60% of the total retail price paid by the consumer while that for grain is about 40%. The high marketing costs are a hindrance to improvements in agricultural productivity, which is closely related to productivity growth in marketing systems. The incentives and ability of producers to make investments in productivity-enhancing inputs and technologies depend on reducing the transaction costs and risks of exchange across output markets. Therefore, the reduction of these costs represents a major opportunity to improve farm production incentives and simultaneously make food more affordable to low-income consumers

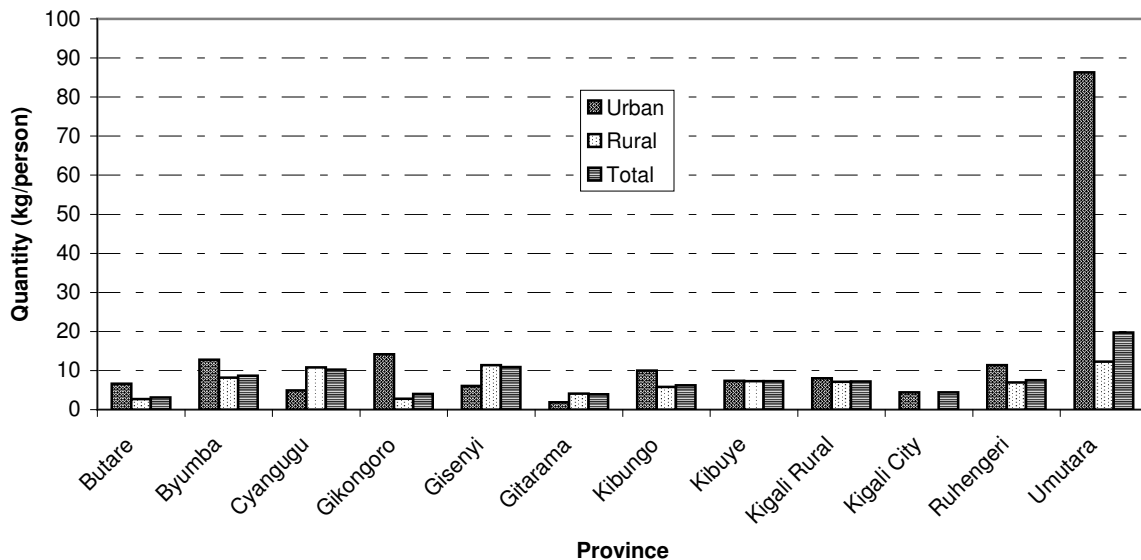
## 4. Demand analysis

### 4.1 Current demand

The survey made a serious effort to estimate market size and growth using data from the household expenditure survey and results of this market study across the maize production zones of Rwanda. The household survey targeted both urban households during the period October 1999 to 2000 while rural surveys covered the period July 2000 to July 2001.

National per capita demand (quantity purchased) is estimated at about 6.8 kg. **Figure 1.2** shows the rural urban distribution for most of the provinces. Per capita demand ranges from 6.4 kg for rural areas to about 6.9 in urban areas for most of the provinces. Results shown in the table below are derived from expenditure and price data for maize. These figures indicate the volume traded or consumed through purchases (demanded). They exclude subsistence output and are thus a good indication of the market size.

**Figure 1.2: Per capita demand\* (kgs) by rural, urban and total -2000**



Source: Survey Calculations

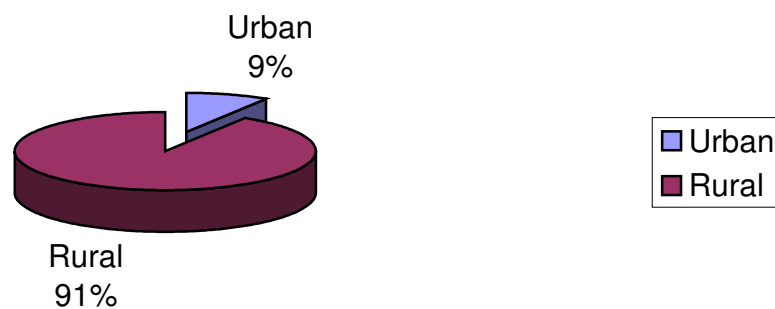
\* demand includes only traded output (kg) per person and is hence lower than total consumption

The national figure masks the difference in the quantity bought per person within the country. Generally, the quantity purchased per person is much higher in areas of Umutara, Gisenyi and Cyangugu. These differences reflect differences in the socio-economic conditions prevailing across the country. Cyangugu, Umutara and Gisenyi are border towns with a big population of people from neighbouring countries where maize is a major staple. In addition, Umutara is not a major agricultural province and instead has

the biggest livestock concentration in the country, implying that relatively more people rely heavily on agricultural markets for food.

Total demand (2000) is estimated at about 55,000 tonnes. Rural demand stands at about 50,000 tonnes, reflecting the predominantly rural population in the country. Urban demand is only about 5,000 tonnes. **Figure 1.3** below shows this distribution by percentage.

**Figure 1.3: Distribution of demand by percentage – Rwanda 2000**

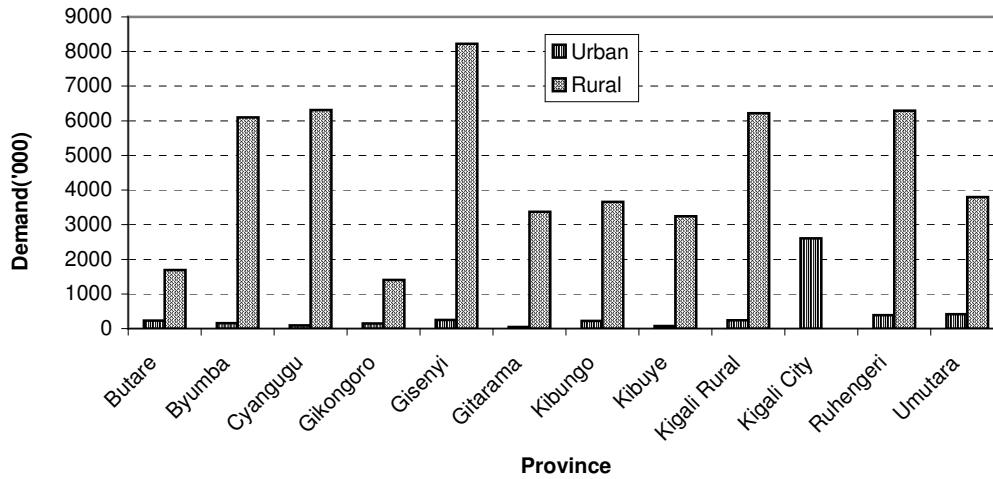


*Source: Field calculations*

Gisenyi province accounts for the biggest share of demand, standing at about 8,000 tonnes per annum. This is followed by Ruhengeri province with about 7,000 tonnes. Other provinces with high demand include Kigali Rural, Cyangugu and Byumba.

On the other hand, Gikongoro has the least total demand, estimated at about 1,000 tonnes while Butare has the second least quantity demanded at about 2,000 tonnes (**Figure 1.4**).

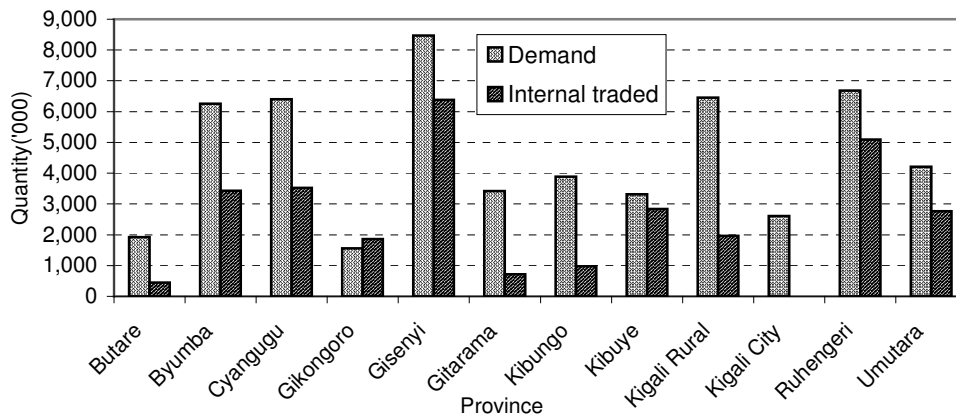
**Figure 1.4: Total demand by province, rural and urban (tonnes) in Rwanda, 2000**



Source: Survey Calculations

The total quantity of maize marketed is more than internal supply and Rwanda is a net importer of maize (**Figure 1.5**). It is estimated that the approximate quantity of maize marketed in Rwanda is in the order of 54,000 tonnes per annum. Although this figure is lower than Rwanda's own production (about 62,000 tonnes), the subsistence sector is large, estimated by earlier surveys at about 50 % of production. This therefore implies that about 30,000 tonnes of internal production is marketed at the moment. Given an estimated internal market demand of about 55,000 tonnes annually, the current deficit is about 25,000 tonnes per annum. This is met through imports from mainly Uganda and Tanzania.

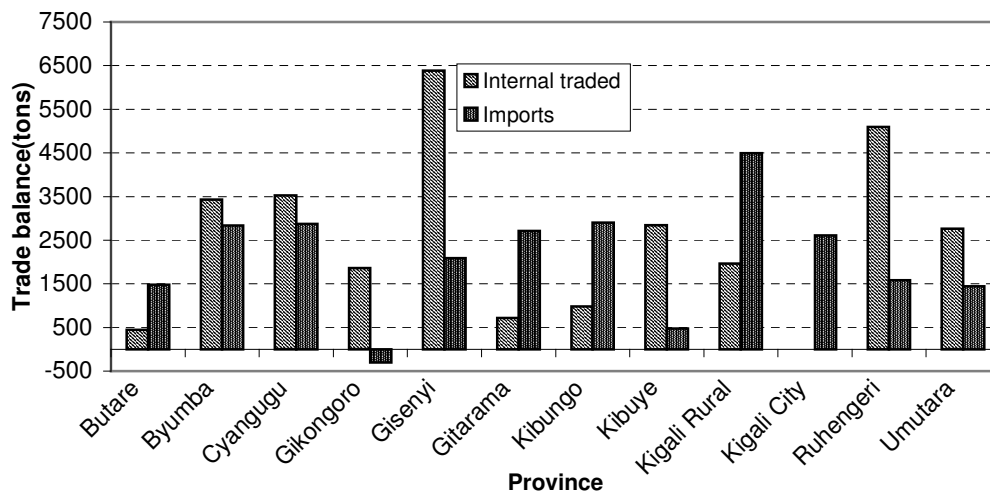
**Figure 1.5: Supply deficit by province 2000**



Source: Survey Calculations

Kigali Rural has the highest level of imports, estimated at about 4,000 tonnes (**Figure 1.6**). The next biggest deficit is found in Kibungo and this is estimated at about 3,000 tonnes. Other provinces with a big deficit of over 2,000 tonnes include Cyangugu, Byumba and Gitarama. On the other hand, Gikongoro is the only province that shows a surplus, estimated at about 300 tonnes.

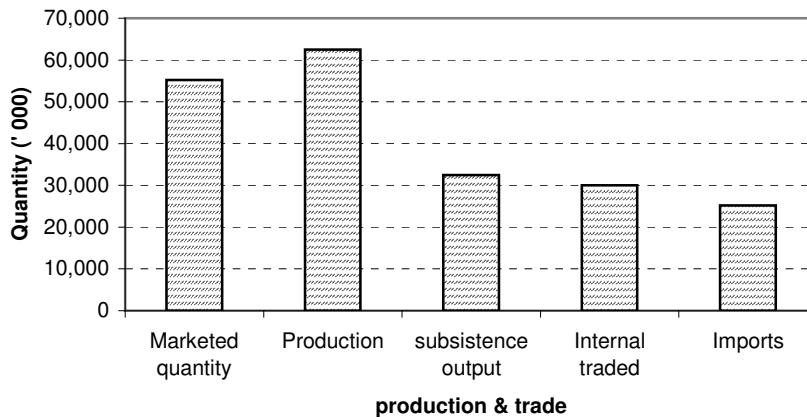
**Figure 1.6: Trade balance (tonnes) by rural, urban and total in Rwanda, 2000**



Source: Own calculations using data from HLCS 2000

As can be seen in **Figure 1.7** below, the total marketed quantity in Rwanda has been estimated at about 55,000 tonnes. Of this, about 30,000 tonnes is from internal supplies while the rest estimated at about 25,000 tonnes is imported.

**Figure 1.7: Production and bean trade balance in Rwanda, 2000**



Source: Field & MINAGRI DATA

**Figure 1.8** below illustrates the composition of marketed output. According to field data, about imports accounted for about 46% of the marketed output.

**Figure 1.8: Composition of marketed output Rwanda 2000.**



Source: Field data

Quantity marketed has been increasing, implying maize markets are assuming greater importance in the fight for food security and household incomes. According to an earlier survey by the DSA/MINAGRI (1990), total maize purchases amounted to about 8,000 tonnes per annum for rural areas, but the current survey found this figure to have risen to

about 49,000 tonnes. This represents an increase of about 500% over the period 1990-2000.

The major factor driving demand is the human food sector. This is from the increasing population and the increased number of returnees who came from areas where white maize is a major staple food. Also, demand increases when schools open. Important market segments include WFP which requires about 7,000 tonnes while prisons consumes about 3,200 tonnes per year but there is shortage of this.

The volume traded increases during planting season i.e. September – October, with a doubling of the quantity demanded for seed. Also, demand for flour increases from March to May and November to December when there is a shortage of other foods.

Another factor pushing demand is the animal feed sector. Although this is not big compared with countries like Kenya (300,000 tonnes), it is expected to increase.

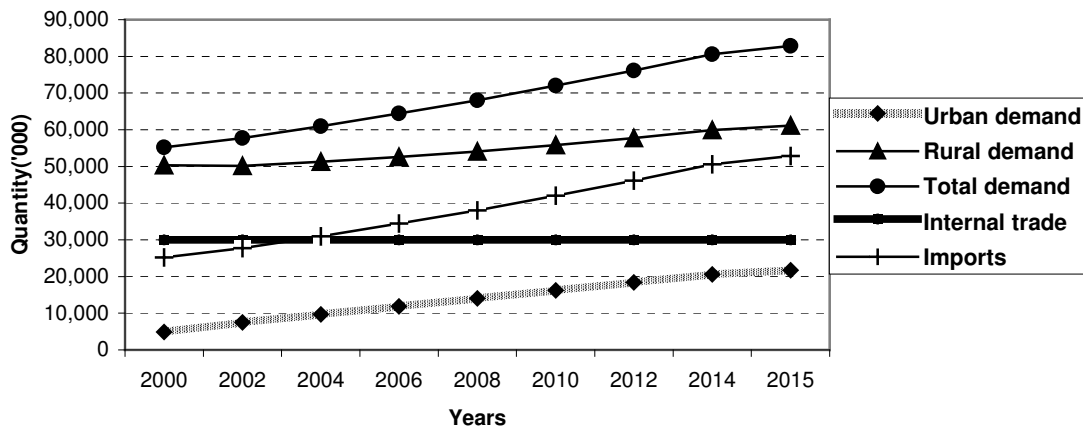
#### **4.2 Future demand**

The importance of maize is likely to increase in the future given the Government policy towards increased production. Also, the demand for maize is expected to continue growing as total population, urbanisation and disposable incomes increase (**Figure 1.9**). Over half the developing world's population will reside in cities by the year 2025 (Bongarts 1995). Mushrooming urban areas, particularly in Sub-Saharan Africa, mean that more and more consumers will depend on agricultural marketing for their daily food requirements rather than on food from their farms.

Domestic demand for maize is largely driven by the evolution of traditional markets ie feed and food markets. These markets are expected to grow at about the same rate as population, given the small income elasticity.

The table below gives some projections based on current population and urbanisation growth rates. In 2010 an estimated 72,000 tonnes will be purchased. Urbanisation will be a major contributory factor to market demand. Of this figure, urban demand will account for about 22.6%, having increased by about 200% over the 2000 figure.

**Figure 1.9: Demand growth by rural, urban and total 2000-2015 (tonnes)**



*Source: Own calculations*

The promotion of the use of maize in food aid programs in eastern and southern Africa has also led to more marketing opportunities in the entire region. However, this increased demand is having an upward pressure on prices as internal supplies take time to respond to market prices.

The feed industry is also expected to contribute to demand. The major feed producer in Rwanda is expected to consume about 480 tonnes per month (5,760 tonnes per year) once full production is achieved.

### 4.3 Demand for quality

Quality is an important market variable. Identified quality parameters included color, cleanliness and dryness or moisture content all of which impacted on marketing margins for traders. Color is the main quality criterion for flour. If it is bright yellow its not preferred and there was less yellow flour on the market.

The survey found that although Rwandan maize is clean than maize from Uganda, Rwandan maize contained different varieties and different colors, implying that the incentive to sort and grade had not yet filtered to the producers. Mixed color maize yields a poor flour after milling. As a result, traders prefer maize from Uganda as this is uniform thereby yielding a uniform white color. However, traders pointed out that maize from Umutara is also of the same color.

For Rwandan maize traders said they lost about 25% during the grading process to have color uniformity. The poor quality seed was also removed and used as feed.

WFP is a major buyer but the flour should be of good quality with one color while the grain moisture content should be below 14%. **Table 1.4** below gives other quality specifications from WFP – Rwanda.

**Table 1.4: Quality specifications for maize, WFP-Rwanda**

<i>Specification</i>	<i>Maximum</i>
Moisture content (maximum)	14.0%
Insect damage (maximum)	3.0%
Broken	2.0%
Shriveled, diseased & discolored	5.0%
Other coloured grains (maximum)	4.0%
Foreign matter	0.5%
Total defective grains	9.0%
Aflatoxin (maximum)	10ppb

*Source: WFP-Rwanda*

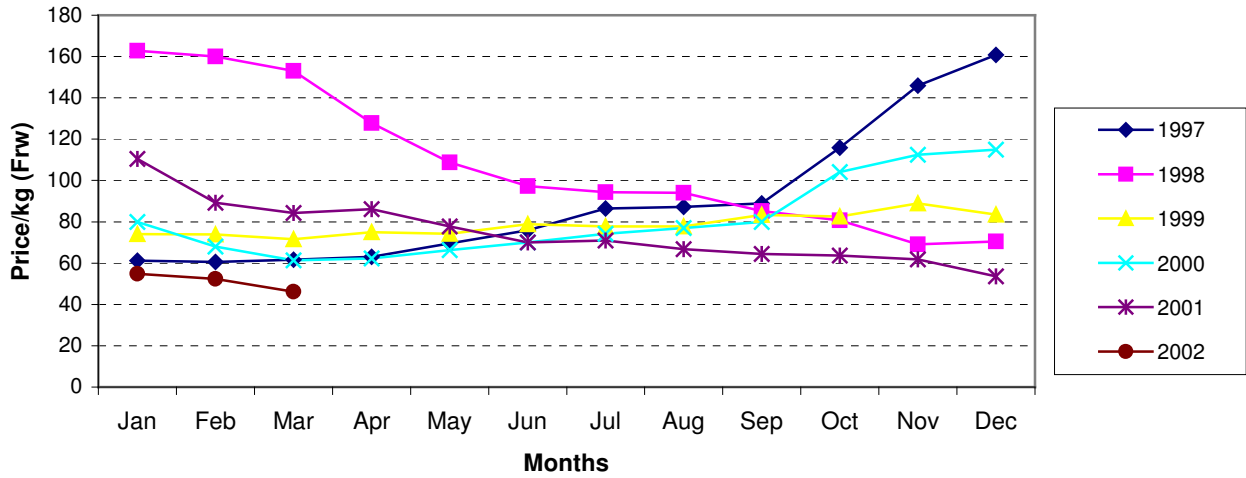
Also, the product should be fumigated and should be free from live weevils. The quantity of dead weevils should not to exceed 10 per kilo.

#### **4.4 Price**

As maize has increasingly become a major tradable commodity and given the liberalization policy, the volatility in maize prices has increased in recent years as price determination is left to the rules of supply and demand and is subject to the weather conditions.

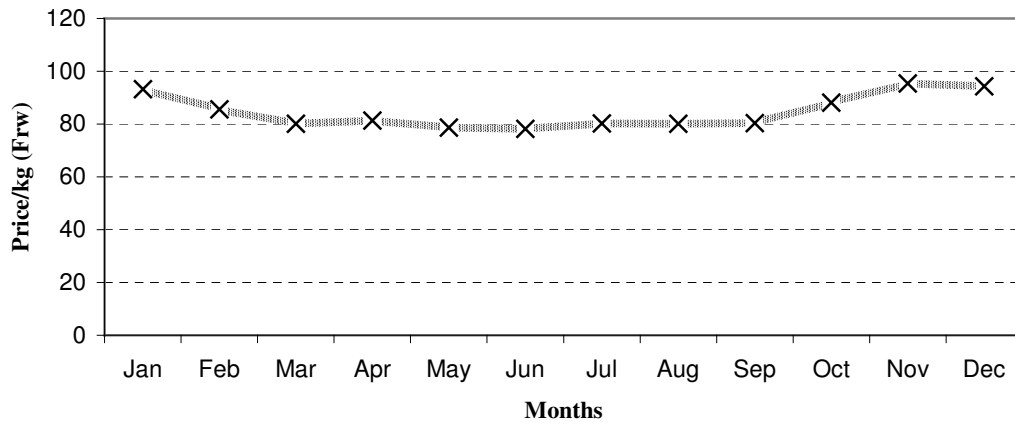
Given the liberalization program that the government is currently pursuing, maize movement, pricing, imports, exports are entirely carried out by the private sector. Private sector participation has increased substantially and supplies maize easily to all parts of the country at competitive prices that fluctuate more than before.

**Figure 1.10: Yearly rural consumer price trend, 1997-2002**



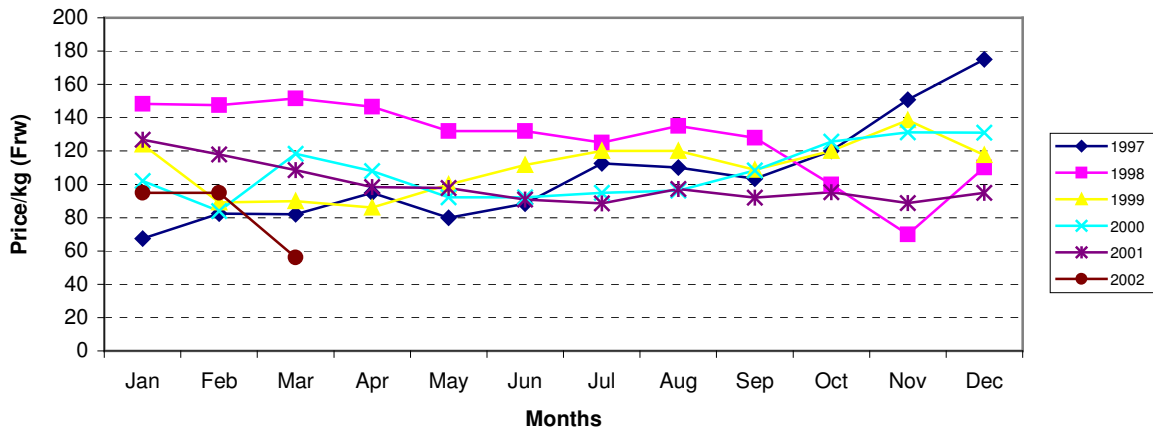
Source: Pasar price data

**Figure 1.11: Grand seasonal index for rural prices**



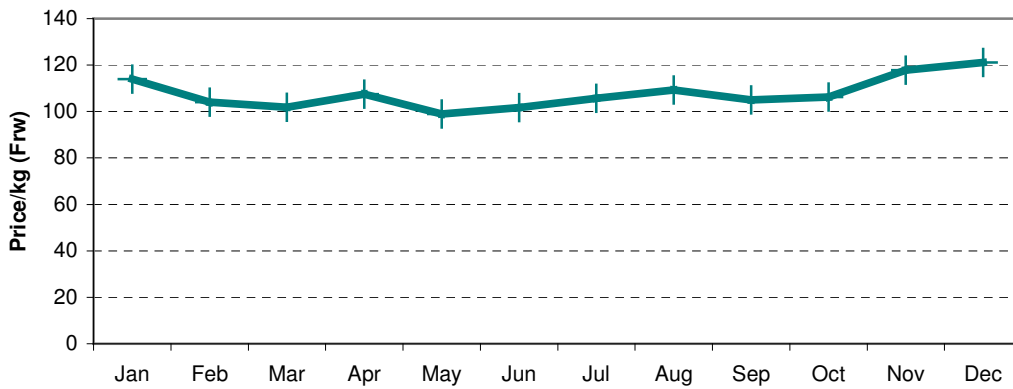
Source: Pasar price data

**Figure 1.12: Yearly price trends, Kigali**



Source: Pasar price data

**Figure 1.13: Grand seasonal index, Kigali**



Source: Pasar price data

Generally prices are lowest during harvest and increase prior to the next harvest. Prices decline at the beginning of the year reaching a minimum around March. Rural prices during this period may vary from about Frw 20 to about Frw 30 per kg. Prices continue increasing reaching a peak at the end of year ie December. Prices may reach as high as frw 120 per kg during this period.

During the time of the survey maize seed was selling for 200 frw/kg and traders were buying it at 150frw/kg from the National Seed Association. On the other hand, the retail price for white flour in Kigali was ranging between 120frw/kg to 130frw/kg.

Also, during the time of the survey, Ugandan maize was costing higher at 90-95 frw/kg while Rwandan maize was costing less at 80-85 frw/kg in Kigali. In Goma one of the sources Maize was costing about US\$ 13 for 100 kgs (white maize) and US\$ 10 for 100 kgs of yellow maize. Grain from outside is subject to a tax of 5%.

Selling price to WFP varied with traders, depending on the time the contract was made. However, most traders had a problem as the rise in prices long after the contracts are made affect their margins.

#### **4.5 Regional market**

Maize is the staple food in most parts of Eastern and Southern Africa and is produced by nearly all countries in the region. However, production is failing to keep pace with increasing demand in much of the region, making maize one of the major traded commodities across regional boundaries.

Within East Africa, Tanzania is the number one producer followed by Kenya and Uganda in that order. In Kenya, Nakuru district alone produces 200,000 tonnes per annum, which is about 4 times more than the whole of Rwanda produces. Unlike Rwanda, maize in Kenya is produced both under large and small-scale production. About 25% of production is under large-scale production (>20 ha). In Kenya the main consumers of maize are the millers of maize meal for human consumption. The second use is by the feed industry with a capacity of about 300,000 tonnes of animal feed per annum.

Maize trade flows are determined more by the theory of comparative advantage as countries in the region aim to create a free trade area. Thus, despite being a major producer Kenya imports maize from Uganda and Tanzania, which are cheaper producers in the region. On-farm prices can be at about 55.6 US \$ per tonne during harvest, while similar prices in Uganda can be as low as US \$ 15.7 per tonne. On the other hand, consumer prices in Nairobi ranged between 111.1 to 138.9 US\$ per tonne during the same period.

Wholesale prices in Western Uganda around first quarter of year (2003) is about US \$ 70 per tonne. Data indicated that maize was moving into Rwanda from Uganda. Also, Tanzania was a major exporter of maize into Rwanda.

A similar situation has been pertaining in the Southern African region where production during 1998 was estimated at about 16.24 million tonnes, representing a decline of about 5% over the previous years' output of 17.05 million tonnes in 11 of the 14 countries. Consequently in 1998 an estimated 2 million tonnes of maize were imported by SADC countries to cover the shortage. This deficit increased to about 4 million tonnes in 2002.

Given this scenario, Uganda, which has been the main exporter of maize to Rwanda has been looking to this southern market. This has created pressure on the demand for maize in Uganda and thereby reducing flows into Rwanda as the southern market seems to offer better prices. Ugandan traders were expecting to export up to 60,000 tonnes in 2002 to the Southern countries of Malawi, Zimbabwe and Zambia with Zambia having the strongest comparative advantage due to the good rail route.

At the moment trade barriers exist in form of taxes. The Government charges import duty of 5% and VAT of 18% if the product is processed while unprocessed products are exempted from VAT and only pay import duty of 5%. However, if the rules of regional and world trading bodies render this impossible, Rwandan producers may face a bigger challenge, being high cost producers. On the other hand, Uganda charges higher tariff rates. These include 6% import duty, 4% withholding tax and 2% import license commission. For trucks Uganda charges Uganda Shillings 73,000 for foreign registered 10 tonne trucks while foreign registered trailers pay Ug Sh 128,000.

## 5. Supply Analysis

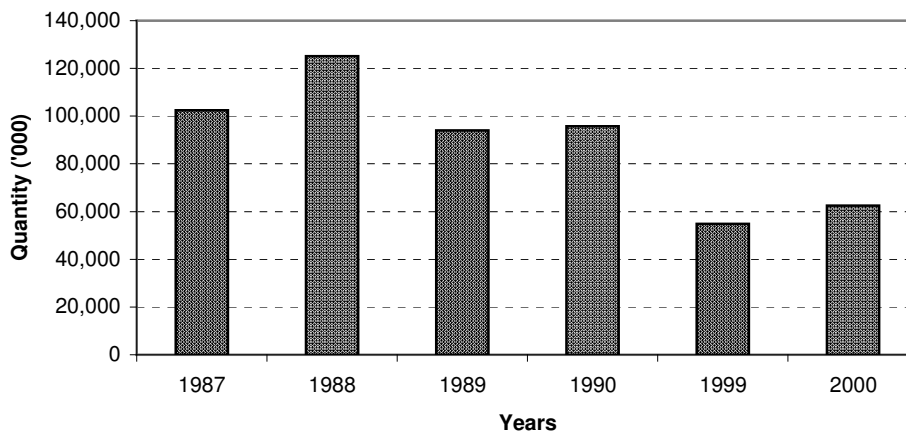
### 5.1 Production

As earlier stated maize is one the major crops in Rwanda, ranking fifth among food crops and second among cereals after sorghum. Maize is cultivated in the whole country and is essentially intercropped with beans. Maize crop has become increasingly important in Rwanda and has recently been targeted by the Ministry of Agriculture in its fight for food security, household incomes and the enhancement of nutritional standards. Maize has also become popular due to its high market potential and easy storage and its production is expected to increase.

Mono cropping occurs in the major production areas, which include the volcanic highlands, the Congo-Nile Crest and Umutara and where maize is a basic food for small-scale farmers. In total these areas account for about 60% of total production.

According to data from MINAGRI's department of statistics, Gisenyi was the highest producer in 2000, followed by Ruhengeri and Cyangugu. Also, Gisenyi and Ruhengeri were the only provinces which registered positive growth in output over the period 1987-90, with Gisenyi having an increase in output of about 77%.

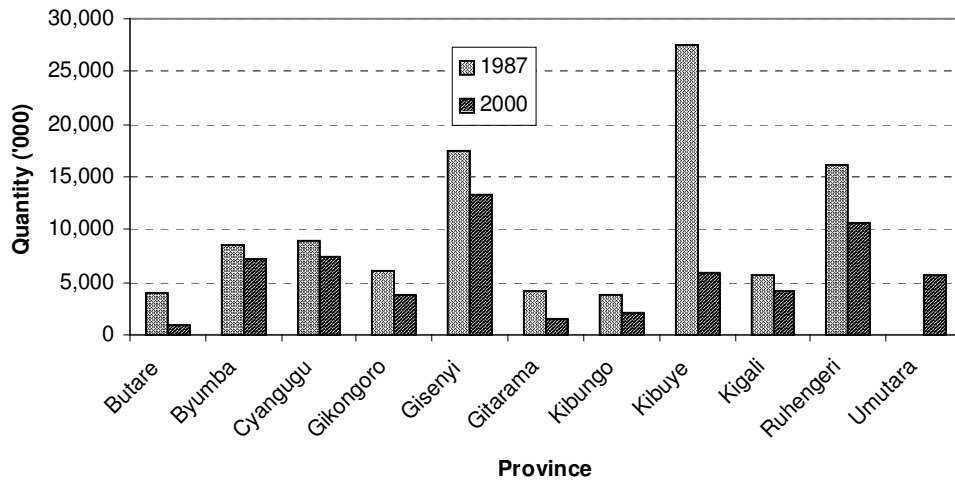
**Figure 2.1: Maize production ('000) 1987-2000, Rwanda**



Source: MINAGRI

Available statistics show that there has been a decline in production of about 39% over the period 1987-2000. Average production for the period 1986-2000 was estimated at about 70,000 tonnes per annum. The figure for the pre-war period (86-90) was about 90,000 tonnes per annum while that for the post war period (97-00) was estimated at about 60,000 tonnes per annum, making Rwanda one of the lowest producers in East and Southern Africa.

**Figure 2.2: Production variation by province**



Source: MINAGRI

The main internal supply occurs around January/February, which is the harvest for the main production season in the country. During this time an estimated 50,000 tonnes were produced in Rwanda in 2000 compared to about 80,000 tonnes, which were produced in 1990, representing a decline of about 60%. Production in the minor season starts coming on the market beginning June/July. On average only about 10,000 tonnes is produced in this period. Thus, the main supply from Rwanda occurs in February. As already indicated internal production has failed to keep pace with demand and Uganda and Tanzania supplement internal production with supplies from Uganda reaching a peak in March and August through to September.

Major supply problems include periodic shortages and poor quality. Storage is also a problem. Rwandan maize is of mixed colors and hence traders incur sorting costs. There is no grading to fetch high price and market information which is mainly got from traders is also limited. For most traders, there are no associations while credit is limited to the big traders.

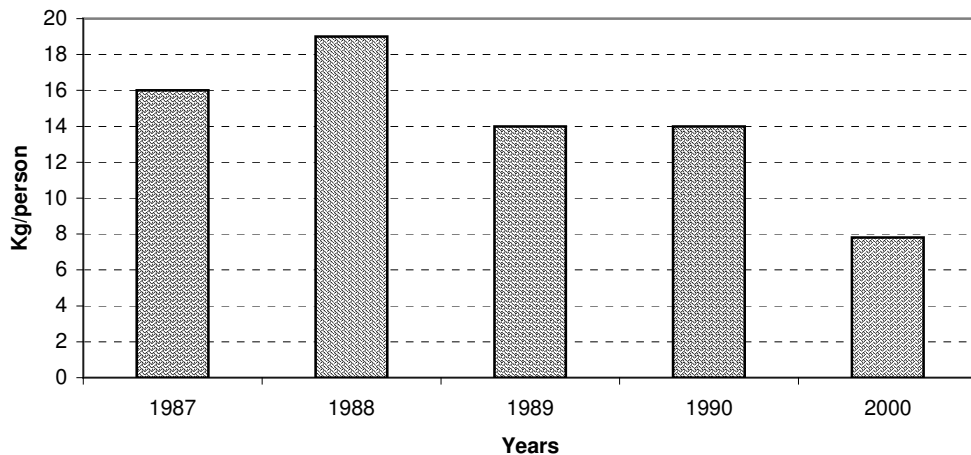
There are two main varieties ie Nyirakagoli (local population) and Katumani which is the improved variety. Although Katumani is preferred due to its high yield, its application is minimal. There is low supply of improved seed. Also the high price of improved seed contributes to its low application by the farmers. Yellow maize (pool 8a also called samesa) is being grown for cattle while the white (pool 9a also tamira) is grown for human consumption especially in Ruhengeri.

In a bid to increase maize availability, traders are organising farmers in associations, providing them with seeds, and fertilizers and buying back their produce. This is in

addition to purchases that they make from rural assemblers and farmers. Most big traders indicated they receive less quantities from Rwanda (about 20%) mainly from Gisenyi, Ruhengeri and Umutara. The bulk of their supplies are delivered from Uganda and Tanzania. Apart from the problem of insufficiency, Rwandan maize also has to be sorted and graded to form uniformity and this generally caused and about 25% lost

**Figure 2.3** below gives trends in per capita maize production in Rwanda over the period 1987-2000 by province and total. While maize production has generally decreased, the population has been increasing leading to a sharp fall in per capita maize production. Per capita production has declined from a national figure of about 16 kg per person in 1987 to about 8 kg per person in 2000, representing a decline of about 50 %. Over the period 1987-90 per capita production declined for all the provinces of Rwanda with the exception of only Gisenyi. The declined was highest in the provinces of Cyangugu, Gikongoro and Butare. On the other hand the provinces of Umutara, Gisenyi, Cyangugu and Kibuye showed high per capita production during 2000.

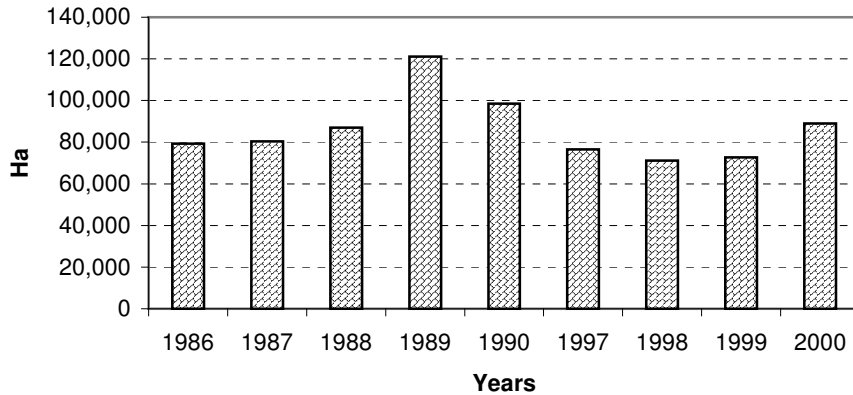
**Figure 2.3: Per capita maize production by province**



Source: MINAGRI

**Figure 2.4** below on the other hand shows the acreage planted to maize over time. Similarly, there has been a decline in this production parameter. The acreage planted to maize has averaged about 90,000 ha per annum over the period 1986 to 90. It consistently increased from 1986 reaching a peak of about 120,000 ha in 1989 and then fell in 1990 to about 98,000 ha.

**Figure 2.4: Acreage planted to maize**

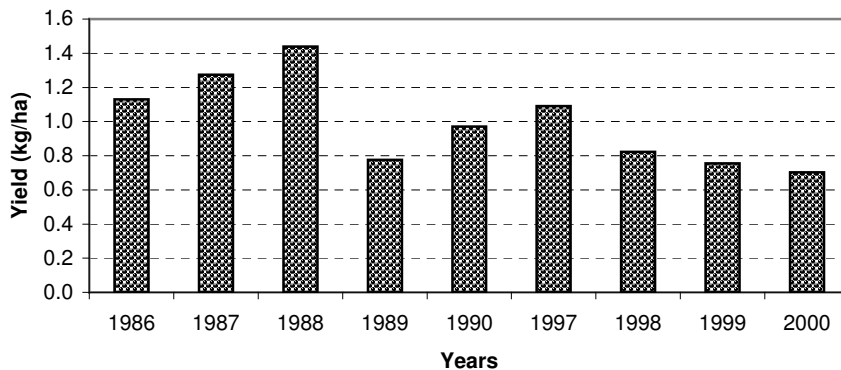


Source: MINAGRI DATA

As is expected the acreage during the post war period declined further reaching an average of about 80,000 ha per annum. One reason that was advanced for this is the increasing pressure on the land from an increasing population. However, the Govt is giving the maize crop high priority and more land might be devoted to maize production. This will have to be either substituted from other crops or farmers will have to move into marginal or previously gazetted areas.

The yield for maize (**Figure 2.5**) has also declined in recent years. During the pre-war period average yield was estimated at about 1.1 kg per hectare. However, this declined to an average of about 0.8 kgs per hectare for the period 1997-2000. This is below the average for Eastern and Southern Africa (1.5 kgs/ha – FAO data).

**Figure 2.5: Yield of maize (kg/ha)**



Source: MINAGRI

Some of the factors responsible for this includes the low application of fertilizer, poor agronomy and low usage of improved or hybrid seed.

## **5.2 Principle constraints to production of this commodity**

### **5.2.1 Agronomic**

Generally, there are low standards of farm management especially soil fertility conservation. There is limited use of manure or mulches due to limited number of livestock and the poor resource base for most of the farmers. This partly contributes to declining soil fertility and the resultant low yields.

Also, declining soil fertility levels results from continuous cultivation, without fallowing, use of chemical fertilizers, or rotation.

Due to land pressure, there was little practice of crop rotation, further depleting soil fertility. Also, a complex of soil erosion and nutrient exportation through harvested crops also contributed to the decline in soil fertility.

Drought stress is one of the two physical factors most responsible for limiting maize production in developing countries; soil infertility is the other. The tendency for maize to be grown in areas subject to the vagaries of rainfall is thought by some to be a major reason why improved varieties and management practices have diffused more slowly for maize

### **5.2.2 Disease and insects**

Among the biotic stresses, taricum leaf blight is a major hindrance. This is followed by polysora rust. Striga spp, previously confined to the south-east of the country, is fast invading Umutara province, a major production area.

### **5.2.3 Infrastructure**

The state of infrastructure has a major bearing on the performance of markets in Rwanda. Production is on many millions of scattered small holdings most of which have limited access to roads, communications and storage facilities. Consequently the costs of marketing the produce from rural areas to urban consumers is relatively high compared with areas that enjoy easy access to roads and stores.

Within the rural communities distances are covered on foot or by bicycle. As such volumes transported to these rural markets are usually small while a lot of time is taken trying to get the produce to the market.

#### **5.2.4 Inputs (fertilizer, pesticides, seeds, labour)**

In general application of inputs is minimal and the hoe is the main equipment used for tillage. Fertilizers and chemical sprays are used on some crops such as potatoes and cotton but not for maize.

In spite of major positive developments in the production of high yielding hybrid seeds, these are not used widely by the rural farmers.

The use of pesticides is used only on higher value crops such as potatoes and cotton but use is minimal on maize

Rwanda imports about 7,000 tonnes of fertilizer. This is one of the lowest in the world. Recent policy changes to stimulate higher fertilizer imports and usage have been to give all fertilizers a zero import tax rating. Development of this sector depends on progress in sales via the output markets and whether donors continue to dump free or highly subsidized fertiliser into the market.

#### **5.2.5 Finance / credit**

Access to credit is limited. Few institutions are willing to lend to small holders as they do not have collateral and farming is viewed as a long-term high risk opportunity.

#### **5.2.6 Technical skills of labour force**

Generally, labor is unskilled. Production is mostly for subsistence with reliance on family labor. Lack of capital implies that labor does not require high skills to carry out most of the farm operations.

### **5.3 Seasonality of supply**

The country enjoys two seasons. Main planting season starts in September. Supplies from this season enter the market from late December up to February. This is also the time of lowest prices within Rwanda and according to traders consumption relies on internal output.

The minor supply season starts in June/July. Supplies during this time are not abundant as they come from the minor growing season

During the off season in Rwanda supplies come from mainly Uganda and Tanzania. Ugandan supplies supply the market from August, September up to December. Price trends reflect this seasonality in supply as shown in **Figures 1.10-1.13**.

## 5.4 Regional flows

Maize is the staple food in most parts of Eastern and Southern Africa and is produced by nearly all countries in the region. However, production is failing to keep pace with increasing demand in much of the region, making maize one of the major traded commodities across regional boundaries.

Within East Africa, Tanzania is the number one producer followed by Kenya and Uganda in that order. In Kenya, Nakuru district alone produces 200,000 tonnes per annum, which is about 4 times more than the whole of Rwanda produces. Unlike Rwanda, maize in Kenya is produced both under large and small-scale production. About 25% of production is under large-scale production (>20 ha). In Kenya the main consumers of maize are the millers of maize meal for human consumption. The second use is by the feed industry with a capacity of about 300,000 tonnes of animal feed per annum.

Maize trade flows are determined more by the theory of comparative advantage as countries in the region aim to create a free trade area. Thus, despite being a major producer Kenya imports maize from Uganda and Tanzania, which are cheaper producers in the region. On-farm prices can be at about 55.6 US \$ per tonne during harvest, while similar prices in Uganda can be as low as US \$ 15.7 per tonne. On the other hand, consumer prices in Nairobi ranged between 111.1 to 138.9 US\$ per tonne during the same period.

The wholesale price in Western Uganda around the first quarter of year (2003) is about US \$ 70 per tonne. Data indicated that maize was moving into Rwanda from Uganda. However, it was not possible to obtain exact figures. Also, Tanzania is a major exporter of maize into Rwanda.

A similar situation has been pertaining in the Southern African region where production during 1998 was estimated at about 16.24 million tonnes, representing a decline of about 5% over the previous years' output of 17.05 million tonnes in 11 of the 14 countries. Consequently in 1998 an estimated 2 million tonnes of maize were imported by SADC countries to cover the shortage. This deficit increased to about 4 million tonnes in 2002.

Given this scenario, Uganda, which has been the main exporter of maize to Rwanda has been looking to this southern market. This has created pressure on the demand for maize in Uganda and thereby reducing flows into Rwanda as the southern market seems to offer better prices. Ugandan traders were expecting to export up to 60,000 tonnes in 2002 to the Southern countries of Malawi, Zimbabwe and Zambia with Zambia having the strongest comparative advantage due to the good rail route.

At the moment trade barriers exist in form of taxes. The Government charges import duty of 5% and VAT of 18% if the product is processed while unprocessed products are exempted from VAT and only pay import duty of 5%. However, if the rules of regional

and world trading bodies render this impossible, Rwandan producers may face a bigger challenge, being high cost producers. On the other hand, Uganda charges higher tariff rates. These include 6% import duty, 4% withholding tax and 2% import license commission. For trucks Uganda charges Uganda Shillings 73,000 for foreign registered 10 tonne trucks while foreign registered trailers pay Ug Sh 128,000.

There have been reports of cross-border trade but these trade flows are not well documented in terms of volumes, period by country. Official statistics are incomplete in many cases and there seems to be no agency charged with their monitoring. Consequently it was difficult to obtain a complete annual data set.

The country has become a major maize importer in the region. Estimates are thought to have increase given the growth in volumes traded coupled with declining production.

**Table 1.5** gives the estimated imports of maize into Rwanda from the neighbouring countries for the two periods of July-December 1999 and January to June in 2001.

**Table 1.5: Estimated imports (tonnes) by origin, Rwanda**

Country	July – December 1999		January - June 2001	
	Grain	Maize/wheat flour	Grain	Flour
Burundi	1.4	0	0	0
DRC	740	0	1	95.5
Tanzania	9,154.8	719	188.7	1,331.1
Uganda	101.4	26.6	10,561.2	225.2
Others			78.6	5,814.7
<b>Total</b>	<b>9,997.6</b>	<b>745.6</b>	<b>10,829.5</b>	<b>7,466.6</b>

*Source: Joint Crop Assessment*

## 5.5 Description of trading chain

Maize trading is very dynamic with complex marketing organisation traversing countries within the region. The chain comprises farmers, rural assemblers, traveling traders, wholesalers, retailers and consumers (**Figure 2.6**). In some cases, there is vertical integration, aimed at maximizing returns.

### 5.5.1 Farmers

These are the first link in the marketing chain. They are both producers and consumers. Over 52% of the production is consumed on farm. They sell during harvest rarely storing due to cash needs. Later they buy back maize for use as seed and food. Transactions are either carried out on the farms (households) or at market. At market farmers transact with consumers, as they take on the added function of transporting produce to market.

Farmers generally have limited market power. They usually sell smaller quantities and enjoy little bargaining power, as they need cash. They lack credit. They typically sell as individuals and are essentially price takers. Farmers who live near the main road, have better market information.

### **5.5.2 Rural traders**

Given the fragmented nature of production rural traders play a vital role in assembling produce from farmers. They have contact with farmers and move from farm to farm purchasing the small quantities farmers offer. They store the produce waiting to supply larger orders from traveling traders. Rural traders are usually found in small trading centers, which can be reached by trucks. Their inputs are labour and working capital.

Transport of sacks to collection points or to rural traders is carried out by farmers or by rural assemblers themselves. Assemblers often buy in the field and hire labor to transport sacks either on their heads.

In a few cases, rural assemblers buy and store produce in their premises for months. Those who store enjoy relatively higher margins although a few traders talked to revealed that this might not be the case due to supplies from elsewhere. However, where it occurs their gross margins are higher.

Rural traders provide growers with direct payment in cash. The service they provide traders where they act on their behalf is assembly of complete truckloads.

### **5.5.3 Traveling traders**

Within producing areas traveling traders purchase maize from either farmers and or rural traders and there after pack and weigh the maize. Normally they traverse long distances and transportation is their main function.

Transport is a major constraint and traders try to minimize this cost by increasing the weight of the bag. A bag being the unit of transport. As bags are not weighed during transportation, traders tend to reduce costs by moving large sized bags of more than 100 kgs. Consequently this cost is passed on to the transporter in form high rates of vehicle depreciation resulting in high maintenance costs. The profit margin of these local transporters varies between 10% and 35% per load, depending on distance and road quality.

Travelling traders at times sell in weekly rural markets. Turnover per trader is limited with volume rarely exceeding 2 sacks. Most traveling traders have good contacts with transporters. The tonnage of the trucks varies from 3.5 tonnes to 10 tonnes. These trucks dominate transport from the supply areas to the important Nyabugogo wholesale market in Kigali.

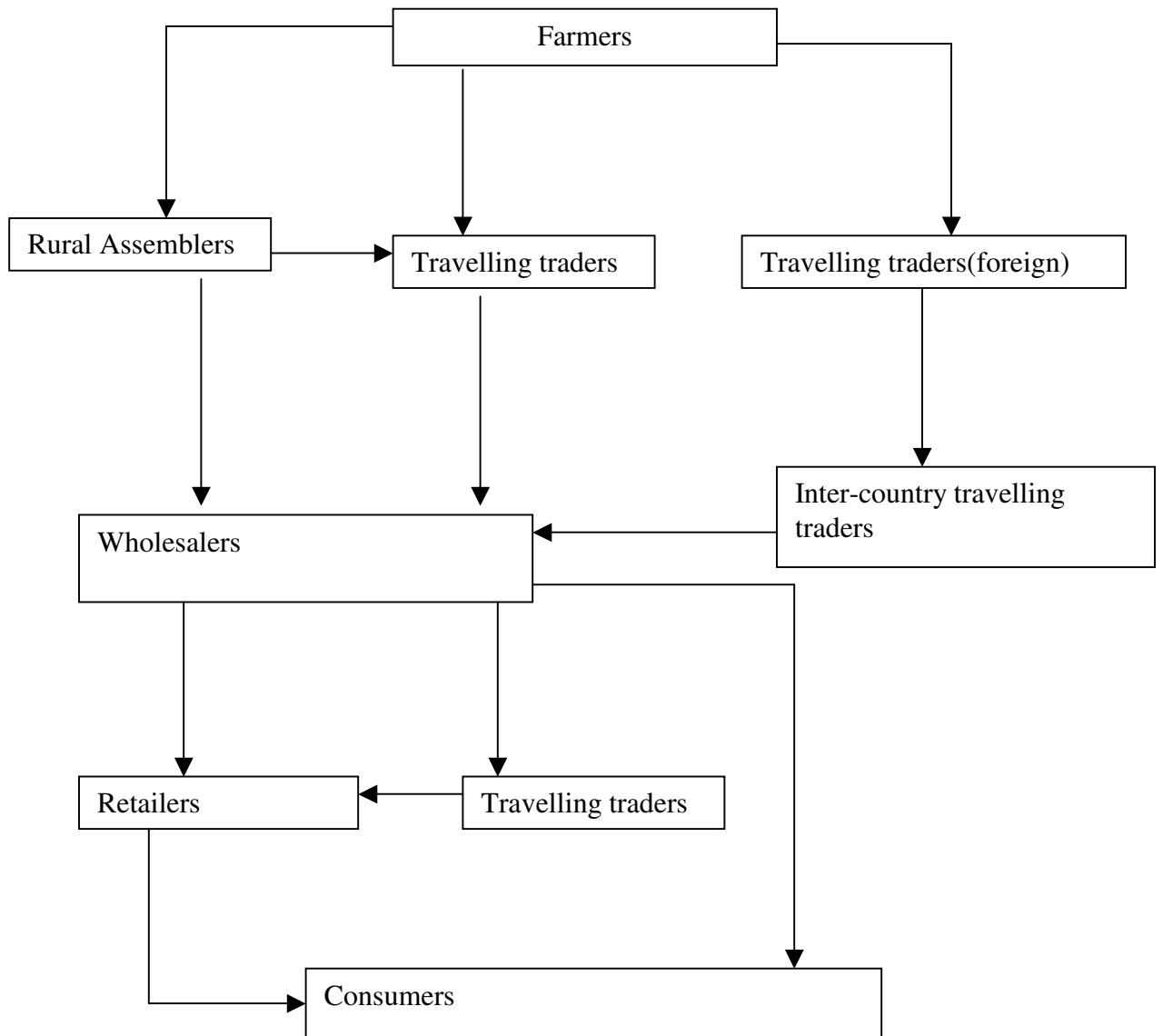
#### **5.5.4 Urban wholesale markets**

Nyabugogo is the main wholesale market supplying Kigali province. Several wholesale stores exist in this location and provide a stop center for maize supplies from within and outside of Rwanda. These traders play an important role as they store and make the product available to the consumers when they need it.

#### **5.5.5 Retail markets**

Distribution in urban areas is through retail markets mostly with stalls or small retail shops in the city neighbourhood. All retailers buy their maize from Nyabugogo stores and generally add not more than 5 Frw as their marketing margin. They all calculate their price as a function of the Nyabugogo price. Therefore, prices in different markets vary directly with each other.

**Figure 2.6: The Maize trading Chain**



## 5.6 Trading margins

The margins are averages, giving a rough indication of the relative importance of the different cost components of marketing functions.

It was quite difficult to obtain thorough data on market margins as they touch on the incomes of the traders who may not wish to divulge more accurate data. However, an attempt was made to try and obtain realistic estimates.

**Table 1.6: Costs and margins within the trading chain**

Marketing agent	Frw/kg	US\$/tonne	% of selling price
<i>Farmer</i>			
Sells	50	101.0	
<i>Rural assembler</i>			
Buys	50	101.0	
Sells	55	111.1	
Gross margin	5	10.1	9.1
<i>Wholesaler</i>			
Buys	55	111.1	
Sells	85	171.7	
Gross margin	30	60.6	35.3
Costs			
Transport	7	14.1	
Loading/unloading	2	4.0	
Bagging material	2	4.0	
Packaging	1	2.0	
Cleaning	11	22.2	
Fumigation	0.9	1.8	
Labeling	1.6	3.2	
Total costs	25.5	51.5	
Net margin for grain	4.5	9.1	5.3
Processing	15	30.3	
Cost of flour	112	226.3	
Selling	120	242.4	
Net margin for flour	8	16.2	6.7

Source: Field data

**Table 1.6** was constructed using data collected during fieldwork in Kigali and Goma in the DRC. Margins for travelling trading within the chain are for both Congo and Rwanda.

Margins change according to season, with farm gate prices increasing towards harvest time. Apart from seasonal fluctuations, margins are also affected by short-term fluctuations in trading activities in terms of supply, depending on the quantities coming on the market.

Although data in the table reveals that travelling traders enjoy a large gross margin, profitability is quite modest, once their numerous costs have been deducted. In addition, their net returns should be put in the context of the high risk they face, especially in terms of uncertain market prices. According to the travelling traders, market prices are highly volatile and may vary by as much as the traders margin on a daily basis.

## **6. Institutional and market barriers**

### **6.1 Marketing barriers (local, national and regional)**

The share of food costs to the consumers that is accounted for by marketing costs is a measure of marketing efficiency. In Rwanda, this share is still large (over 40%) implying that maize markets are inefficient. Like other developing countries, several factors are responsible for this phenomenon. Marketing barriers mentioned by traders include the various trading taxes being charged. Most of the traders felt these are high compared to their level of trading. Also, cross border tariffs constitute the major problem affecting regional traders. The other problems that traders mentioned are lack of information and high transport charges.

#### **6.1.1 Finance**

This is still a major problem in the production and marketing of maize in Rwanda. Marketing is carried out by small-scale traders who are mostly resource constrained. They lack the necessary finance to carry out more efficient large-scale operations in order to reduce the unit cost per output. However, there exists a few big traders.

#### **6.1.2 Price information**

Price information is done through traders. There is a project that is collecting market prices but this is not disseminated to traders. Also, farmers do not receive market information and hence do not take advantage of market premiums.

#### **6.1.3 Grades and standards, health certifications**

Grading is minimal. Farmers grow mixtures mainly for food security reasons. However, quality issues are beginning to assume great importance and there is need for farmers to take advantage of this. This development is viewed as an important process in improving the marketing of maize.

#### **6.1.4 Quality control measures**

Quality control measures are still weak and this problem is exacerbated by the small amounts that farmers bring on the market. Methods for post harvest handling are still largely traditional and labor intensive.

## **6.2 Institutional and policy constraints**

### **6.2.1 Private sector organization / institutional set-up along the production / marketing chain**

While the private sector is increasingly becoming the main driving force behind sub-sector growth in terms of market provision and production, there are at this time no traders associations, which could work with Government and Research to address the socio-economic constraints at the moment. Developing private sector associations may therefore be one way to start a process of developing partnerships between the private and public sectors through a body that can represent the needs of the trades and negotiate with the public offices of research and government.

### **6.2.2 Government barriers**

Barriers from the government are mainly in form of the tax regime from different levels of government and the indirect macro-economic impacts like poor infrastructure and the high costs of transport.

### **6.2.3 Trade barriers**

Trade barriers are contained in the tariff rates that traders who are crossing frontiers have to meet. Most of the traders feel these taxes are too high. High tariff rates are considered to hinder further trade within the region. Information about tariffs was available at the border. As with many taxes in Africa, it would be difficult to ascertain the percent of taxes actually paid as borders tend to be highly porous.

In regard to Government levies it may well be more effective to raise fuel and transport taxes to vehicles and remove the border and inter-district taxes that tend to cause delays and are probably not well monitored.

## **7. The way forward: Production and export growth strategies for the sub-sector**

### **7.1 Development strategies for the sub-sector**

Breeding programs should focus their activities on different market opportunities, in addition to the traditional production constraints. Farmers produce maize not only for food but also sale in markets and therefore varietal development should aim to meet market trends. The market trends revealed in this survey are (i) increasing demand for more maize (ii) demand for clean, white maize (iii) seasonal supply of maize and relief markets (tender for local producers).

### **7.2 Priority requirements (changes in production, processing and quality control and enhancement, product differentiation, technology and investment.**

Breeding for resistance to diseases and pests, and for better yields, is important and should continue. This will make a difference to the small-scale farmer by increasing yields and income.

The introduction of improved technology has increased small-scale farming production in many areas, thus improving family nutrition and income. For example, in the Great Lakes region of Africa, the population is increasing rapidly and farms are tiny (0.5-1.0 ha) with no land for expansion. Hybrids were introduced and now Rwandan farmers grow these hybrids to assist increase yields.

### **7.3 Priority Government Intervention to support the production and export development strategy**

Areas where government assistance will have greatest impact on production and growth from this sub-sector include the following:

#### **7.3.1 Infrastructure development**

Appraisal and investment in mainly feeder but also a few main roads is vital in lowering transport costs and ensure that maize get to the consumer especially in times of rain when roads become impassable. The high cost of transport is one of the major factors causing high market prices.

Increasing population pressure, which is leading to the opening up new areas with poorer access further points to the need for opening up these feeder roads.

### **7.3.2 Improved seed / product improvement**

Population increases and the resultant reduction in cropland have in recent times partly been responsible for the ever-widening disparity between maize production and demand. This therefore makes investments in high yielding seed one of the best options to combat the resultant low per capita maize consumption. A lot of progress has been made in this direction but what is still pertinent is to increase the adoption rate of these improved technologies. ISAR and ATDT have been successful in developing several new varieties of maize that are resistance to a number of pests and diseases. These varieties need to be selected by farmers groups through extension providers.

Seed of the most promising variety needs to be bulked and supplied to recognised farmers associations through a system that is sustainable. This task may be initiated by public service providers but should rapidly shift into the private sector. Support schemes should aim to build private sector capacity in this area rather than building capacity in free distribution schemes through NGOs. Under the current circumstances in Rwanda, i.e. of many millions of very poor farmers the transition from a system of free distribution to a financially based system will not be simple. However to avoid this will continue to undermine the process of market reform.

### **7.3.3 Processing efficiency**

The survey found processing of maize to produce value added products. What is relevant for Rwanda is increasing processing efficiency, minimizing losses and increasing the return on investments through (i) cleaning (ii) bulking and (iii) grading. For this to occur there is need to provide appropriate technologies for small-scale processors.

### **7.3.4 Market information**

Market information is vital for increased production and investments in the sub-sector. At the moment price information is being collected but its use by the traders and other stakeholders needs to be improved. Also, there is information about niche markets, their requirements and penetration but this needs to be packaged and availed to farmers in a detailed, continuous and integrated way. There is thus need to collect and provide this vital information to the users.

### **7.3.5 Attracting foreign investment and technology**

Technology is still poor. Virtually all operations rely heavily on labor whose output is not only low but also of a poor quality and untimely. Attracting technology both for production and processing is vital to increase utilization and stimulate demand. Also, improved technology will lower the costs per unit of output and hence increase the level of investments.

#### **7.4 Areas where donor assistance might be best applied.**

Although there are biological constraints where donor assistance has helped a lot, there are other major constraints to increased production and marketing of maize in Rwanda. Socio-economic factors also affect farmer adoption of new technologies, seed distribution while market requirements may also restrict maize production.

The development and use of new technology is limited by the degree of organisation, resources, and the number of trained personnel within national programs. Donor countries could play a great role in assisting national governments/programs to address some of these issues.

Networks have proved to be most efficient in introducing new technologies to the small-scale farmer. They include international organisations, national research institutions, state and private universities, ministries of agriculture, and nongovernmental organisations.

The small-scale farmer's main cost and biggest problem is often the purchase of high-quality seed. Network members have supported small holders by supplying high-quality seed at low cost. But there is an urgent need to develop strategies for its production, distribution and adoption as still many farmers rely on own seed.

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## Appendices

**Appendix 1: Characteristics of main crops (National Average)**

Crop	Caloric cost (Frw/1000 kcal)	Yield per hectare per season				Index of crop cover (c-value) (%)	Sales price (Frw/kg)
		Weight (kg)	Value (*000 Frw)	Energy (mill.kcal)	Protein (kg)		
Beans	13	838	29	2.50	164	19	31
Peas	19	272	16	.90	56	15	62
Sorghum	9	1016	23	3.10	73	40	19
Maize	9	1010	23	3.30	86	35	19
Sweet Potato	9	4527	40	4.20	65	23	8
Cassava	7	2185	17	2.20	11	26	9
White potato	26	6102	78	3.50	73	22	10
Taro	15	1580	20	1.30	22	35	12
Cooking banana	10	6788	51	5.40	48	4	7
Beer banana	6	6788	31	5.40	48	4	4
Banana beer	41	6788	47	1.30	9	4	27
Coffee	n.a.	256	21	n.a	n.a.	2	83

Note: Mean banana yield used for all bananas

Source: yields: 1989-1991 means computed from DSA/MINAGRI farm survey data

C-values: Lewis (1986); Prices: 1990 means computed from DSA/MINAGRI data

**Appendix 2: Average Kcalories per capita per day 1984, 1986-1990, Rwanda**

Province	BanaC	BanaB	BanaF	Bean	Sorg	Maize	Sweet Potato	Cassava	Irish Potato	Peas	Total	+SEASON C
Butare	97	151	44	332	267	42	549	264	13	12	1772	1985
Byumba	241	143	80	422	403	101	419	62	25	27	1923	2153
Cyagungu	218	128	72	178	20	147	229	153	11	13	1170	1310
Gikongoro	26	66	15	159	142	102	700	102	16	33	1359	1523
Gisenyi	66	128	21	207	24	345	284	53	130	22	1279	1432
Gitarama	149	201	90	310	165	46	379	309	14	13	1675	1876
Kibungo	984	274	150	394	232	55	204	129	8	15	2443	2736
Kibuye	61	70	19	210	84	606	483	76	56	59	1723	1930
Kigali	221	186	61	377	318	66	243	222	9	8	1712	1917
Ruhengeri	121	100	40	306	143	251	469	26	279	27	1762	1973
Rwanda	221	153	62	306	198	156	381	150	57	21	1703	1908

Source: *Joint Crop Assessment Report/MSU/MINAGRI*

Key: BanaC = Cooking banana; BanaB = Brewing banana; BanaF = Banana fruit; Sorg = Sorghum

**Appendix 3: Per capita demand\* (kgs) by rural, urban and total, Rwanda -2000**

<b>Province</b>	<b>Urban</b>	<b>Rural</b>	<b>Total</b>
Butare	6.6	2.7	3.1
Byumba	12.8	8.2	8.7
Cyangugu	4.9	10.8	10.2
Gikongoro	14.2	2.8	4.0
Gisenyi	6.1	11.4	10.9
Gitarama	1.9	4.1	3.9
Kibungo	10.0	5.8	6.2
Kibuye	7.4	7.3	7.3
Kigali Rural	8.0	7.1	7.2
Kigali City	4.4		3.8
Ruhengeri	11.4	7.0	7.5
Umutara	86.3	12.3	19.7
<b>Total</b>	<b>6.4</b>	<b>6.9</b>	<b>6.8</b>

*Source: Survey Calculations*

\* demand includes only traded output (kg) per person and is hence lower than total consumption

**Appendix 4: Total demand by province, urban, rural and total, Rwanda - 2000**

<b>Province</b>	<b>Urban</b>	<b>Rural</b>	<b>Total</b>
Butare	232	1,694	1,926
Byumba	160	6,100	6,261
Cyangugu	89	6,313	6,402
Gikongoro	146	1,409	1,556
Gisenyi	245	8,226	8,471
Gitarama	48	3,376	3,423
Kibungo	225	3,660	3,884
Kibuye	74	3,243	3,317
Kigali Rural	238	6,216	6,454
Kigali City	2,608		2,608
Ruhengeri	388	6,292	6,680
Umutara	413	3,798	4,210
<b>Total</b>	<b>4,866</b>	<b>50,327</b>	<b>55,193</b>

*Source: Own calculations*

**Appendix 5: Demand and estimated imports (tonnes) - Rwanda, 2000**

Province	Urban	Rural	Total	Output	Own consumption	Internal traded	Imports
Butare	232	1,694	1,926	926	482	444	1,482
Byumba	160	6,100	6,261	7,142	3,714	3,428	2,833
Cyangugu	89	6,313	6,402	7,350	3,822	3,528	2,874
Gikongoro	146	1,409	1,556	3,870	2,012	1,858	-302
Gisenyi	245	8,226	8,471	13,300	6,916	6,384	2,087
Gitarama	48	3,376	3,423	1,489	774	715	2,709
Kibungo	225	3,660	3,884	2,040	1,061	979	2,905
Kibuye	74	3,243	3,317	5,920	3,078	2,842	475
Kigali Rural	238	6,216	6,454	4,088	2,126	1,962	4,492
Kigali City	2,608		2,608				2,608
Ruhengeri	388	6,292	6,680	10,617	5,521	5,096	1,584
Umutara	413	3,798	4,210	5,760	2,995	2,765	1,445
<b>Total</b>	<b>5,347</b>	<b>49,083</b>	<b>55,193</b>	<b>62,502</b>	<b>32,501</b>	<b>30,001</b>	<b>25,192</b>

*Source: Own calculations using data from HLCS 2000*

**Appendix 6: Demand growth (tonnes) by rural, urban and total 2000-2015 - Rwanda**

<b>Year</b>	<b>Urban</b>	<b>Rural</b>	<b>Total</b>
2000	5,346	49,298	54,644
2002	7,525	50,188	57,713
2004	9,705	51,269	60,974
2006	11,884	52,552	64,436
2008	14,063	54,048	68,112
2010	16,243	55,771	72,014
2012	18,422	57,733	76,156
2014	20,602	59,949	80,551
2015	21,691	61,157	82,849

*Source: Own calculations*

**Appendix 7: Maize production ('000) by province and total 1987-2000, Rwanda**

<b>Province</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1999</b>	<b>2000</b>	<b>% change 1987-90</b>	<b>% change 1990-00</b>
Butare	4,069	3,014	1,904	2,119	581	926	-47.9	-56.3
Byumba	8,607	7,428	5,359	6,840	5,997	7,142	-20.5	4.4
Cyangugu	8,970	7,690	6,315	5,161	3,190	7,350	-42.5	42.4
Gikongoro	6,028	5,849	3,345	3,054	1,470	3,870	-49.3	26.7
Gisenyi	17,425	23,328	27,690	30,826	11,048	13,300	76.9	-56.9
Gitarama	4,204	4,162	2,403	3,037	1,869	1,489	-27.8	-51.0
Kibungo	3,810	3,070	3,585	3,324	2,112	2,040	-12.8	-38.6
Kibuye	27,489	36,557	18,977	18,538	17,990	5,920	-32.6	-68.1
Kigali Rural	5,745	9,098	7,271	4,121	2,687	4,088	-28.3	-0.8
Ruhengeri	16,092	24,978	17,105	16,976	6,161	10,617	5.5	-37.5
Umutara				1,690	1,807	5,760		240.8
<b>Rwanda</b>	<b>102,439</b>	<b>125,174</b>	<b>93,954</b>	<b>95,686</b>	<b>54,912</b>	<b>62,502</b>	<b>-6.6</b>	<b>-34.7</b>

Source: MINAGRI

**Appendix 8: Per capita maize production by province - Rwanda**

<b>Province</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>2000</b>	<b>% change 1987-90</b>	<b>% change 1990-00</b>
Butare	6	4	3	3	1	-50.0	-53.3
Byumba	13	11	7	11	9	-15.4	-14.5
Cyangugu	20	17	13	10	12	-50.0	22.0
Gikongoro	15	14	8	7	8	-53.3	10.0
Gisenyi	27	35	40	43	18	59.3	-59.3
Gitarama	6	5	3	4	2	-33.3	-55.0
Kibungo	7	5	6	6	3	-14.3	-48.3
Kibuye	67	86	43	41	13	-38.8	-68.3
Kigali rural	6	9	7	4	5	-33.3	12.5
Ruhengeri	24	36	24	23	11	-4.2	-50.4
Umutara					18		
<b>Rwanda</b>	<b>16</b>	<b>19</b>	<b>14</b>	<b>14</b>	<b>8</b>	<b>-12.5</b>	<b>-44.3</b>

*Source: MINAGRI*

**Appendix 9: Area planted to cereals (Ha) - Rwanda**

<b>Year</b>	<b>Sorghum</b>	<b>Maize</b>	<b>Wheat</b>	<b>Rice</b>	<b>Total cereal</b>	<b>Maize %</b>
1986	149,717	79,246	5,319	3,602	237,884	33.3
1987	155,935	80,429	5,840	3,184	245,388	32.8
1988	151,891	87,011	7,589	3,274	249,765	34.8
1989	132,440	121,140	7,290	4,492	265,362	45.7
1990	133,421	98,522	9,313	6,816	248,072	39.7
<b>Av 86-90</b>	<b>144,681</b>	<b>93,270</b>	<b>7,070</b>	<b>4,274</b>	<b>249,294</b>	<b>37.4</b>
1997	108,894	76,481	6,275	3,233	194,883	39.2
1998	114,639	71,212	5,700	4,144	195,695	36.4
1999	129,261	72,673	5,172	4,919	212,025	34.3
2000	174,195	89,053	10,043	4,266	277,557	32.1
<b>Av 97-00</b>	<b>131,747</b>	<b>77,355</b>	<b>6,798</b>	<b>4,141</b>	<b>220,040</b>	<b>35.5</b>

Source: MINGRI

**Appendix 10: Yield of cereals (kg/ha), Rwanda**

<b>Year</b>	<b>Sorghum</b>	<b>Maize</b>	<b>Wheat</b>	<b>Rice</b>	<b>Total cereal</b>
1986	1290.4	1130.5	1034.8	2343.1	1247.4
1987	963.3	1273.6	1077.7	2066.9	1082.1
1988	958.3	1438.6	1067.3	2105.1	1144.0
1989	958.1	775.6	1086.4	2595.7	906.0
1990	1068.8	971.2	749.1	1365.2	1026.2
<b>Av. 86-90</b>	<b>1047.8</b>	<b>1117.9</b>	<b>1003.1</b>	<b>2095.2</b>	<b>1081.1</b>
1997	1122.2	1090.8	955.7	3032.8	1136.2
1998	1051.4	823.1	726.3	1914.8	977.2
1999	832.2	755.6	697.4	1813.2	825.4
2000	890.4	701.9	641.6	2731.8	849.2
<b>Av. 97-00</b>	<b>974.1</b>	<b>842.9</b>	<b>755.3</b>	<b>2373.2</b>	<b>947.0</b>

Source: MINGRI

**Appendix 11: Cereal production, all seasons (tonnes), 1990-2000, Rwanda**

<b>Crops</b>	<b>1990</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>
<b>Cereals</b>	254,569	141,000	182,081	221,433	191,226	175,006	235,415
<b>Sorghum</b>	142,603	77,300	102,076	122,204	120,533	107,566	155,106
<b>Maize</b>	95,685	55,600	66,595	83,427	58,618	54,912	62,502
<b>Wheat</b>	6,976	6,000	6,814	5,997	4,140	3,607	6,444
<b>Paddy</b>	9,305	2,100	6,596	9,805	7,935	8,921	11,363
<b>Annual % change</b>		-41.9	19.8	25.3	-29.7	-6.3	13.8
<b>% of maize to total cereals</b>	37.6	39.4	36.6	37.7	30.7	31.4	26.5

*Source: FAO, MINAGRI (PASAR)*



**Appendix 12: Average crop production by province and total, 1984,1986-90, MT**

Province	Banana cooking	Banana Beer	Banana Fruit	Bean	Sorghum	Maize	Sweet potato	Cassava	Irish potato	Peas	TOTAL
BUTARE	29,182	189,317	20,611	26,286	21,075	3,158	124,395	63,072	5,485	950	483,531
BYUMBA	75,024	183,761	38,462	34,948	33,178	7,842	97,489	15,271	10,923	2,192	499,088
CYANGUGU	44,391	107,212	22,682	9,510	1,091	7,465	35,274	24,556	3,259	677	256,117
GIKONGORO	4,779	50,137	4,121	7,657	6,865	4,696	96,688	14,648	4,169	1,588	195,346
GISENYI	19,268	153,603	9,286	15,884	1,799	25,277	62,199	11,873	53,012	1,597	353,797
GITARAMA	50,268	282,387	47,176	27,648	14,676	3,830	96,197	82,314	6,547	1,118	612,160
KIBUNGO	257,397	294,022	60,000	27,243	16,121	3,576	39,619	26,055	2,962	994	727,989
KIBUYE	10,712	52,571	5,604	10,206	4,119	28,168	67,057	11,029	14,540	2,828	206,834
KIGALI	102,199	354,585	43,587	46,056	38,516	7,471	82,856	80,093	5,585	983	761,929
RUHENGERI	36,874	125,851	19,087	24,996	11,596	19,131	108,000	6,337	120,414	2,044	474,328
<b>RWANDA</b>	<b>630,092</b>	<b>1,793,445</b>	<b>270,616</b>	<b>230,433</b>	<b>149,035</b>	<b>110,612</b>	<b>809,774</b>	<b>335,248</b>	<b>226,895</b>	<b>14,970</b>	<b>4,571,119</b>

Source: MINAGRI, FSRP

**Appendix 13: Production of maize by province, season and total ('000), 1984 – 2000**

Year/season	Butare	Byumba	Cyangugu	Gikongoro	Gisenyi	Gitarama	Kibungo	Kibuye	Kigali Rural	Ruhengeri	Umutara	Total
1984A				944							5,438	19,250
1984B	1,268	1,620	967	1,273	4,197	1,110	652	710	1,147	2,231		15,175
<b>Total</b>	<b>1,268</b>	<b>1,620</b>	<b>967</b>	<b>2,217</b>	<b>4,197</b>	<b>1,110</b>	<b>652</b>	<b>710</b>	<b>1,147</b>	<b>2,231</b>	<b>5,438</b>	<b>34,425</b>
1986A	2,265	5,849	8,508	4,051	19,521	4,120	3,679	43,210	9,692	17,077		117,972
1986B	1,872	3,071	340	2,089	2,811	1,988	1,254	29	2,249	1,335		17,038
<b>Total</b>	<b>4,137</b>	<b>8,920</b>	<b>8,848</b>	<b>6,140</b>	<b>22,332</b>	<b>6,108</b>	<b>4,933</b>	<b>43,239</b>	<b>11,941</b>	<b>18,412</b>		<b>135,010</b>
1987A	2,220	5,963	8,165	4,220	15,528	2,920	3,005	27,055	4,419	15,332		88,827
1987B	1,849	2,644	805	1,808	1,897	1,284	805	434	1,326	760		13,612
<b>Total</b>	<b>4,069</b>	<b>8,607</b>	<b>8,970</b>	<b>6,028</b>	<b>17,425</b>	<b>4,204</b>	<b>3,810</b>	<b>27,489</b>	<b>5,745</b>	<b>16,092</b>		<b>102,439</b>
1988A	1,577	4,603	7,060	5,169	22,381	3,315	1,749	36,388	6,061	23,543		111,846
1988B	1,437	2,825	630	680	947	847	1,321	169	3,037	1,435		13,328
<b>Total</b>	<b>3,014</b>	<b>7,428</b>	<b>7,690</b>	<b>5,849</b>	<b>23,328</b>	<b>4,162</b>	<b>3,070</b>	<b>36,557</b>	<b>9,098</b>	<b>24,978</b>		<b>125,174</b>
1989A	1,344	3,648	5,285	3,060	27,055	1,444	2,012	18,795	4,239	15,726		82,608
1989B	560	1,711	1,031	285	835	957	1,573	180	3,032	1,379		11,543
<b>Total</b>	<b>1,904</b>	<b>5,359</b>	<b>6,316</b>	<b>3,345</b>	<b>27,890</b>	<b>2,401</b>	<b>3,585</b>	<b>18,975</b>	<b>7,271</b>	<b>17,105</b>		<b>94,151</b>
1990A	1,145	4,814	4,478	2,149	29,791	1,980	2,129	17,604	2,440	14,666		81,198
1990B	974	3,426	683	905	1,035	1,057	1,484	0	1,681	2,310		13,555
<b>Total</b>	<b>2,119</b>	<b>8,240</b>	<b>5,161</b>	<b>3,054</b>	<b>30,826</b>	<b>3,037</b>	<b>3,613</b>	<b>17,604</b>	<b>4,121</b>	<b>16,976</b>		<b>94,753</b>
1999A	390	6,642	4,998	2,970	11,900	713	1,530	5,712	3,500	10,125	3,780	52,260
1999B	536	500	2,352	900	1,400	776	510	208	588	492	1,980	10,242
<b>Total</b>	<b>926</b>	<b>7,142</b>	<b>7,350</b>	<b>3,870</b>	<b>13,300</b>	<b>1,489</b>	<b>2,040</b>	<b>5,920</b>	<b>4,088</b>	<b>10,617</b>	<b>5,760</b>	<b>62,502</b>
2000A	1,604	6,882	2,836	872	10,449		4,461	1,630	1,409	5,587	3,760	39,634
2000B	307	3,572		675	1,831		2,381				1,791	19,439
<b>Total</b>	<b>1,911</b>	<b>10,454</b>	<b>2,836</b>	<b>1,547</b>	<b>12,280</b>		<b>6,842</b>	<b>1,630</b>	<b>1,409</b>	<b>5,587</b>	<b>5,551</b>	<b>59,073</b>

Source: MINAGRI

**Appendix 14: Average per capita production (kg) 1984, 1986-90 by province, crop and total**

Province	Cooking Banana	Brewing Banana	Banana Fruit	Bean	Sorghum	Maize	Sweet potato	Cassava	Irish Potato	Peas	TOTAL
BUTARE	44	281	25	40	32	5	186	94	8	1	717
BYUMBA	109	266	45	51	48	11	142	22	16	3	714
CYANGUGU	99	238	41	21	2	17	77	55	7	1	560
GIKONGORO	12	122	8	19	17	12	236	36	10	4	477
GISENYI	30	238	12	25	3	39	96	19	82	3	546
GITARAMA	68	374	51	37	20	5	128	110	9	2	804
KIBUNGO	448	509	85	47	28	6	69	46	5	2	1,245
KIBUYE	28	130	11	25	10	69	163	27	36	7	505
KIGALI	100	346	35	45	38	7	82	79	5	1	740
RUHENGERI	55	185	23	37	17	28	159	9	177	3	694
<b>RWANDA</b>	<b>101</b>	<b>284</b>	<b>35</b>	<b>37</b>	<b>24</b>	<b>18</b>	<b>129</b>	<b>54</b>	<b>36</b>	<b>2</b>	<b>718</b>

Source: MINAGRI



**Appendix 15: Cultivated land area for seasons A & B 1990, 1998-2000**

<b>Crops</b>	<b>1990A</b>	<b>1990B</b>	<b>1998A</b>	<b>1998B</b>	<b>1999A</b>	<b>1999B</b>	<b>2000A</b>	<b>2000B</b>	<b>%00A/90A</b>	<b>%00B/90B</b>
<b>Cereals</b>	<b>93637</b>	<b>154403</b>	<b>74492</b>	<b>121204</b>	<b>63485</b>	<b>148541</b>	<b>83297</b>	<b>194260</b>	<b>89.0</b>	<b>125.8</b>
Sorghum	17742	115679	15199	99440	10650	118613	9292	164903	52.4	142.6
Maize	68168	30354	54549	16663	48074	24598	67600	21453	99.2	70.7
Wheat	4013	5300	2333	3367	2196	2977	4300	5743	107.2	108.4
Paddy	3714	3070	2411	1733	2565	2353	2105	2161	56.7	70.4
<b>Pulses</b>	<b>210633</b>	<b>134058</b>	<b>180069</b>	<b>108507</b>	<b>155212</b>	<b>126270</b>	<b>237820</b>	<b>168384</b>	<b>112.9</b>	<b>125.6</b>
Beans	169657	92906	150957	83966	129134	99081	195300	137905	115.1	148.4
Peas	25396	20500	18803	9947	15563	11232	19130	10863	75.3	53.0
Groundnuts	5482	3883	4397	2648	4307	3091	8720	4743	159.1	122.1
Soya	10098	16769	5912	11946	6208	12866	14670	14873	145.3	88.7
<b>Bananas</b>	<b>202448</b>	<b>202448</b>	<b>213195</b>	<b>213195</b>	<b>206082</b>	<b>204241</b>	<b>171250</b>	<b>189220</b>	<b>84.6</b>	<b>93.5</b>
<b>Roots &amp; tubers</b>	<b>187375</b>	<b>214478</b>	<b>133354</b>	<b>166239</b>	<b>176391</b>	<b>200862</b>	<b>228360</b>	<b>197069</b>	<b>121.9</b>	<b>91.9</b>
Irish potatoes	19595	22460	16347	11917	11813	17957	56420	52563	287.9	234.0
Sweet potatoes	74511	101382	55268	93590	79518	100424	92020	82643	123.5	81.5
Taro	25122	27015	25110	21048	22757	26292	12000	9320	47.8	34.5
Cassava	68147	63621	36630	39684	62303	56188	67920	52543	99.7	82.6
<b>Veg. &amp; fruits</b>	<b>10325</b>	<b>8049</b>	<b>12327</b>	<b>6983</b>	<b>12678</b>	<b>8210</b>	<b>24675</b>	<b>17017</b>	<b>239.0</b>	<b>211.4</b>
<b>Total</b>	<b>704418</b>	<b>713436</b>	<b>613437</b>	<b>616127</b>	<b>613848</b>	<b>688124</b>	<b>745402</b>	<b>765950</b>	<b>105.8</b>	<b>107.4</b>

Source: Rwanda Development Indicators



**Appendix 16: Area cultivated by crop and province-seasons A & B, 1999 (ha)**

Season A	Butare	Byumba	Cyangugu	Gikongoro	Gisenyi	Gitarama	Kibungo	Kibuye	Kigali R	Ruhengeri	Umutara	Total
Sorghum	-	4127	74		1172	216	717	49	459	2345	1491	10650
Maize	645	3879	3351	1514	7276	2296	3277	14598	4967	4160	2111	48074
Wheat	-	925	-	457	360	-	-	231	-	223	-	2196
Rice	723	39	683	-	-	210	343	-	363	-	204	2565
Beans	9094	22797	6132	5235	4113	14676	24366	9736	18093	7408	7484	129134
Peas	700	3037	587	4245	1016	803	1217	790	1248	773	1147	15563
Groundnuts	225	639	-	-	63	169	2151	-	665	-	395	4307
Soya	1765	90	776	1177	70	946	337	463	508	21	55	6208
Bananas	20777	25257	9423	8489	9287	36269	41779	5041	32136	6877	10747	206082
Irish potato	435	1061	745	433	2180	1434	1233	1111	803	1712	666	11813
Sweet potato	8835	10231	4153	9479	3851	13376	4437	7873	9323	3511	4449	79518
Taro	1833	763	3401	1324	771	4337	1110	4825	3266	611	516	22757
Cassava	5741	2445	5186	2073	1250	16421	7562	3763	14072	1424	2366	62303
Veg. & fruits	495	549	393	1225	234	3475	552	504	4678	341	232	12678
<b>Total</b>	<b>51268</b>	<b>75839</b>	<b>34904</b>	<b>35651</b>	<b>31643</b>	<b>94628</b>	<b>89081</b>	<b>48984</b>	<b>90581</b>	<b>29406</b>	<b>31863</b>	<b>613848</b>
<b>Season B</b>												
Sorghum	13251	22054	260	7024	252	7652	17902	3889	28975	2573	14781	118613
Maize	801	3276	692	240	6184	937	3407	1277	4415	993	2376	24598
Wheat	-	988	-	586	112	-	-	399	-	892	-	2977
Rice	526	-	702	-	-	45	160	-	453	-	467	2353
Beans	6308	11566	4255	562	4147	8430	15697	4085	21790	12178	10063	99081
Peas	381	1237	1054	492	864	947	285	3714	711	1019	528	11232
Groundnuts	326	541	101	7	15	182	352	-	1494	-	73	3091
Soya	3451	184	1809	1728	302	4094	242	98	621	293	44	12866
Bananas	17147	19804	9494	6999	10077	29146	33902	5556	37340	19829	14947	204241
Irish potato	346	847	505	2625	3283	340	870	982	1029	6386	745	17958
Sweet potato	11998	12191	4043	10711	6055	13518	4260	9749	10675	12126	5098	100424
Taro	2293	849	4535	2041	842	5447	2487	2085	3809	1405	499	26292
Cassava	7628	3481	5534	1816	1858	11716	3449	2760	13935	1938	2073	56188
Veg. & fruits	470	612	243	461	186	2109	1078	538	1710	326	477	8210
<b>Total</b>	<b>64926</b>	<b>77630</b>	<b>33227</b>	<b>35292</b>	<b>34177</b>	<b>84563</b>	<b>84091</b>	<b>35132</b>	<b>126957</b>	<b>59958</b>	<b>52171</b>	<b>688124</b>

Source: FSRP, MINAGRI



**Appendix 17: Agricultural production forecasts ('000 tonnes)**

<b>Crop</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
Cereals	235	257	280	305	362	573	923	1584
Pulses	252	290	300	330	399	643	1036	1692
Bananas	2150	2279	2415	2530	2877	3720	5400	6961
Tea	15	17	18	20	24	37	60	101
Coffee	18	20	21	23	28	43	71	119
Roots/Tubers	2881	3097	3286	3479	4136	5938	7845	11003
Fruit/Veg	205	227	249	273	319	468	688	1011
<b>Total</b>	<b>5772</b>	<b>6185</b>	<b>6569</b>	<b>6953</b>	<b>8145</b>	<b>11423</b>	<b>16022</b>	<b>22471</b>

Source: Rwanda Development Indicators 2001, MINECOFIN



**Appendix 18: Average maize area, yield and production 1997-99 - region**

<b>Country/Region</b>	<b>Harvested area('000)</b>	<b>Yield (t/ha)</b>	<b>Production ('000 t)</b>
Angola	658	0.7	434
Burundi	115	1.2	135
Ethiopia	1,606	1.7	2,724
Kenya	1,502	1.5	2,255
Lesotho	134	1	128
Madagascar	192	0.9	170
Malawi	1,342	1.4	1,826
Mozambique	1,221	0.9	1,117
Somalia	200	0.7	141
South Africa	3,691	2.3	8,514
Sudan	169	0.3	56
Swaziland	63	1.8	115
Tanzania	1,785	1.3	2,362
Uganda	615	1.2	763
Zambia	553	1.5	818
Zimbabwe	1,437	1.2	1,710
<b>Eastern and Southern Africa</b>	<b>15,436</b>	<b>1.5</b>	<b>23,389</b>

*Source: FAO data*



**Appendix 19: Growth rate of maize by country (%) 1988-99**

<b>Country/Region</b>	<b>Area</b>	<b>Yield</b>	<b>Production</b>
Angola	-2.9	9.3	6.3
Burundi	-1.2	-1.6	-2.8
Ethiopia	8.9	3.4	12.3
Kenya	0.2	-1.5	-1.3
Lesotho	-0.6	1.3	0.7
Madagascar	2.7	-1.3	1.4
Malawi	0.3	3.1	3.4
Mozambique	2.2	12.3	14.5
Somalia	-0.5	-6	-6.6
South Africa	-2.1	1.6	-0.5
Sudan	8.1	-2.9	5.2
Swaziland	-3.7	4.4	0.8
Tanzania	-0.6	0.1	-0.5
Uganda	5.3	-1.1	4.3
Zambia	-4.1	-2	-6.1
Zimbabwe	2.5	-3.2	-0.7
<b>Eastern and Southern Africa</b>	<b>0.1</b>	<b>0.4</b>	<b>0.5</b>

*Source: FAO data*



**Appendix 20: Source of seed and moisture by country and region**

Country/Region	Maize area by type of seed and moisture regime, 1999 (%)				Maize area by moisture regime as a percentage of total maize area, 1999 (%)	
	Improved seed	Hybrids	OPVs	Farm-saved seed	Irrigated	Rainfed
Kenya	87	85	2	13	0	100
Mozambique	9	3	6	91	4	96
South Africa	100	90	10	0	<1	100
Uganda	65	10	55	35	0	100
Zambia	65	62	3	35	1	99
Zimbabwe	100	91	9	0	2	98
<b>Eastern and Southern Africa</b>	<b>92</b>	<b>81</b>	<b>11</b>	<b>8</b>	<b>1</b>	<b>99</b>

Source: FAO data

**Appendix 21: Fertilizer use by country**

Country	Fertilized area as a percentage of total maize area (%)	Fertilizer applied per ha of maize harvested, 1999-2000 (kg/ha)		
		Nitrogen	Phosphorous	Potassium
Kenya	30	34	30	0
Mozambique	3	n.a.	n.a.	n.a.
South Africa	88	85	15	8.0
Sudan	n.a.	80	40	0
Uganda	15	70	35	0
Zambia	75	130	50	20
Zimbabwe	30	43	14	7

Source: FAO data

**Appendix 22: Population trends, Rwanda**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total population ('000)	6,879	7,092	7,312	7,538	5,224	5,696	6,167	7,666	7,883	8,109	8,343
Annual % change		3.1	3.1	3.1	-30.7	9.0	8.3	24.3	2.8	2.9	2.9
Male ('000)	3,349	3,453	3,560	3,670	2,421	2,640	2,858	3,552	3,666	3,781	3,901
Female ('000)	3,530	3,639	3,752	3,868	2,803	3,056	3,309	4,113	4,217	4,328	4,442
Male (%)	48.7	48.7	48.7	48.7	46.3	46.3	46.3	46.3	46.5	46.6	46.8
Female (%)	51.3	51.3	51.3	51.3	53.7	53.7	53.7	53.7	53.5	53.4	53.2
Urban ('000)	413	426									
Rural ('000)	6,466	6,666									

*Source: Household and demographic survey, ONAPO, Rwanda, 2000*

**Appendix 23:****Rural Transaction quantities**

Millions of units	Sales	Gifts given	Purchases	Gifts received	Net sales and gifts
Beans	16.11	5.47	75.91	5.39	-59.71
Peas	0.63	0.21	2.35	0.30	-1.81
Peanuts	0.86	0.11	1.03	0.07	-0.13
Soybeans	1.07	0.25	1.50	0.25	-0.44
Sorghum	25.42	1.93	50.57	3.31	-26.53
Maize	4.84	3.62	7.71	2.82	-2.07
Wheat	2.11	0.19	0.98	0.15	1.16
Finger millet	0.11	0.09	0.05	0.08	0.07
Rice	2.23	0.24	3.54	0.22	-1.29
Cassava	42.71	4.57	68.25	2.80	-23.77
White potato	77.95	5.99	52.85	3.23	27.86
Sweet potato	58.04	17.22	48.15	8.60	18.51
Taro	4.96	1.48	6.06	1.11	-0.74
Cocoyam	0.05	0.02	0.11	0.04	-0.08
Cooking banana	47.02	7.63	16.99	4.87	32.80
Beer banana	59.01	10.42	61.71	5.93	1.79
Fruit banana	7.26	0.54	2.53	0.41	4.86
Coffee	41.13	0.00	0.00	0.00	41.13
Banana beer	207.08	39.97	6.99	12.71	227.35
Sorghum beer	67.62	15.32	8.75	11.05	63.13
Milk	0.06	0.00	0.00	0.00	0.05
Cattle	0.13	0.02	0.05	0.03	0.07
Pigs	0.19	0.01	0.07	0.01	0.12
Sheep	0.28	0.02	0.09	0.02	0.20
Goats	0.65	0.05	0.20	0.07	0.43
Chicken	0.64	0.10	0.38	0.14	0.22
Ag. Labor	23.68	N.R.	34.30	N.R.	-10.63
Non-Ag. Unsk. Labor	15.02	N.R.	8.20	N.R.	6.82
Skilled Labor	41.43	N.R.	4.12	N.R.	37.31

Source: DSA/MINAGRI, Agricultural Survey 1990; 1184 households; Units are kilograms, except for beer, milk (litres), livestock (heads), and labor (mandays). N.R. = Data not recorded.

**Appendix 24: List of people contacted**

Geci Kabera, wholesaler/travelling trader – 08300672

Nkubili Alfred, wholesaler, travelling trader-08300760; 08301967

KIST (Kigali Institute of Science and Technology), Kigali

KIE (Kigali Institute of Education), Kigali

MINITEL, Kigali

Innocent Benineza, wholesaler

Callixte Kabera, wholesaler

Nathan Loyd Ndungu, wholesaler

David Stevenson, Country Representative, WFP-Rwanda

Elie Iyakaremye, Head of Programme, WFP-Rwanda

Rathi Palakrishnan, Programme Officer, WFP-Rwanda

Simone Lyons, Head of Procurement

Epitace Nobera, Fewsnnet - Rwanda

Bizimana Fidele, retailer, Nyarugenge market

Annonciate, SEMAGRI Association, 08591243, seed retailer

Mukamudenge, retailer of maize flour, Nyarugenge market

Mukamana, retailer of white flour, Nyarugenge market

Callixte Nduwinana, wholesaler, maize flour

Adelaide Rubagumira, wholesaler

Emmanuel, miller

Sebukayire Francis, 084-79888, miller

Bitwayiki A, rural assembler and travelling trader

Duhamic ADRI, 08540741, wholesaler

Sam Rubagumya, SOPABU, wholesaler, 08301289

Uwimana Innocent, NSS, 08302301, seed producer

Lyce de Kigali, 08431940

Edward, travelling trader

Nkubili Alfred, wholesaler, 08300760, 08301967

Iyanuranye Uzia, wholesaler, 08521055, 08300911

Kabera Geci, 08300672, wholesaler

COODAF, farmers cooperative, Ruhengeri

Sam Karuyonga, Kanguka association, Umutara

Marie Nyarabeza, maize retailer, Ruhengeri

Beatrice Uwimanaikunda, farmer

Isabele Riziki, farmer

Twagirayezu, retailer, Ruhengeri

Seninega, travelling trader

Bitwayiki, travelling trader

**Appendix 25: Data collection instrument**

**Rwanda Sub-sector survey - Producers**

Topic	Sub-topics	Questions/comments
Personal information	1. Name 2. Physical location 3. Experience	
Production	1. Quantity 2. Trends	1. Estimate acreage planted of the commodities in question and the trend of in acreage planted 2. Find out the reasons for the trend 3. Estimate the the trends in output of each of the commodities in question 4. Find out the reasons for these trends
Sales	3. Quantity 4. Type of buyer 5. Seasonality 6. Variety 7. Consumer preferences 8. Price data	5. How much do you normally sell eg. per day, per week, per month 6. Who do you sell to 7. Are there changes in volume sold over time 8. Are their different varieties sold 9. If so, which ones and what is their respective demand/preference 10. What is the price you sell at by variety (get unit measure) 11. Are there changes in price over time (short term & long term changes) 12. If so, what are the reasons 13. Do you find problems selling your products. Which problems 14. Where do you sell from and why?
Supply of inputs	1. Source by area 2. Source by type of person 3. Price 4. Quality	1. What inputs do you use 2. What inputs do you buy 3. How much seed do you usually plant 4. From whom do you buy your inputs 5. From where do you buy (meeting point) 6. At what price do you buy by variety/input 7. Does the price change over time. If so, why and how 8. Do you have problems getting the inputs. If so, which ones 9. What is the quality of the inputs (for seed eg improved or not) 10. Do you get technical advice about inputs/farming
Quality	1. Quality of output 2. Post-harvest issues	1. What is the quality of your produce 2. How do you dry ? 3. What quality problems do you face during and after harvest
Storage	3. Quantity 4. Time 5. Storage problems	4. How much do you usually store 5. For how long do you usually store 6. Do you have storage problems 7. Do you experience storage losses
Production costs	1. Type 2. Proportions	1. What are your production costs 2. What is their proportions
Grading / sorting	1. Grading incentive	1. Do you grade or sort 2. Does better grade fetch higher price 3. If you don't sort/grade why?
Market information	1. Sources 2. Spatial arbitrage	1. Do you get market information eg. on price 2. If so, from whom and how 3. Is there a relationship between prices in different areas at a given time
Price formation	1. Market power	1. Who determines the price 2. How is the price determined 3. If farmer/individual is a price taker, find out why 4. If you negotiate the price what factors do you consider
Institutional and legal framework	1. Associations	1. Do you have an association 2. Are there any market regulations. If so, which ones and how do they affect your business
Market structure	1. Competition	1. No of sellers 2. Is there price competition 3. Is there non-price competition. If so, how eg. interlocking markets
Credit availability	1. Sources 2. Types	1. Are there credit institutions 2. Do you use them. If no, why 3. What are their rates

## Rwanda Sub-sector survey Traders/processors

Topic	Sub-topics	Questions/comments
Personal information	4. Name 5. Address physical 6. Telephone 7. experience	NB: For better established firms exchange of business cards saves time. For small traders market place is enough. Note: if a trader has a mob. Phone it might be useful to get it for future follow up.
Type of Business	1. Value addition 2. Physical functions	1. How does the respondent add value along the marketing chain? Does he change the form of the product ( <b>Processor</b> ) or just move the product ( <b>Travelling trader</b> ) or store ( <b>Wholesaler</b> ) or is he <b>Retailer</b> or is he <b>Consumer</b> . <b>NB:</b> There might be overlap as firms try to maximise profit through vertical integration
Demand ( <i>For consumer substitute consumption for sell in the probe</i> )	9. Quantity 10. Type of buyer 11. Seasonality 12. Variety 13. Consumer preferences 14. Price data	15. How much do you normally sell eg. per day, per week, per month 16. Who do you sell to 17. Are there changes in volume sold over time 18. Are their different varieties 19. If so, which ones and what is their respective demand/preference 20. What is the price you sell at by variety (get unit measure) 21. Are there changes in price over time (short term & long term changes) 22. If so, what are the reasons 23. Do you find problems selling your products. Which problems
Supply	5. Source by area 6. Source by type of person 7. Price 8. Quality	11. Which are your supply areas (geographical) 12. From whom do you buy 13. From where do you buy (meeting point) 14. At what price do you buy by variety 15. Does the price change over time. If so, why and how 16. Do you have problems getting the products. If so, which ones 17. What is the quality of the supplies
Quality	6. Perishability 7. Post-harvest issues	8. What is the quality of products along the chain 9. What is the shelf-life of the products
Storage ( <i>Relevant to wholesaler</i> ) <b>NB: For others it's not intentional but still get the impact of not selling quickly</b>	8. Quantity 9. Time 10. Storage problems	10. How much do you usually store 11. For how long do you usually store 12. Do you have storage problems 13. Do you experience storage losses
Transaction costs	3. Forms 4. Proportions	3. What are your transaction costs 4. What is their proportions
Grading / sorting	2. Grading incentive	4. Do you grade or sort 5. Does better grade fetch higher price
Market information	3. Sources 4. Spatial arbitrage	4. Do you get market information eg. on price 5. If so, from whom and how 6. Is there a relationship between prices in different areas at a given time
Price formation	2. Market power	5. Who determines the price 6. How is the price determined 7. If firm/individual is a price taker, find out why
Institutional and legal framework	2. Associations	3. Do you have an association 4. Are there any market regulations. If so, which ones and how do they affect your business
Market structure	2. Competition	4. No of sellers 5. Is there price competition 6. Is there non-price competition. If so, how eg. interlocking markets
Credit availability	3. Sources 4. Types	1. Are there credit institutions 2. Do you use them. If no, why 3. What are their rates