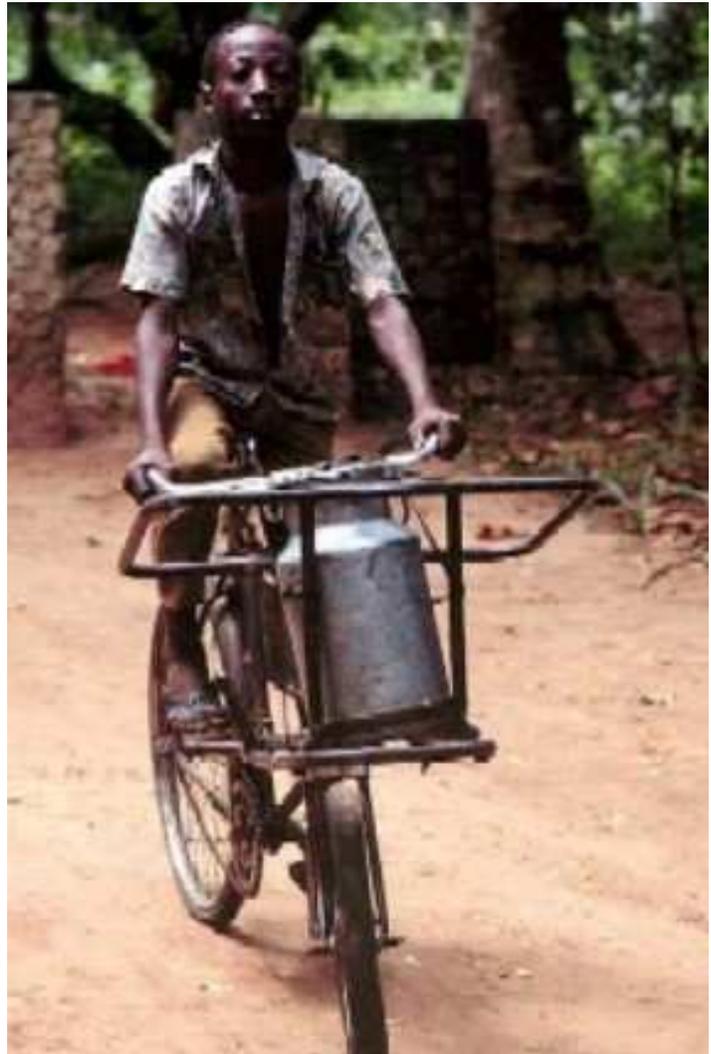


S-Netherlands
N-Development
V-Organization

Investment
Opportunities
in the Dairy
sub-sector of
Rwanda
1st Draft



Innocent RUTAMU
E-mail: innorut@gmail.com
www.eagledevelopers.com
Kigali-Rwanda.

TABLE OF CONTENTS

Acknowledgement	4
Acronyms	5
Executive Summary.....	6
1.0 Introduction	8
1.1 Background.....	8
1.2 Terms of Reference.....	10
1.3 Research Methodology.....	12
2.0 The Rwandan Livestock Sector.....	12
2.1 Livestock Production Systems.....	13
2.1.1 Extensive Production.....	13
2.1.2 Mixed crop/livestock system.....	13
2.1.3 The cut and carry system.....	15
2.1.4 Dairy Ranching.....	16
2.2 Social Environmental Factors affecting the dairy Industry and their influence on trade.....	16
2.2.1 Human population.....	17
2.2.2 Land.....	18
2.2.3 Cattle.....	19
2.2.3.1 Breeds of cattle kept in Rwanda.....	22
3.0 Government Policies and Interventions in the Dairy sub-sector.....	23
3.1 Collaboration with development partners and private Sector.....	24
4.0 Laws and regulations governing the dairy sub-sector.....	25
4.1 Equity Environment.....	26
4.2 Institutional framework.....	26
4.3 Current policy and legal framework.....	27
4.4 Global and regional organizations and treaties of interest to potential investors...27	
4.5 The East African Community.....	28

4.6	Tax incentives/regime.....	29
4.7	Tariff on imports.....	30
4.8	Non-tariff charges and barriers.....	30
4.9	Disputes and dispute resolutions.....	31
5.0	National Dairy Strategy and existing opportunities in the dairy industry	31
5.1	Constraints facing the dairy sub sector of Rwanda.....	32
5.1.1	Lack or no access to milk markets to generate highly needed cash to cater for other family needs.....	32
5.1.2	Low quality of milk that renders it to quick spoilage and being unacceptable even where markets are accessible.....	33
5.1.3	Lack of quality feeds to match the potential productivity of the existing dairy cattle.....	33
5.1.4	Lack of veterinary services and other inputs to support health of animals and increased production.....	33
5.1.5	The existing installed collection and cooling units have no access to produced milk and have serious water shortages.....	35
5.1.6	Continued consumption of raw milk due to affordability, posing health hazards..	37
5.1.7	Plants operating at lower than installed capacity.....	38
5.1.8	High cost of processed milk.....	38
5.1.9	Lack of milk market in rainy season due to weak collection and marketing strategy.....	39
5.1.10	Lack of good breeds of dairy cattle that will produce the volume of milk commensurate to labour and other inputs.....	39
6.0	Employment and Investment opportunities in dairy sub-sector of Rwanda...	39
6.1	Employment in the informal sector.....	41
6.1.1	Mobile milk traders.....	41
6.1.2	Milk bars.....	41
6.1.3	Shops and Kiosks.....	41
6.2	Employment in the formal Sector.....	41

6.3	Employment in milk marketing and processing.....	42
6.4	Opportunities and policy implications.....	42
6.4.1	Opportunity at farm level.....	43
7.0	Trends on national production and Marketing and pricing of milk and milk products in Rwanda.....	44
7.1	Quality as a pre-requisite for Rwanda dairy market expansion and competitiveness in accessing regional markets.....	49
7.1.1	Quality assurance at farm level.....	51
7.1.2	Quality assurance at milk Vendors/cyclists level.....	52
7.1.3	Quality assurance at MCC's.....	52
7.1.4	Quality assurances by transporters from MCC's to processing plant.....	53
7.1.5	Quality assurances at the processing plant.....	53
8.0	Support and business service markets for dairy sub-sector in Rwanda.....	54
9.0	Road and electricity (Infrastructure) issues.....	54
10.0	SWOT analysis of Rwanda dairy sub-sector.....	55
11.0	Long and medium dairy trends at country level.....	56
12.0	Conclusion and recommendations on nature, scale and location of investment in the dairy sub-sector of Rwanda.....	56
12.1.	Nature of investments.....	57
12.2.	Scale of Investments.....	57
12.3.	Location of investment.....	58

LIST OF FIGURES

Figure 1:	A zero grazing farmer in Ruhango district.....	14
Figure 2:	Cut and carry system in Kamonyi District	15
Figure 3:	Land fragmentation in Gakenke district	18
Figure 4:	Farm area per household.....	19
Figure 5:	Ankole type of cattle.....	22

Figure 6: Sahiwal x Ankole crosses.....	22
Figure 7: Friesian breed.....	22
Figure 8 : Jersey breed.....	23
Figure 9 : Brown Swiss breed.....	23
Figure 10: Milk value chains.....	40
Figure 11: Map of Rwanda.....	59

List of Tables

Table1: Milk Production and imports.....	9
Table 2: Cattle distribution per province.....	20
Table 3: Percentage of cattle distribution in One cow per poor household program.....	20
Table 4: Different organization supporting dairy sub-sector in Rwanda.....	24
Table5: Value of imported milk and milk products	25
Table 6: Existing situation of installed collection and chilling centres.....	34
Table 7: Economic performance of a milk collection centre-Kageyo.....	37
Table 8: Performance of existing processing plants in Rwanda.....	38
Table 9: Cheese production (Kg) by different small processors.....	42
Table 10: Gross margin for a small farmer in Rwamagana district.....	44
Table11: Milk Chain channels common in East Africa.....	46
Table 12: Processing cost of Nyabisindu dairy products.....	47
Table 13: Livestock projections for next 12 years.....	56

Acronyms

ACP: African Caribbean and Pacific
ADB: African Development Bank
ATI: African Trade Insurance Agency
BNR: National Bank of Rwanda
CAPMER: Center for Support to Small and Medium Enterprises in Rwanda
COMESA: Common Market for East and Southern Africa
EAC: East African Community
GOR: Government of Rwanda
HA: Hectare
ISEA: Institute of Agronomic and Livestock Studies
IFAD: International Fund for Agricultural Development
ISAR: Rwanda Institute of Agricultural Research

ISD: International Centre for the settlement of Investment Disputes
PADEBL: Dairy Development Project
LoL: Land O'Lakes
MCC: Milk Collection Center
MINAGRI: Rwanda Ministry of Agriculture
MIGA: Multilateral Investment Guarantee Fund
MINECOFIN: Ministry of Finance and Economic Planning
PADEBL: Dairy Cattle Development Support Project
RARDA: Rwanda Agricultural Research Development Agency
RRA: Rwanda Revenue Authority
RBS: Rwanda Bureau of Standards
RWF: Rwandan Franc
REMA: Rwanda Environment Management Agency
RIEPA: Rwanda Investment and Export Promotion Agency
RPSF: Rwanda Private Sector Federation
WIPO: World Intellectual Property Organization
WTO: World Trade Organization

Acknowledgement.

The researcher would like to thank all farmers, milk transporters, processors and policy makers who provided their valuable time to discuss issues affecting the dairy sub-sector in their areas of operations. In particular I would like to thank staff from RARDA, RBS, RRA, National Bank, RIEPA, PSF and CAPMER for contributing to this information. The contributions from farmers of Matimba, Ruhuha, Ryabega, Nyarubuye, Rurangazi and Kageyo were very useful. The interactive discussions with milk kiosks owners in Kigali and Huye shed some light on the intricate system of milk trading.

The author would also like to thank all development agents in the region who agreed to share their experiences in East Africa and other COMESA countries.

EXECUTIVE SUMMARY

The Rwandan dairy sub-sector has undergone dramatic and dynamic progress after the 1994 war and genocide. Dairy cattle were decimated during that period. The returning Rwandans came with a substantial number of cattle and that became the basis of dairying in the country. Thereafter the government and individuals imported pure dairy breeds from all over the world. Of recent years a number of initiatives from the government, development partners and private investors have been growing. Meanwhile a large volume of milk and other dairy products were imported into the country to-date. Although the dairy industry has been growing fast, its faced with a number of constraints that provide the challenges for development but equally provide the opportunities for actors who want to invest in the sub-sector.

This report summarises the trend for the last 10 years to 2020 along the national development strategy and how the dairy sub-sector can provide investment opportunities along the value chain.

Agriculture contributes 40% (about 6% of which is from livestock) of the country's GDP, employs 90% of the population and over 80% of its exports. Annual production is estimated at 97,981 tons of milk. Consumption in Rwanda is 0.035 litres per day (13 litres of milk per person per year) and 75% of that is consumed in rural areas. Meat consumption is 4.8 Kg per person per year. FAO recommends respectively 220 litres of milk and 50 Kg of meat per person per year. The milk supply grows at the same pace as demand, but less than 50% reaches the market of any form, with the price of raw milk being 1/3 of processed milk. Rwanda as a member of EAC and COMESA is harmonizing its quality standards with the COMESA recommendations but it still has a long way to go to achieve that. The harmonization of quality standards will go in parallel with tariffs while EAC/COMESA countries are negotiating elimination of non-tariff barriers to trade, such as unnecessary certifications and import licensing.

Dairy is a profitable and one of the best investments that can work properly in the rural areas due its benefits not only as a source of income but also as a way of providing food security and support of crop production through manure.

About 90% of all milk is marketed informally in Rwanda, a scenario that is common in East Africa, and the main reason being high prices of processed milk. Innovations that will cut

costs of processed milk are required so as provide the population of much safer, reliable but affordable milk and milk products. Investment opportunities are available all along the value chain through the supply of inputs to dairy farmers, milk transporters, collection and chilling facilities. Opportunities are also available through different forms and sizes of processing in different parts of the country.

INTRODUCTION

1.1 Background.

Rwanda is a small landlocked rural country with a land area of 26,338 square kilometres at an altitude ranging from 1000-4500m above sea level. It has few natural resources and minimal industry. It is the most densely populated country in Africa with a population estimated at 9.2 million, derived from the figure of 8 128 553 inhabitants (2002 population census) and an average population density of 321 persons per km². At a growth rate of 2.3%, the population is expected to rise to 14,000,000 by the year 2020. There is therefore, considerable demographic pressure on agricultural land with over 58% of households having holdings of less than 0.5 ha (MINECOFIN, 2002). Family farms are continuously sub-divided into increasingly smaller plots, fields are over cropped, marginal lands (including marshlands) and pasturelands have been converted to arable lands. The issue of land and farm size is therefore has great influence on cattle production in the country.

Agriculture contributes 40% (about 6% of which is from livestock) of the country's GDP, employs 90% of the population and over 80% of its exports. For example under the agro-pastoral production system of Rwanda cattle form an integral part of the agricultural systems, performing a variety of roles. They supply manure for crop production and serve as living savings that can be converted into cash when the need arises. Milk from cattle provides nutrients for the family and act as a source of regular income to the producers. Cattle keeping systems are forms of employment at family and village level, something often overlooked by the policy makers. They also have other non-monetary but important social functions including prestige and payment of bride price. In turn cattle benefits from crop by-products and forage crops from which they get nourishment. The major challenge facing the livestock sector and dairy sub-sector in particular is to satisfy the rise in general demand for livestock products by the increasing human population at the technological level that the natural resource base can sustain without destroying the environment. Annual animal production is estimated at 97,981 tons of milk, 39,126 tons of meat, 2,432 tons of eggs, 7,612 tons of fish and 1,499 tons of hides and skins. This does not satisfy the needs and requirements of the population. Consumption in Rwanda is 0.035 litres per day (13 litres of milk per person per year) and 75% of that consumed in rural areas. Meat consumption is 4.8 Kg per person per year. FAO recommends respectively 220 litres of milk and 50 Kg of meat

per person per year. The milk supply grows at the same pace as demand, but less than 50% reaches the market of any form, with the price of raw milk being 1/3 of processed milk.

Specific constraints for dairy development in Rwanda are numerous: Deficiency in animal feed both in quality and quantity. This arises from poor and narrow pastures, water shortage, poor quality of commercialized feeds and limited use of agricultural by-products; Animal diseases, especially epidemic diseases which regularly affect animals;

Poorly performing of local breeds with low productivity ; Poor veterinary services with few qualified cadres and poor means of responding to farmers needs, Low level of investment in Livestock development which results into the absence of necessary infrastructure especially for transformation of animal products ; Inaccessibility to loans by small livestock farmers which limits their opportunities and possibilities of adopting modern technology in animal production ; Weaknesses in farmers organizations, which do not have sufficient human and material resources ; Weak link between research and extension services. Most of the research is carried out in research stations and have no impact on the farmer. High population growth has led to demand for livestock products that are higher than domestic production, thereby forcing the country to invest its small financial resources in the massive import of milk and meat.

YEAR	MILK PRODUCTION TONS	MILK IMPORTATION IN TONS
1999	55577	1280
2000	57853	1378
2001	63484	1687
2002	98981	1378
2003	112463	720
2004	127417	645
2005	133612	500
2006	152511	500
2007	158764	450

Table1. Milk production and imports 1999-2007

Despite a few constraints on stockbreeding, the agro-climatic ecosystems make it possible to increase the productivity of livestock to satisfy domestic needs and provide reasonable income for stockbreeders. To eliminate persistent constraints and assist operators in developing stockbreeding, the Government in 1999 obtained financing from the African

Development Bank (ADB) for the development of dairy cattle; as a result P.A.D.E.B.L project was initiated. It is from this program where funds for the popular ‘one cow per poor household’ are drawn.

This scenario provides a number of challenges but also business opportunities in the dairy sub sector of Rwanda.

This is one of the reasons that made SNV commission a research on investment opportunities in the dairy sub sector of Rwanda for the purpose of poverty alleviation through enhanced productivity, employment and income generation in a sustainable manner.

1.2 Terms of Reference

This report brings forth the findings of the conducted research commissioned by SNV, based on the following terms of reference:

The scope of this study was a current sector analysis of the dairy industry in Rwanda but with a national, regional and international focus on investment. Among other things I focussed on the following:

Assessment of ease of entry into the dairy sector in terms of capital requirement and existing competition for investments.

Assessment of socio-environmental factors, which may limit or promote the case for investments in the dairy sector and how this influences trade Laws and regulations from Rwanda facing the dairy sector which may have implications on investment in the country. This included a scan of the regulatory environment on equity restrictions (obligation of local partners, foreign ownership of agricultural land), incentives to investors (Duty and VAT exemption on machinery, equipments and raw materials; tax holidays; Liberal Depreciation Rates; Loss-Carry forward etc) among others.

Study of trade tariffs/ and or subsidies in the dairy sector of Rwanda which may have impact on cross border trade in dairy in the East African and COMESA region.

Assessment of the existing opportunities in the dairy sector of Rwanda in the areas of new markets, new market regions, differentiated / new consumer segments and new technologies

Statistics and trends in national production and price levels in the dairy sectors including:

- Processing capacity of the dairy plants and latent potential that exists in relation to the supply and demand of raw materials
- Farm gate & retail prices for milk and dairy products in Rwanda

Analysis of support markets/business service markets with respect to degree of privatization, outreach and penetration by different organizations, % market share, potential demand for services including.

- market linkage firms
- feed supply,
- artificial insemination and extension,
- milk testing and quality control,
- veterinary and pharmaceutical services,
- transportation,
- finance services,
- hardware supplies
- Refrigeration
- Processing
- Packaging

Mapping of potential commercialization areas in Rwanda based on but not limited to:

- Milk density
- All season road access
- Poverty level
- Access to and reliability of power grid

SWOT analysis of Dairy sector in Rwanda

Report on long & medium term dairy trends at country level

1.3 Research Methodology.

Site visits across the country, interviews with stake holders along the dairy value chain, meetings with farmer groups, policy makers and desk studies were used to collect primary and secondary data sufficient to make an authoritative statement on the task at hand. Analysis of milk production and marketing systems and farmer organizations was done using the Conceptual Framework for Dairy Research (CFDR) We looked at the role of middlemen, existing market information system, policy and tariff issues, marketing intelligence and potential for niche markets in the dairy value chain. Areas visited were those with a high number of dairy related activities across the country.

A lot of secondary data varied slightly and some were outdated and had to be verified and updated through different methods. Most of data were obtained from Rwanda Animal Resources Authority (RARDA,) National Statistics Authority, Rwanda Revenue Authority (RRA), Rwanda Investment and Export Promotion Agency (RIEPA), Land O' Lakes, Technoserve, Heifer International, Livestock World International, Send a Cow Rwanda, Dairy cooperative UDAMACO, Processing plants, Nyanza Milk Transporters Association, Gishwati Cheese Producers Association and Rwanda Dairy Processors Association whose Chairman is the author of this report.

2. The Rwanda Livestock Sector.

In the Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS) one of the main programmes is improvement of dairy farmers technical and organisational capacity, improving the dairy chain and strengthening the institutional framework at central and local level. As was emphasized in the country's Poverty Reduction Strategy Paper (PRSP) document, agriculture is a central element of the poverty reduction strategy in Rwanda. The human population growth and natural resource of land, livestock, forestry and water etc. are key factors in achieving this noble goal. Access to land and population growth are the lead factors. Concurrent with population growth, there has also been a decrease in the area and quality of grazing lands due to non-pastoralists dominating key, high potential land. Climatic conditions also compound the pressures on grazing land in many areas of the country.

Increasing demand for animal products, and pressures on the land, has forced many grazing-based livestock production systems to become demand-led, with less consideration for the productive capacity of the pastoral vegetation. As a consequence, the sustainability of use of many types of grassland is questionable. Soil depletion, which is occurring on many grazing lands, is accelerated by increases in livestock numbers, and has significant impact on long-term support capacity.

2.1 Livestock Production Systems.

2.1.1. Extensive production.

This system is practiced mainly in Eastern Province , especially in Nyagatare and Gatsibo districts. Cattle almost get all their dry mater intake from annual pastures in individual farms, communal grazing lands or crop residues. Annual stocking rates are often higher than the recommended carrying capacity per hectare. On communal areas, land is characterised by overgrazing and development of undesirable plant species. This implies that the present stocking rate per hectare has reached dangerous levels and may be a serious threat to the environment. Signs of serious environmental damage are apparent due to the high concentration of cattle confined to small areas of land especially near water sources. Spread of cattle diseases is easier because of shared water and grazing areas. Pastoralists in this system keep about 1-15 cows .

The government have tried to intervene to reverse this trend through two major development projects. These include PADEBL, which is concerned with all issues of dairy development and funded by the African development Bank (ADB). Another is PDRCIU, a multi-purpose IFAD funded project, dealing with community resources including livestock and infrastructure development, especially provision of water dams at strategic areas.

2.1.2 Mixed crop/livestock systems

This system evolved from the Agro-pastoralist that used to exist when communal grazing lands were still existing. The Agro-pastoralists system where cattle are grazed on communal lands between cultivated areas has dwindled fast and currently represents about 16% of the national cattle population. Mixed systems can be defined as farming systems conducted by households or by enterprises where crop cultivation and livestock rearing are *more or less integrated* components of one single farming system. The *more integrated* systems are characterized by interdependency between crop and livestock activities. A typical example

of a more integrated system is that found in Ruhango and Rubavu districts, and some parts of Kigali peri-urban and Ngoma district. Such systems are basically resource driven aiming at an optimal circulation of locally available nutrients.



Fig.1 A zero grazing farmer in Ruhango District

Part of the time animals may still be tethered on communal areas to eat what ever they can reach.

In general there are more opportunities to mitigate the negative and enhance the positive impacts of livestock on the environment in mixed systems than in specialized systems. Still, the most remarkable aspects of livestock – environment interactions and the degrees in which they play a role will depend on the production objectives and the feed resource base, the land/livestock ratio, the livestock/cropland ratio, and the species involved.

We found mixed farming to be an ideal system for smallholder farmers and probably the most benign agricultural production system, since there are many opportunities for nutrient recycling as resource use in the system is highly self-reliant with an energy flow from crops to livestock and back. Being a closed system, it internalizes environmental costs, making them less damaging and more beneficial to the natural resource base. Mixed farming systems therefore, offer positive incentives to compensate for environmental effects and are said to be in environmental equilibrium (Rutamu, 2004). The challenge is to maintain this equilibrium at the same time improving cattle productivity and milk yields through better but appropriate production and feeding technologies. We visited ISAR and we realized that it is very much challenged to design and carry out multi-disciplinary on-farm technology transfer farmer managed research to try and solve some of the farming challenges facing farmers.

The principal production objectives of crop farmers are to keep livestock as a savings account. Large ruminants are kept in village / family herds grazing communal areas. Small ruminants are often herded by children and looked after by women. In general households own a mix of small (sheep and goats) and large ruminants (cattle) but aspire to possess more large ruminants.

2.1.3 The cut and carry systems

Defined as systems where feed, crop residues and/ or litter is cut and carried from communal areas and/or other farms to livestock, which are confined, on or close to the farm. The major share of the feed is cut and carried from outside the farm.



Fig. 2. Cut and carry system –Kamonyi

This system is characterized by land scarcity and housed cattle are fed on fodder cut from riverbanks, roadsides and other areas where green vegetation is abundant including large scale sugar estates (Kamonyi) and tea farms (Rusizi)

Besides the cut and carry forage systems under landless conditions mentioned above, zero grazed cattle include those stall-fed on improved grass/legume forages grown on fallow land, back yard plots and forage farms. This system prevalent practiced in Kigali city, Kigali-peri urban, Rusizi, Ruhango and Nyanza, Huye, Rwamagana and Ngoma districts Eastern province. Cultivated forage includes mainly elephant grass (*Penisetum purpureum*), Guatemala grass (*Tripsicum luxum*) and *Setaria spp.*

Crop residues and fodder resources from the farms are intensively used but are insufficient to meet all feed requirement. External and local concentrates are supplied only occasionally in

small amounts, if at all (Ruhango, Kicukiro, Huye and Ngoma). Feeding of concentrates is very common in zero grazed dairy cattle in Kigali city.

In Rural Rwanda, the cut and carry system is labour intensive and found in densely populated rural areas with a high potential for crop cultivation: i.e. valleys of hilly areas, areas, surroundings large estates, and in urban and peri-urban areas. In the concerned areas, free grazing of cattle is not allowed or is restricted to prevent damage to crops, vegetation on hill slopes and / or planted forests. Farmers involved are those with small farm sizes, cultivating as shareholders, farm labourers and "landless" households. The land they have access to is often cultivated intensively: food crops for home consumption, fruits and vegetables for the market. In general households are poor and a major share of income is derived from casual labour and / or employment. In general livestock are their main asset and savings account. Through sale of products and services they contribute considerably to household food security and income.

Constraints are the non-availability of feed and household labor, distance of resources to farm, means of transport and access rights to resources on private and / or public owned land. Lack of knowledge and training in animal husbandry is also a great hindrance to improved cattle productivity on many smallholder farms.

2.1.4 Dairy Ranching

This system is rarely practiced in Rwanda compared to other countries like Kenya or Uganda mainly due to lack of bigger pasture lands required. A few private farms are found in Eastern province, and government farms (Songa and Rubona) in Southern province. This system is less labour intensive and more economical, but lack of large pasture lands makes it an insignificant system in Rwanda.

2.2 Social Environmental factors affecting the dairy Industry and their influence on trade.

Dairy development is one of the most important pathways to pro-poor livestock induced growth. Dairy development can make important contributions to pro-poor livestock induced growth. This is, however, considerably affected by factors such as resource access, service

delivery, food safety standards as well as national and international subsidies. Dairy development can contribute to poverty alleviation in rural areas, as increasing market for dairy products is particularly in the urban areas, it will therefore require considerable investment in infrastructure to link the small rural producers with the urban markets. This is why the most profitable dairy producers are the ones in peri-urban areas. However, dairy development has been successful in rural areas and improved the standard of living in these areas. India and China are examples of countries where smallholder production is very important and has been successful as a measure for rural development and poverty reduction. The issue is that smallholder producers can produce milk at much lower costs than more industrialised peri-urban productions, if they will access the market for the produced milk. Moreover, food security at household level and use of manure for crop production adds value to the rural production system.

The social and economic benefits from smallholder dairy development are so important that it is certainly worth the investment in areas where the climatic and ecological conditions are suitable.

In rural areas where there is lack of formal markets and quality control, the possible health risks associated with indigenous milk markets are seriously threatening smallholder dairy livelihoods and thereby the potential for poverty reduction, unless they are dealt with in an appropriate way.

The cost benefit of dairy production varies so much depending on a number of factors such type or breed of cattle, number of producing cattle kept, market accessibility, availability of supplementary feeds, AI services, veterinary services, size of land available for fodder production and access to water.

2.2.1 The human population

As earlier mentioned, Rwanda is overpopulated with approximately 92% of Rwandans living in rural areas. The Northern Province and Eastern Province are the most and least populated regions in Rwanda respectively. While high population density provides a market for livestock products such as milk, competition on resources makes production more challenging.

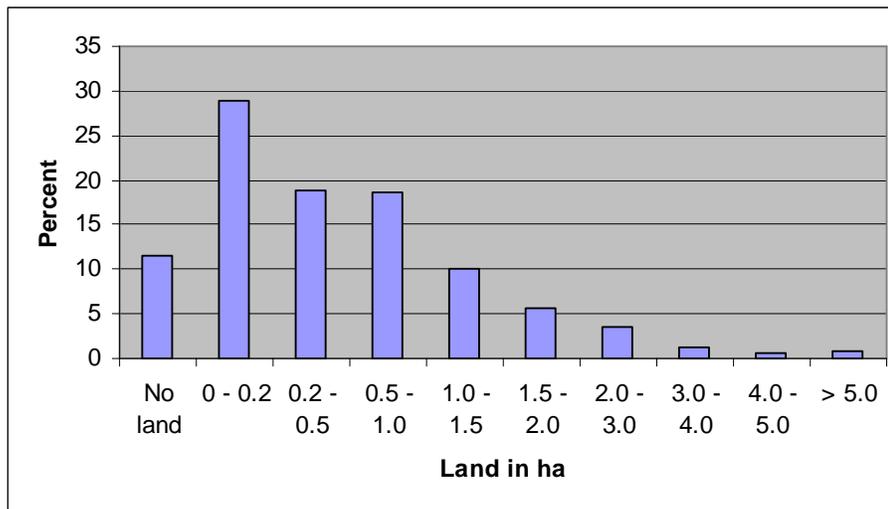
2.2.2 Land

Chart 1 shows that on average, 79.4% of households in Rwanda own some farmland regardless of its size and quality. About 11.5% of the households mostly in urban areas are landless. Apart from Kigali City, Rusizi has the highest number of landless households. According to MINECOFIN, (2002), the percentage of households that own farm size of less than 0.2 ha is around 28.9 % for the whole country Huye and Nyamagabe at 61.7 and 59.0% respectively are the districts with highest percentage of households with farm sizes of less than 2ha, followed by Rusizi (37.3%) and Burera (35.9%). Such small land holdings can barely support a typical Rwandese family, especially where land quality is poor increasing the level of vulnerability of many households with no chances of off-farm employment in the formal and informal sectors. Crop livestock integration is key to increased productivity of such small portions of land.

Fragmentation of land (Plate 1) is potential sources of conflicts between communities of farmers if concrete short and long term plans are not put in place to forestall the current and envisaged livestock feed and feed constraints. The current government policy of

Fig.3. Fragmented plots of land (in Gakenke district)



Fig.4. Farm area per household (%)

Besides some land ownership by households, the practices of land renting, share cropping and lending are very common. For example, on average 10.7% of farmland in Rwanda is rented in the form of cash and in kind. The practice of land renting is more prevalent in Nyamagabe (19.2%) and Huye (15.8%). It is less prevalent in Nyagatare (2.8%). The economic implication of such a system is that the majority of such tenants will desist from making long-term investments on rented land due to lack of tenure security. However, the land rented provides employment in terms of fodder production for sale to land less cattle keepers.

2.2.3 Cattle

The decimation of livestock during the genocide affected the fertility of the soil, given that before the war a large proportion of farmers relied solely on manure for fertilizing their land (Thompson, 1999). Although many cattle were killed during the war, large herds of cattle entered the country in 1994, brought in by Rwandan returnees from exile in Uganda and Tanzania. The result is the high concentration of cattle in the Eastern parts of the country, with an attendant pressure on the area's natural resources.

Cattle population including improved dairy cattle is estimated at about 1.160.090 heads of cattle .Out of that, 86% are local breeds, 13% crosses and 1% grade cattle. The target is to have 38%, 54% and 8% of the of the cattle population being local breeds, crosses and grade

or pure breeds respectively. Nationally, the number and proportion of cattle is highest in Eastern Province, Southern Province and the suburbs of Kigali, and lowest in Kigali Urban, Northern and Western Provinces (MINAGRI, 2008).

Province	Number of cattle
MVK	32,630
North	171,718
East	455,311
South	333,316
West	167,366
TOTAL	1,160,090

Table 2. Number of cattle per province

The importation of pure-bred cattle has been done to increase the dairy cattle population, but of recent more effort is put in the breeding programmes. The following numbers of cattle were imported from different countries:

The current government programme of *One Cow Per Poor Household* is aimed at distributing dairy cattle all over the country and especially where there is low cattle population. Dairying is one of the most cost-effective methods of converting scarce land, crude and improved feed resources into high quality protein- rich food for human consumption. Equitable growth strategies for poor countries foster inclusion of the rural poor into high-value agricultural markets. Dairy production presents an opportunity for smallholder households to become more integrated into such markets while improving their nutrition. The following is the status of dairy cattle distribution by “one Cow per poor household” status by July 2008.

Table. 3 Distribution of heifers in “One cow One poor household program

Province	Percentage
MVK	2.4
North	10.6
East	30.1
South	36.1
West	20.9
TOTAL	13939

Milk production is growing in importance in developing countries. Milk consumption in these regions is projected to increase 3.3% per year through 2020, well above the rate of population growth. Moreover, milk is the most important and ubiquitous animal product that smallholders produce. Few smallholder systems in the world have adjusted to the pressures of increasing population density and urbanization without recourse to dairy production. Dairy production increases household income and improves its stability while furthering other high-value activities, such as intensive poultry and vegetable cultivation and small-businesses. Small amounts of nutrient-rich dairy foods can relieve both protein malnutrition and micronutrient deficiency in the most vulnerable groups-malnourished children and women in their child-bearing years. Smallholder dairy farming, which is overwhelmingly a female occupation, also empowers women, generates cash for buying extra food and sustains crop production.

The coincidence of these factors presents an opportunity in smallholder dairy that can be seized upon to lay the foundation for equitable broad-based growth in developing areas.

Since the smallholder farmers have labor and access to land regardless of size, they are the most likely source of future increases in milk supplies in Rwanda if deliberate efforts are made to help them acquire one to two quality cattle managed under the zero grazing system.

The dairy industry in Rwanda is however, highly constrained by tremendous pressures created by both the availability of land per capita and the ingrained cultural habit of Rwandans to maintain large numbers of cattle. There are also the endemic problems of lack of availability of production inputs like feeds and lack of good quality cattle.

The Government through MINAGRI and her development partners, NGOs and the private sector, seem to be awakening to the above-mentioned realities as evidenced by the existing dairy development projects and support programmes. For example under PADEBL, efforts have been directed towards the improvement of the genetic makeup of the national herd through sound-breeding practices, improved AI delivery systems and distribution of improved bulls to farmers and farmer groups, extension and farmer training and organized marketing systems for milk and meat etc. Other interventions include those geared towards the utilization of improved and locally available feed resources through better forage

husbandry, utilization and conservation of feed resources for dry season feeding. The latter aspects are mandated to ISAR.

2.2.3. 1 Breeds of cattle kept in Rwanda

Identification of the types and breeds of cattle kept by farmers is a key element in attaining the objectives of this assignment. The type of breed kept has a direct relationship to the livestock production system described below.

Available data show that smallholder milk producers' mainly keeping traditional and crossbred cattle (Plate 2 and 3) collectively own 99% of the cattle in Rwanda. The rest comprise exotic breeds of cattle mostly Friesians, a few Jerseys and Browns Swiss (Plates 4, 5 and 6 respectively). There is also an allay of non-descript crosses between the exotic breeds themselves and with the local Ankole and scrub breeds, all kept on commercial dairy farms in and around Kigali City, Kicukiro, Gasabo, Ngoma, Rubavu, Gakenke and Gicumbi districts. Most traditional cattle (Ankole) are found in Nyagatare district while Ruhango district has the highest concentration of crossbred cattle.



Fig.7 Frieans



Fig.5 Ankole



Fig.6 Sahiwal
Ankole
crosses



Fig.8. Jersey



Fig.9. Brown Swiss

There is an increasing demand for all the dairy breeds shown above and this demand will be there for a number of years to come. The one cow per family program needs heifers in thousands and the supply is limited. Investment in Artificial Insemination and other related services will have positive returns.

3.0 Government Policies and Interventions in the Dairy sub-sector

The dairy industry in Rwanda is young and growing fast. Rwanda produces about 25% of East Africa's raw milk and about 0.02% of fresh milk produced globally. In 2007, Rwanda produced about 160,000,000 litres of fresh milk from a cattle population estimated at 1,148,000. About 62,000,000 litres were consumed on farm, and about 35% of the raw milk is wasted from spoiling before reaching the market or being processed. Most of the milk

(48%) is produced in traditional or extensive grazing system in the Eastern Province. The Eastern province keeps more than 49% of all cattle population, and the predominant breed is Ankole type, which make up 84% of cattle population in Rwanda. Calculations show that about 62% of the pastoralists' revenues come from keeping livestock.

3.1 Collaboration with development partners and Private Sector

The government of Rwanda has encouraged donors to support the dairy sub-sector in different areas whenever that fits in the objectives of the donor organizations. These are some of the organizations identified during the study that are involved in the dairy sub-sector.

Table 4. Different organizations supporting the dairy-sub sector in Rwanda

ORGANIZATION	TYPE OF SERVICE	PATTERNSHIP WITH MINAGRI
HPI	Genetic Improvement in , Gicumbi, Gakenke and Bugesera	Train Inseminators working in their operation area, Provision of Insemination kits Provision of liquid nitrogen
PDRCIU	Animal husbandry in Nyagatare	Train Inseminators working in their operation area
ARMV	Vaccination	Provision of vaccines
GAHINI DIOCESE	Animal husbandry	Train Inseminators working in their operation area Provision of Insemination kits Provision of liquid nitrogen Extension to farmers
SEND A COW	Genetic Improvement in Buliza Kabuga	Provision of Insemination kits Provision of liquid nitrogen Provision of Semen and Hormones
IAR	Extension	Building capacity and helping farmers to form cooperatives.
ISAR	Research	Train Inseminators, Pasture improvement
ISAE	Training and Research	Joint student research supervision
LWF	Extension Kamonyi and Ruhango	Train farmers in their operation area
EPR	Extension Kigali	Train farmers in their operation area
INGABO	Genetic Improvement in Ruhango	Provide AI kits Train inseminators
ADRI	Genetic Improvement in Kigali peri-urban	Provide AI kits Train inseminators
IRST	Animal health	Use of traditional medicine for diseases control
Rwanda Community Works	Milk Collection and marketing in Bugesera	Support farmer organization in production, milk collection and marketing.
Land O' Lakes	Improve Rwandan dairy competitiveness	Support all dairy components that will increase Rwandan Dairy competitiveness in Eastern and Southern province in the districts of Nyagatare and Nyanza.
Technoserve	Support farmers along the dairy chain in Nyagatare district.	Liaise with Minagri on required support along the dairy chain in Nyagatare district and provide the needed training.

There could be other organizations working in different forms in different areas that we did not come across during the study period. It is however evident that all these organizations are putting a lot of resources in the rural area in support of dairy development. This trend coupled with the one cow one family program, the dairy cattle population is increasing dramatically in Rwanda. Although the dairy production is still low in Rwanda compared to Uganda, Kenya and Tanzania, timely efforts should be in place to cope with the increasing numbers of dairy cattle. The Ministry of Agriculture, through RARDA, should find a way to harmonize all the existing support and advise appropriate support areas for new organizations to intervene. Due to different interventions, milk imports have been going down gradually.

Apart from milk, other milk products are being imported in the country in big quantities, which is one of the indicators of internal demand. For the last three years, the following products worth over 3M US\$ were imported. The trend has actually been the decline of dairy imports which were much higher in previous years (1999-2004).

Table 5. Importation of milk and milk products (2005-2007)

Year Product	2005		2006		2007 (Jan-Nov)	
	Quantity in kg	Value (cif) in Frw	Quantity in kg	Value (cif) in Frw	Quantity in kg	Value (cif) in Frw
Full cream milk	134.373	29.399.779	139.836	33.141.310	194.356	40.515.483
Full cream milk with additives	352.800	406.972.316	324.372	307.103.404	548.460	702.389.643
Yoghurt	3.893	6.281.285	36.773	22.602.051	12.866	12.796.210
Concentrated milk	7.655	24.152.258				
Butter	1.381	3.222.259	3.547	7.811.994	14.838	11.043.671
Cheese	16.164	21.409.464	18.659	20.213.727	18.957	19.903.341
Total	516.266	491.437.361	523.187	390.872.485	789.477	786.648.708

Source : National Bank of Rwanda, 2007

4.0 Laws and Regulations governing the dairy sector.

The laws and regulations governing the dairy sector are not so different from those for the agricultural sector. Rwanda has liberalized economic policies that support the private sector development. Livestock sector policy has not yet been put in place, and dairy is handled in the general framework of agricultural policy.

4.1. Equity Environment.

There are no equity restrictions in Rwanda and a foreign investor can own up to 100% of business. He can as well repatriate all capital and profits after tax.

4.2 Institutional framework

Investment in the dairy sub-sector is handled in equal terms with other investments in agricultural sector. A new investment law, on investment and export promotion and facilitation, which came into force in March 2006, is intended to assist investors in obtaining the necessary licenses and by providing other assistance and incentives. The principal features of the law include the following:

- The law defines “foreign investor” and “local investor” and specifies that the former shall qualify for an investment certificate with an investment of \$250,000 and the latter \$100,000.
- The law provides for free economic zones of three kinds: export-processing zones, single enterprise export-processing zones and free trade zones.
- A one-stop centre is established at the Rwanda Investment and Export Promotion Agency (RIEPA), composed of officials from the Rwanda Revenue Authority, the Ministry of Justice, the Ministry of Labour, and the Department of Immigration and Emigration, among others. In the performance of their duties, these officials are to be answerable to RIEPA.
- The provisions on fiscal incentives have been moved to the new law on customs and the new law on income tax but maintained as annexes to the investment law, for ease of reference.
- The law provides special non-fiscal incentives for investors who invest \$500,000 in one step. These include permanent residence, citizenship and access to land.
- RIEPA is required to make and communicate its decision regarding an investment certificate within 10 working days after receiving a complete application. Should RIEPA fail to act within 10 days, the investor may complain to the Minister of Commerce who is in turn required to investigate the matter and communicate his/her decision within 5 working days.

- The law also states that the holder of an investment certificate is entitled to certain benefits.

4.3 Current policy and legal framework

The current policy is intended to spur economic growth, as outlined in the document Vision 2020. All sectors are open to foreign investment.

- The Law Governing Commercial Establishments,
- the Investment Law,
- the Law on Privatization and Public Investment,
- the Land Law, and
- the Law on Protection and Conservation of the Environment are the main laws governing investment in Rwanda.

The existing framework provides guarantees against the expropriation of private property, except in the public interest and with fair and prior compensation. It also guarantees the repatriation of capital and after-tax profits.

4.4 Global and regional organizations and treaties of interest to potential investors

- The African Trade Insurance Agency (ATI)
- The Common Market for Eastern and Southern Africa (COMESA)
- The East African Community
- The Cotonou Agreement between the European Union and African, Caribbean and Pacific States (ACP)
- The International Centre for the Settlement of Investment Disputes (ICSID)
- The Multilateral Investment Guarantee Agency (MIGA)
- The Paris Convention on Intellectual Property, the Universal Copyright Convention and the Berne Copyright Convention
- The World Intellectual Property Organization (WIPO)
- The World Trade Organization (WTO).

Rwanda has also signed several bilateral investment treaties (BITs) and double taxation treaties (DTTs).

4.5 The East African Community

Rwanda is a full member of the East African community. Rwanda is therefore in the process of harmonizing all investment and customs codes. With Rwanda, the EAC will offer investors a significant market of over 100 million consumers. Unlike other regional organizations in Africa, the EAC may actually move relatively quickly towards its goal of economic integration.

An investment allowance of forty per cent (40%) of the invested amount in new or used assets may be depreciated excluding motor vehicles that carry less than eight (8) persons, except those exclusively used in a tourist business is accepted to deduct from a registered investor in the first tax period of purchase or of use of such an asset if:

- 1° the amount of business assets invested is equal to at least thirty million (30,000,000) Rwandan francs; and,
- 2° the business assets are held at the establishment for at least three years
- 3° tax periods after the tax period in which the investment allowance was given.

The investment allowance shall be fifty per cent (50%) if the investor carries out operations in rural areas outside the City of Kigali or invests money in priority sectors as mentioned in law establishing Rwanda Investment Promotion Agency.

The investment allowance reduces the item value or construction cost, as well as the basic depreciation value of pooled business assets.

If the business asset that is granted an investment allowance is disposed of, before the provisions of point 2° on the paragraph one related to investment allowance,, the reduction of income tax caused by the investment allowance, increased by an interest applicable to late monthly filers starting from when that investment allowance was granted to the time of disposal, shall be paid back to the Tax Administration unless such an asset is out due to natural calamities or other involuntary conversion.

Taxable Business profit is rounded down to the nearest 1,000 RWF and taxable at a rate of thirty per cent (30%).

However, a registered investment company which carries out its non taxable economic operations or a foreign company which has its headquarters in Rwanda and which fulfils what is required by Rwandan law on investment promotion shall be entitled to:

- 1° pay corporate income tax at the rate of zero per cent (0%);
- 2° exemption from interest tax mentioned in article 51 of the law on direct taxes on income;
- 3° non-taxed repatriation of profits abroad.

4.6 Tax incentives/regime

A registered investor shall be entitled to a profit tax discount of:

- 1° two per cent (2%) if the investor employs between one hundred (100) and two hundred (200) Rwandans;
- 2° five per cent (5%) if the investor employs between two hundred and one (201) and four hundred (400) Rwandans;
- 3° six per cent (6%) if the investor employs between four hundred and one (401) and nine hundred (900) Rwandans;
- 4° seven per cent (7%) if the investor employs more than nine hundred (900) Rwandans.

The mentioned tax discount shall only be granted to the investor if he or she employs such employees for a period of at least six (6) months during a tax period, and are not in the category of employees who pay at the rate of zero per cent (0%) stipulated in article 50 of the Law on direct taxes on incomes.

If a taxpayer exports commodities or services that bring to the country between three million (3.000.000) US dollars and five million (5.000.000) US dollars in a tax period, he or she shall be entitled to a tax discount of three per cent (3%).

If he or she exports commodities or services that bring to the country more than five million (5.000.000) US dollars in a tax period, he or she shall be entitled to a tax discount of five per cent (5%).

An individual who receives taxable income prepares an annual tax declaration and presents the declaration to the Tax Administration (Large Taxpayer's Office, Small and Medium

Taxpayers Office or in RRA offices in Provinces) not later than 30 June of the following tax period.

- An individual person is liable to income tax per the tax period from all domestic and foreign sources;
- A non-resident person is only liable to income tax, which has a source in Rwanda.

Taxable income is composed of the following: 1° Employment income; 2° Business profits; 3° Investment income.

Taxable income is levied progressively according to the following rates.

Annual Taxable Income (RWF)	Tax Rate
From 0 To 360,000	0%
From 360,001 To 1,200,000	20%
From 1,200,001 and greater	30%

Intermediate business owners shall pay a lump sum tax of 4% on an annual turnover not exceeding 20 million Rwandan francs (20.000.000 FRW).

4.7 Tariff on imports.

The above tax regime is global to all investments. Livestock/dairy investments attract 0 tariff on all investment and inputs in the sector. The bigger and more rural the investment is, the higher tax incentives it attracts. Foreign and local investors play on level ground. All finished dairy products attract 5% from EAC and COMESA countries and 30% from non-EAC/COMESA sources.

4.8 Non-Tariff Charges and barriers

Delays on cross border procedures, difficulty on identification of product codes (eg powder milk for direct consumption vis avis powder milk for reconstitution in dairy plants) are difficult to differentiate on custom duties and tariffs. Non tariff payments include 4% for MAGERWA, 1% for RBS, and document clearing fees.

4.9 Disputes

Most disputes in Rwanda are resolved through commercial courts. At the moment, there is no specialized commercial court but the planned reforms include the creation of one. Arbitration and alternative methods of dispute resolution are being developed, since the civil, commercial and labour codes, as well as administrative procedures provide for arbitration.

An Arbitration Centre was created in 1998 as a non-governmental organization with the mission of settling all commercial disputes. The Government has adopted a policy of encouraging the formation of more arbitration centres. A Law on Arbitration and Conciliation is being drafted to provide a legal framework for improving arbitration and alternative dispute resolution in general.

Rwandan commercial courts would, as a general rule, recognize a governing-law clause in an agreement that provides for foreign law. However, the selection of such a law must be real, genuine, bona fide, legal and reasonable. A Rwandan court would not give effect to a foreign law if the parties intend to apply it in order to evade the mandatory provisions of a Rwandan law with which the agreement has its most substantial connection and which, for this reason, the court would normally have applied. There have been few investment disputes in Rwanda and the Government has never been involved as a complainant or respondent in dispute settlement under the auspices of the World Trade Organization (WTO). The country has been a member of the Multilateral Investment Guarantee Agency (MIGA), which provides guarantees against non-commercial risks, since 1989. It is also a member of the International Centre for the Settlement of Investment Disputes (ICSID), associated with the World Bank, and a founding member of the African Trade Insurance Agency (ATI).

5.0 National Dairy Strategy and existing Opportunities in the dairy Industry

The National dairy sub-sector strategy falls in the general framework of the EDPRS and is geared towards increasing farmer income, improvement of nutritional status at family level without any adverse effect to the environment. Apart from food security, it is forecasted in the Eastern African region that dairy products demand will grow steadily, and Rwanda wants to position herself to be able to export in the neighboring countries in the near future. Rwanda is a member of COMESA and EAC. COMESA through ESADA, has been implementing a program of regional harmonization of milk quality standards that will govern

milk marketing in the region. It is from this strategy that the Government of Rwanda decided to pursue dairy development through the zero grazing system where livestock keeping will benefit from crop production through feeding of crop residues and crop production will be improved through manure application. It is understood that by increasing numbers of dairy cattle in rural settings, there are significant direct contributions at household level of dairy producing households such as

- Access to high quality nutrients – improved nutritional status of the children
- Employment of family members
- Regular incomes for long periods
- Manure for crops and improved soil fertility
- Income funds for education and health expenses

It was easy to identify the difference in living standards of the household with one or two dairy cows compared to those without. Two physical features that confront you is the health good health of the children and healthy banana plants near the cattle shed. Most of farmers were using manure for fertilising tomato gardens which produced further income to the household. The vast majority of the poor and malnourished in Rwanda live in rural areas and depend on farming and farm income. Malnutrition here is pervasive among women and pre-school children. A glass of milk every day can make a great difference. In short, dairy support food security first, and extra income next.

In spite of all these positive elements, we observed a number of constraints facing the dairy sector. Every constraint provides an opportunity for investment and introduction of new technology or innovation.

5.1 Constraints facing the dairy sub-sector of Rwanda

5.1.1 Lack or no access to milk markets to generate highly needed cash to cater for other family needs.

It is estimated that out of 160 million litres produced per year, about 62 million litres never reach the market and is consumed at home or lost through wastage. It is however further estimated that about 50 million litres are wasted every year. Poor infrastructure especially road networks between production areas and the market is a major constraint to milk

producers. Dairy farmers depend on bicycle transporters who buy milk at very low prices and most of times on credit. We observed many cases where farmers are not paid with an excuse that milk got spoiled before it was sold. This could be true that milk really got spoiled due to staying in the sun for a long time and has undergone a lot of shaking due to corrugated pathways, but the farmer is the ultimate loser.

5.1.2 Low quality of milk that renders it to quick spoilage and being unacceptable even where markets are accessible.

This problem was observed to emanate from poor hygienic conditions at farm level, poor quality of milk pails and containers used to transport milk, and the time it takes for the milk to reach the final buyer. Lack of water for udder cleaning, lack of knowledge on minimum hygienic milking conditions, use of plastic containers that are difficult to clean and long distances with poor roads were the issues to mitigate in order to come up with clean milk that will reach the market in wholesome conditions.

5.1.3 Lack of quality feeds to match the potential productivity of the existing dairy cattle

About 50% comes from indigenous (Ankole cattle) and the rest comes from improved breeds with varying degrees of dairy breed genetic components ranging from 50% crosses to pure bred cows. These improved dairy cattle need improved feeding to attain their milk production potential. In most cases it was observed that quality feeds, especially good quality roughages and supplementary concentrates and essential minerals were lacking. This problem has long term negative effects ranging from poor milk production to prolonged calving intervals. Prolonged calving interval is of particular problem as it makes the farmer work hard to maintain the animal when there is no milk production. The cow becomes a burden instead of a blessing.

5.1.4 Lack of veterinary services and other inputs to support health of animals and increased production

It was indicated in most districts visited that veterinary services were lacking or comes very late when the animals get sick. The issue here was observed to be a lack of critical mass of animals to justify a private veterinary service provider to invest in the area. The tendency is for the veterinary services providers to install the service delivery points in towns. The common means of reaching them when a farmer has a problem was use of mobile phones, either owned by the farmer or borrowed from a neighbour. The whole process seemed complicated and by the time the vet arrives, he comes ill-equipped, and has to go back for

the right solution and in most cases the animal dies or takes too long to treat. Lack of basic knowledge on heat identification where there is no bull was also noted as a major problem. Farmers would notice that the cow was on heat when it was too late for insemination, even in areas where inseminators were available.

5.1.5 *The existing installed collection and cooling units have no access to produced milk, and serious water shortage*

Table 6. *The existing situation (2008) of the installed collection and chilling centres.*

N°	Collection centre	District	When Installed	Funding Agency	Capacity (L)	Current capacity (L)	Milk received/day	% of the Installed capacity	Source of energy	Cost of Installation	Is the centre operating properly	Water availability
1	Matimba	Nyagatare	2005	PADEBL	2000	2000	2,000	100%	Grid Electricity & Generator	32,000,000	Yes	Yes
2	Kirebe	Nyagatare	2006	PADEBL	2150	4300	3,100	72%	Generator	32,000,000	Yes	Yes
3	Mbare	Nyagatare	2004	PADEBL	2150	5200	4,200	81%	Grid Electricity & Generator	32,000,000	Yes	No
4	Ndama	Nyagatare	2005	PADEBL	2,150	3,289	2,140	65%	Generator	32,000,000	Yes	Yes
5	Ruhuha	Nyagatare	2005	PADEBL	2,150	2,150	1,300	60%	Generator	32,000,000	Yes	No
6	Nyagatare	Nyagatare	-	Nyagatare District	3,200	3,200	3,200	100%	Grid Electricity & Generator	-	Yes	No
7	Gacundezi	Nyagatare	1997	PNUD	3,200	3,200	2,700	84%	Generator	-	Yes	No
8	Ryabega	Nyagatare	2006	Farmer's coop	3,200	3,200	1,700	53%	Grid Electricity	-	Yes	No
9	Buhabwa	Kayonza	2003	PADEBL	2,000	2,000	1,700	85%	Generator	32,000,000	Yes	No
10	Rwisirabo	Kayonza	2005	PADEBL	2,150	2,150	1,700	79%	Grid Electricity & Generator	32,000,000	Yes	No
11	Kayonza	Kayonza	2006	Gakuba Damascène	1,030	2,300	1,030	45%	Grid Electricity & Generator	4,670,000	Yes	No
12	Nyarubuye	Kirehe	2005	PADEBL	2,500	2,500	100	4%	Generator	32,000,000	Yes	No
13	Mbyo	Bugesera	2001	Handicap International	1,500	1,500	300	20%	Grid Electricity & Generator	28,580,000	Yes	Yes
14			2005		2,000	2,000	3,200	160%	Generator	32,000,000	Yes	No

N°	Collection centre	District	When Installed	Funding Agency	Capacity (L)	Current capacity (L)	Milk received/day	% of the Installed capacity	Source of energy	Cost of Installation	Is the centre operating properly	Water availability
	Rugobagoba	Kamonyi		PADEBL						000		
15	Kinazi	Ruhango	2005	PADEBL	2,000	2,000	800	40%	Grid Electricity & Generator	32,000,000	Yes	No
16	Buhanda	Ruhango	2005	PADEBL	2,000	2,000	0	0%	Grid Electricity & Generator	32,000,000	No	No
17	Rurangazi	Nyanza	2005	PADEBL	2,250	2,250	800	36%	Generator	32,000,000	Yes	No
18	Kageyo	Gicumbi	2004	PADEBL	2,000	2,000	5,000	250%	Generator	32,000,000	Yes	No
19	Byumba	Gicumbi	-	-	0	-	-	-	-	-	-	-
20	Musanze	Musanze	2002	PADEBL	2,015	2,015	2,015	100%	Grid Electricity & Generator	32,000,000	Yes	yes
21	Kajevuba	Rulindo	2001	Handicap International	1,500	1,500	0	0%	Generator	16,500,000	No	No
22	Mizingo	Rubavu	2004	PADEBL	2,000	2,000	3,000	150%	Generator	32,000,000	Yes	No
23	Rugende	Gasabo	2002	Handicap International	1,500	1,500	200	13%	Grid Electricity & Generator	14,330,000	Yes	No

As it can be seen in the summary above, a number of collection centres in Eastern province and some in Northern Province were doing well and some even needed increased capacity to cope with milk produced in the area. However a majority of the collection centres did not receive sufficient milk to cover their operation costs. Others were closed altogether (Kajevuba, Buhanda) because farmers prefer to sell the milk in Kigali where they fetch better prices.

The profitability of the collection and chilling centres is questionable and could be the reason that most of them don't save enough to invest in sufficient water supply. A typical example is from analysis done by CAPMER in March 2008 at Kageyo in Gicumbi district.

Table 7. Kageyo milk collection centre

Collection Centre	Kageyo
Annual Income	216,000,000
Milk purchase	204,400,000
Salaries	3,360,000
Electricity	0
Generator fuel	927,680
Water	72,000
Milk quality control	360,000
Other hygiene expences	0
Transport	1,825,000
Property management	240,000
Depreciation-buildings	750,000
Depreciation- machines	3,400,000
Profit before tax	1,415,320

5.1.6 Continued consumption of raw milk due to its affordability, posing health hazards

The raw milk market is strong and is here to stay if sufficient technological innovations are not put in place to lower the cost of production at farm level and price of good quality processed milk. Due to a strong milk consumption culture in Rwanda, demand for milk is high, but less than 50% of produced milk reaches the market. The high demand makes some unscrupulous traders to add water which contaminates the milk. RBS indicates between 7-8 million/ml of bacteria in sampled milk around Kigali. Still consumers go for the raw milk instead of imported or locally packed milk with quality assurance. Studies done by Land O'Lakes in most East African countries show that quality is number one consumer concern. There must be something wrong therefore, for price to override this perception so significantly in Rwanda. The suspect culprit is affordability. Data from the national bank of Rwanda (NBR) show a massive import of powder milk and UHT milk. Personal observation

noticed that a truck of VIVA milk sold at 1.2 US\$ per litre is offloaded to shops without even reaching the warehouse, still all this goes to a small number of potential consumer base. This confirms Land O'Lakes study results and NBR' data. What is needed is to balance the quality expectations with affordability for majority of consumers.

5.1.7 Plants operating at lower than installed capacity.

All the existing processing plants are operating at less than 20% of installed capacity. The main reasons provided by most of these plants for this state of affairs is the lack of sufficient raw milk of the right quality and low market for pasteurised milk. These observations contradicts the Land O' lakes' study in East Africa and the fact that there is sufficient raw milk in different areas of the country , and also the fact that consumers even go a long way to buy expensive imported UHT milk . Lack of knowledge among the processors as to where the milk is was noticed. Un-operable equipment and lack of technical skills to produce diversified products was evident in most of the plants.

Table 8. Performance of existing dairy processing units in Rwanda

Dairy Plant	Installed Capacity (L/day)	Processed milk (L/D)	Products Produced	% to Installed capacity
Nyabisindu Dairy (Nyanza District)	15,000	3,000	Cultured drinking yoghurt Flavoured Yoghurt	20%
Inyange Industries (Kicukiro – Kigali)	100,000	2,000	Pasteurised milk, flavoured yoghurt	2%
UDAMACO	40,000	Not yet Started	-	0%
Ruyenzi -	25,000	Not yet started	-	0%
Dan- Cheese Gishwati	5000	3000	Hard Cheese	60%
Rubirizi dairy Kicukiro- Kigali	8000	1200	Pasteurised milk Cultured drinking yoghurt	15%

The planned installation at Inyange will require extra planning and effort to get the required volume of raw milk, otherwise it will end up as a 'white elephant'

5.1.8 High cost of Processed milk

The price of one litre of processed milk is three times that of raw milk, this gap is too big for the consumers. At most the price of processed milk should be twice of that of raw milk to balance the quality perception and affordability. The current situation is:

—	Fresh milk	: 200 Frw
—	Cost of processing	: 117 Frw
—	packaging material	: 83 Frw
—	Gross margin	: 100 Frw
—	plant-gate price	: 500 Frw
▼	Retail price	: 600 Frw

5.1.9 *Lack of markets during rainy season due to weak collection and marketing strategy.*

This is a common phenomenon in all East African countries. The habit of informal milk marketing develops a vicious circle where processing plants lack milk during the dry season, and as a result don't plan for increased volumes during the rain season where milk would be processed and sold during lean periods. On the other hand, informal markets of raw milk cannot absorb all the milk produced in the rain season. This results in spoilage ranging from 30% to 40% of all produced milk.

5.1.10 *Lack of good breeds of dairy cattle that will produce the volume of milk commensurate to labour and other inputs.*

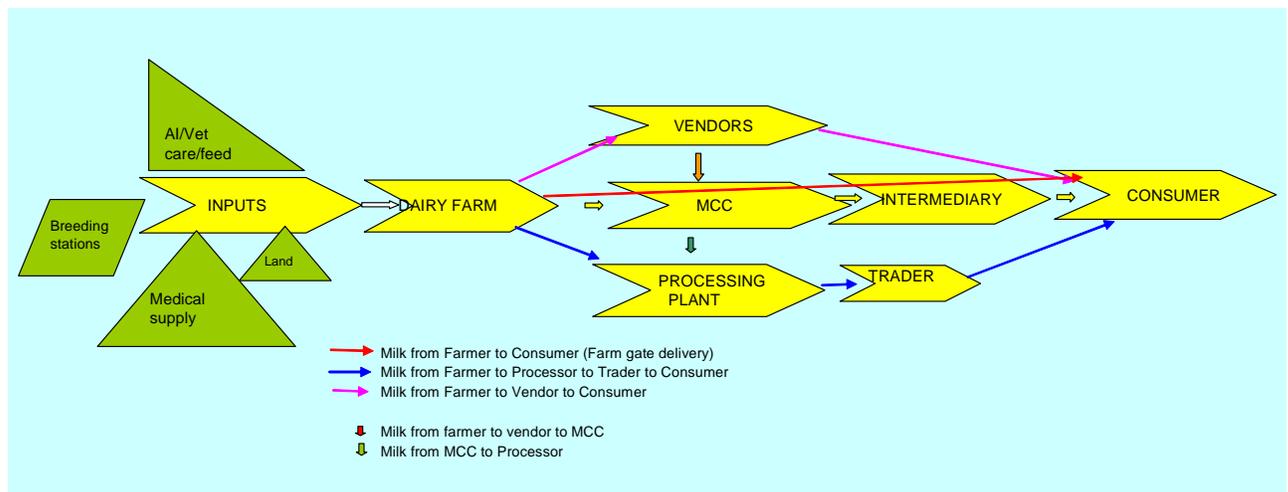
The cost of maintaining a cow does not vary so much whether that cow produces less milk than another. However, a higher milk producing cow makes a huge economic difference from the non-producing one through milk sales. This simple reality is the sole reason that farmers are looking for breeds of cattle that are high producers, so that they get return on their investment through feeds, medicine, cattle shed etc. There is shortage of good quality dairy cattle in the region (East Africa). Rwanda has tried to compensate for this problem by importing dairy cattle from as far as Ireland, South Africa, Germany, Netherlands and recently from Kenya and Uganda. As importation of this animals comes close to US\$ 2000 per pregnant heifer landed in Kigali, more efforts have been put in upgrading local breeds through Artificial Insemination. This trend is evident from the priorities of NGO's working to support dairy development (see table....)

6.0 Employment and Investment opportunities in dairy sub-sector of Rwanda.

Investment opportunities exist along the value the dairy value chain. The value chain starts with a farmer all the way to the retailer and final consumer. The dairy industry is a significant source of employment in Rwanda. Tens of thousands of Rwandans earn their

living through dairying and related activities. The sector currently accounts for 6 percent of total national gross domestic product (GDP) and about 15 percent of the agricultural GDP. Small-scale operators dealing in raw milk dominate the informal market, while larger enterprises provide processed milk in the formal market. There are over 100,000 dairy farm households in Rwanda, and much of the labour input on these farms is family-based self-employment. In addition, it has been estimated that dairy farming generates about 50 full-time wage-labour opportunities per 1,000 litres of milk produced on a daily basis. This translates to 10,000 jobs nationally. Dairying also generates many indirect jobs in the supply of secondary inputs and services to farmers, although such employment has not yet been quantified. Given the very large share of dairy farming in the agricultural GDP and the rapid growth rate of the sector, through 'one cow per household and other breeding and animal importation initiatives, it is reasonable to conclude that investment in dairying creates significant job opportunities in Rwanda. Many people are employed in the wide range of enterprises involved in moving milk from the farm to the consumer, including retail outlets (such as milk kiosks) and mobile milk traders in the informal sector, and milk processors and distributors in the formal sector. These people and enterprises generate indirect employment by buying services and products, such as bicycle or milk equipment repair, and milk packaging material. The following diagram illustrates the point of entry along the value chain as points of investment opportunities.

Fig.10. Milk Chain



6.1 Employment in the informal sector

About 500,000 litres of milk are traded daily in the informal market in Rwanda. Those engaged in delivering milk from the producer to the consumer include:

6.1.1 *Mobile milk traders* are largely self-employed. They typically sell 50 to 100 litres of raw milk daily, delivering their produce mainly by bicycle. This trade generates a mean of 20 full-time jobs (17 direct, 3 indirect) per 1,000 litres of milk handled on a daily basis. A major constraint is the lack of legal recognition of the trade by the RARDA and RBS, who argue that the lack of fixed premises compromises milk quality.

6.1.2 *Milk bars* are specialist outlets selling milk from fixed premises, often with seats for customers a good example is at Mary's in Commercial street in Kigali. The employment rate is 14 jobs (11 direct, 3 indirect) per 1,000 litres of milk handled daily. They use both family labour and wage employment. They collect milk from producers on foot, by bicycle, or by public transport.

6.1.3 *Shops and kiosks* trade in milk as part of other retail activity, mainly involving sale of household consumer items. The milk trade often comprises less than half of their total turnover.

6.2 Employment in the formal sector

The larger enterprises of the formal processing and marketing sector generate a mean of 12.5 full-time jobs per 1,000 litres of milk handled on a daily basis, less than in the informal sector. Of this total, 11 jobs are direct, less than the rate for mobile milk traders (see above). Conversely, only 1.2 indirect jobs are generated per 1,000 litres of milk handled by formal processors, compared to 3 in the informal sector. About half of the indirect employment arises from the manufacture of packaging material. There are variations within these figures; the amount of employment generated per 1,000 litres handled daily declines with scale, perhaps due to substitution of capital for labour. For example, smaller scale processors support about 13 jobs per 1,000 litres (Dan Cheese), while larger-scale processors support about 6 jobs.⁷ Although the formal sector generates fewer jobs per 1,000 litres of milk handled than the informal sector, it does on the other hand offer more stable employment. Nyabisindu, Inyange, Rubirizi and now UDAMACO are typical examples in Rwanda.

6.3 Employment in milk marketing and processing

Using the employment rates above, it is projected that the entire dairy marketing and processing sector in Rwanda supports a total of some 8,000 jobs. Most jobs in both the formal and informal dairy sectors are direct. Direct job opportunities in the informal sector predominantly involve self-employment. In areas where daily transportation of milk is difficult, farmers resolved to preserve their milk through cheese making. There are more than 15 cheese processors' associations/groups, but the most prominent ones are indicated in the table below:

Table. 9 Cheese production (Kg) by different small producers.

N°	Year	2001	2002	2003	2004	2005
	Cooperative					
1	Amizero	1.055	1.372	1.688	2.110	2.659
2	Ihogoza	985	1.281	1.576	1.970	2.482
3	Tuzamurane	438	569	700	875	1.102
4	Dufashanye	320	416	512	640	804
5	Abanyamurava	273	354	436	545	685
6	Jyambere	108	140	172	215	271
7	Twiyubake	95	124	152	190	239
8	La Reine	243	315	388	485	611
9	Imbaraga	113	146	180	225	284
10	Ingabo	425	553	680	850	1.071
	Total	4.055	5.270	6.484	8.102	10.208
	Milk Used in litres	40 550	52.700	64.840	81.020	102.080
	Trend		+30%	+23%	+25%	+26%

Source: Rwanda Association of Cheese Processors

6.4 Opportunities and policy implications

The following conclusions can be drawn from this analysis of employment within the dairy industry .

1. Dairying is a profitable growth industry which has the potential to contribute greatly to employment-led economic growth in Rwanda.
2. This potential is increased by the fact that dairying activities straddle many sectors rural and urban, agricultural and industrial, formal and informal, small scale and large scale. In addition, employment in some parts of the informal milk market is particularly important to women.
3. It is clear, therefore, that employment-enhancing policies should target all sectors of the dairying industry.
4. Improved conditions for more stable employment in the informal milk market may require the formulation of innovative policies.

Dairying generates many jobs throughout Rwanda. The most effective policies would recognize the potential for further employment in all sectors of the industry, and would attempt to tackle the constraints currently limiting employment:

- The current high level of employment of other rural poor by smallholder farmers is likely to be sustained and further developed if farm services such as animal health and breeding were improved.
- Employment in informal marketing is hindered by regulatory constraints; policies designed to facilitate licensing, training and organization of traders, would increase job opportunities and stabilize current employment.
- Employment generation in the formal dairy processing and marketing sector is constrained by low local demand for processed dairy products, and most processors are operating below their installed potential. Accessing export markets and markets for new dairy products will increase formal employment opportunities. As demand for processed products responds positively to rises in income levels, the formal sector will ultimately benefit from policies which generate overall economic growth in Rwanda

6.4.1 Opportunity at farm level.

Literature and field data presented through out this document has shown sufficient evidence of a big number of business opportunities through out the dairy value chain. However the biggest emphasis remains on rural job creation and investments. An example of a farmer keeping three cows and two calves is given below to indicate the relative competitiveness of dairy farming in relation to other rural activities.

Table 10. Gross margins for a smallholder dairy farmer in Rwamagana District

<u>Animal numbers and performance</u>	
Average herd size excluding calves	3
Average number of calves	2
Average number of cows in milk	2
Average milk yield per cow per day (litres)	8.2
Average lactation length in months	10
<u>Revenue (Frw) ^a</u>	
Milk (2,220 x 2) litres @ Frw. 150	738,000 Frw
<u>Variable costs (Frw)</u>	
Concentrates	252,000 Frw
Mineral supplements	28,000 Frw
Purchase of supplementary fodder	150,000 Frw
Maintenance of cattle shed	7500
Veterinary expenses	22,000
<u>Total variable costs^c</u>	459,500
Gross margin (revenue-costs) (Frw)	278,000 Frw
Gross margin per cow (Frw)	139,250 Frw
Labour in man days per year ^c	55,000 Frw
Gross margin per man day (Frw)	111,750 Frw

^a The revenue on milk sales assume that all milk is sold at 150 Frw / litre.

^b The price of concentrate was averaged at 70 Frw/Kg made of maize bran mixed with sunflower cake at a ratio of 3:1.

^c Only family labour is used, at 55 man days per cow per year at 500 Frw / man day

This example from Rwamagana is typical for most areas with market accessibility.

7.0 Trends on national production and marketing and pricing of milk and milk Products in Rwanda.

The price of a product in the market is an important factor influencing consumer demand. Hence to be marketable, a dairy product must be competitively priced. This implies that the costs involved in raw material procurement, processing, packaging, storage, marketing and distribution must be kept as low as possible. Generally the price of a dairy product will involve the following costs:

- a. Cost of raw milk
- b. Cost of raw milk collection and transportation

- c. Cost of processing
- d. Cost of packaging
- e. Cost of marketing and distribution
- f. Taxes and tariffs
- g. Profit margins at each stage of the marketing channel (Collection, Processing and marketing margins)

In order to arrive at a realistic costing of a product, all those elements involved at each stage must be carefully calculated on a unit basis.

Market function	Cost element
1. Raw milk procurement	Cost of raw milk; labour; materials etc.; collection margin
2. Transportation	Transport cost; labour; materials and equipment; transport margin
3. Processing	Raw materials; machinery and equipment; labour; packaging; energy; taxes; marketing and distribution; processing margin
4. Marketing and distribution	Transport; labour; materials; rent; retail margin

The as fixed costs are not affecting the milk price so much as the variable costs. Fixed costs such depreciation of equipment and buildings were found to be stable while variable cost such as raw material; marketing expenses; overhead costs (labour and personnel) expenses were the main components that brought up the price of the finished product.

High 'real cost' and overpricing has made processed milk uncompetitive in Rwanda and almost all East African countries. In Rwanda only 9% of all produced milk is processed. The cost of processing has been increasing year by year due to factors that are not directly related to the dairy industry. Transport cost of packaging materials, and the fact that Rwanda law does not allow packaging in plastic sachets, makes milk packing an expensive component of the end product. Nyabisindu Dairy plant has been facing problems to market the cultured milk (IKIVUGUTO) due to the cost of packaging. The cost of production is also affected by the fact that the plant process about 20% of installed capacity. The cost of processing is also inversely proportional to the processed volume as fixed costs remain the same even with lower milk intake.

The price of milk at the final consumer depends on the channels it has followed. Like most East African countries, there are different channels as observed in this study:

Table 11. Milk chain Channels common in East Africa (including Rwanda)

	Channels	Number of intermediaries
1	Producer-consumer	0
2	Producer-milk hawker-consumer (bicycle boys in Kigali)	1
3	Producer-processor-consumer (Eg Masaka Farms)	1
4	Producer-processor- retailer-consumer (Eg Inyange)	2
5	Producer-dairy co-operative -processor- retailer consumer (Eg Nyabisindu)	3
6	Producer-milk transporter-processor - retailer-consumer (Large scale Farms via Inyange)	3
7	Producer-milk trader-processor-retailer-consumer (eg Gakuba Damascene via Inyange)	3
8	Producer-dairy coop - milk transporter-processor-retailer-consumer (Eg UDAMAKO via Nyabisindu)	4

The number of intermediaries involved will have a bearing on both producer and consumer milk prices. The shorter the channel the more likely that the consumer prices will be low and the producer will get a higher return.

From the consumer point of view, the shorter the marketing chain, the more likely is the retail price going to be low and affordable. This explains why direct sales of raw milk from producers to consumers (channel 1) or through hawkers (channel 2) has been on the increase despite the public health risks associated with the consumption of untreated milk and milk products. Land O' Lake's counted up to 680 milk outlets selling raw milk from different private farms and hawkers. Milk producers may not necessarily benefit from a short marketing chain i.e. milk processors in channels 5 - 6 may be paying farmers the same price as hawkers. However, farmers sometimes prefer selling milk to hawkers because other factors such as prompt payments and inaccessibility to formal market outlets such as producer co-operatives or lack of near by milk processing factory. The biggest disadvantage of direct milk sales to consumers by hawkers is the total lack of quality control and the frequent rate of adulteration of milk with (dirty) water, which is illegal. Another problem is disappearance of hawkers during rainy season. An efficient milk marketing chain is one which would enable farmers to receive at least 50% of the retail price of milk. Streamlining the activities of hawkers and provision of equipment used and training provides an opportunity to business service providers.

Table 12. Processing cost of Nyabisindu dairy products

**PRODUCTION COST OF 1LITER FOR CURD MILK (IKIVUGUTO) AND
YOGHURT WHEN PROCESSING 3000 DAY AUGUST 2008 (80% IKIVUGUTO &
20% YOGHURT)**

S/N	Commodity	Charges		Charges at 80%	Qty (1/2L)	Unit Cost(Rwf)
1	Raw milk	12,240,000	_	12,240,000.00	144,000	85.00
2	Packaging materials (1/2 Liter)	6,048,000	_	6,048,000.00	144,000	42.00
3	Fuel	3,487,536	0.80	2,790,028.80	144,000	19.38
4	water and electricity	1,500,000	0.80	1,200,000.00	144,000	8.33
5	Salary	7,610,860	0.80	6,088,688.00	144,000	42.28
6	Petit Cash	400,000	0.80	320,000.00	144,000	2.22
7	Calling Cards	50,000	0.80	40,000.00	144,000	0.28
8	Internet services	118,000	0.80	94,400.00	144,000	0.66
9	Advertisement	500,000	0.80	400,000.00	144,000	2.78
10	Security services	430,000	0.80	344,000.00	144,000	2.39
11	stationneries & consummables	100,000	0.80	80,000.00	144,000	0.56
12	Maintenance	399,477	0.80	319,581.60	144,000	2.22
13	Others (bank charges)	9,536	0.80	7,628.80	144,000	0.05
14	Starter culture	22,060	0.80	17,648.00	144,000	0.12
15	Laboratory test	100,000	0.80	80,000.00	144,000	0.56
16	Monthly Contribution to Horizon Ltd	6,333,333	0.80	5,066,666.40	144,000	35.19
17	Monthly Contribution to HDI HQS	5,292,267	0.80	4,233,813.34	144,000	29.40
18	S/Total	44,641,069	0.80	39,370,454.94	144,000	273.41
19	Miscellaneous (5%)	2,232,053	0.80	1,968,522.75	144,000	13.67
20	PRODUCTION COST	46,873,122		41,338,978		287.08
21	Margin 10%	4,687,312		4,133,898		28.71
22	Sales Price at the Plant					315.78
23	Market Price Including transport to Kigali					330.78

NOTES: 1. One Liter of fuel : 929 Frw

2. Cost of one piece of curd milk packing material : 42 Rwf

3. 3000 litres of raw milk were taken as a reference for daily reception.

4. The production cost was computed based on the monthly reception distributed between our major product lines in the ratio of 80% & 20% for Curd milk & Yoghurt respectively.

**PRODUCTION COST OF 200ml YOGHURT
CUP AUGUST/2008**

S/N	Commodity	Charges		Charges at 20%	Cups	Unit Cost(Rwf)
1	Raw milk	3,060,000	—	3,060,000	90,000	34.00
2	Packaging materials (Cups 200ml)	1,800,000	—	1,800,000	90,000	20.00
3	Fuel	3,487,536	0.20	697,507	90,000	7.75
4	water and electricity	1,500,000	0.20	300,000	90,000	3.33
5	salary	7,610,860	0.20	1,522,172	90,000	16.91
6	Petit Cash	400,000	0.20	80,000	90,000	0.89
7	Calling Cards	50,000	0.20	10,000	90,000	0.11
8	Internet services	118,000	0.20	23,600	90,000	0.26
9	Advertisement	500,000	0.20	100,000	90,000	1.11
10	Security services	430,000	0.20	86,000	90,000	0.96
11	stationneries & consumables	100,000	0.20	20,000	90,000	0.22
12	Maintenance	399,477	0.20	79,895	90,000	0.89
13	Others (bank charges)	9,536	0.20	1,907	90,000	0.02
14	Starter culture	22,060	0.20	4,412	90,000	0.05
15	Laboratory test	100,000	0.20	20,000	90,000	0.22
16	Monthly Contribution to Horizon HQs	6,333,333	0.20	1,266,667	90,000	14.07
17	Sugar	1,440,000	—	1,440,000	90,000	16.00
18	Flavors & Colors	42,740	—	1,440,000	90,000	16.00
20	Monthly Contribution to HDI HQS	5,292,267	0.20	1,058,453	90,000	11.76
21	S/Total	32,695,809		13,010,614		144.56
22	Miscellaneous (5%)	1,634,790		650,530.69		7.23
23	PRODUCTION COST	34,330,599		13,661,144		151.79
24	Margin 15%	—	—	—	—	22.77
25	Sales Price at the Plant	—	—	—	—	174.56
26	Market Price Including transport to Kigali	—	—	—	—	210.00

7.1 Quality as a prerequisite for Rwandan dairy market expansion and competitiveness in accessing regional markets

As indicated before, over 90% of all milk is sold through informal milk channels. The hygienic standard of the milk sold on the local market is usually poor with regard to contamination with potentially pathogenic bacteria. This poor quality is mainly a result of the quite low level of the local milk production (adulteration with poor quality water), high environmental temperatures (rapid multiplication of bacteria), lack of energy (for cooling) appropriate equipment for pasteurization and neglected hygiene measures. Samples taken around Kigali kiosks show bacteria count of around 7-8 million/ml. The two most important threats are brucellosis and bovine tuberculosis.

The complexity of the dairy sector and the related public health risks is of great concern of authorities in Rwanda and East Africa in general. The lack of basic hygienic knowledge and understanding is also a major constraint to increase milk quality in small dairy businesses. The milk quality improvement interventions model tested in Mali and validated. The foreseen milk quality standard implies the specificity of local products and the consumer's preferences. The adoptions of technical recommendations (tools and methods) at the farm or household levels are dependent on the socio-cultural, economic and environmental conditions which the stakeholders face. If the outcome of hygiene improvement is not perceived directly by the stakeholders, interventions will not take place unless consumers pay or share the producers costs

From 2007, the Common Market for East and Southern Africa (COMESA) embarked on an extensive programme to harmonize standards for dairy products across the region. The regional standards would replace national standards to facilitate trade and make it easier for traders to conduct trade across the region. The harmonization programme is being driven by all member states through the Standards and Quality Assurance Committee made up of Heads of National Standards Bureaus (NSBs).

COMESA had set up a technical working committee to examine various programs and determine the best ways to achieve results without duplication of efforts.

COMESA has set standards for the following dairy products:

1. Raw milk
2. Butter
3. UHT milk

4. Pasteurized milk
5. Powder milk
6. Yoghurt
7. Sweetened condensed milk
8. Dairy Ices and Ice creams

These dairy standards are still in draft form and are in the custody of RBS. It could take years before these standards are practically harmonized and effected. The RBS has not embarked on the process of sensitization to stakeholders, instead, some officials visit a few milk outlets, take samples and warn the owners if they find the milk to be of low quality.

It is important therefore for RBS to set out a process of education all key stakeholders on basic quality requirements. The chain should start from farmers, transporters, collection centres, bulk transporters, milk kiosk owners, processors and retailers. Consistent training and enforcement would improve the milk and milk standard quality to a level that they will meet COMESA standards when enforcement is effected throughout the region. RBS with support from RARDA could conduct appropriate tests along critical control points in the milk dairy value chain and sensitize the actors accordingly. Some critical points are:

1. Farm
 - Somatic cell count
2. Milk Collection centre
 - Bacteria and acid test
 - Sediment test
 - Milk density test (for water addition)
3. Processor
 - Bacteria or acid test
 - Adulteration test
 - Antibiotic test
 - Milk component test

Traceability will require keeping of record downstream. The whole process is expensive and would require the government through RBS to charge a fee for quality control as long as a premium is paid on quality at farm level and methods are in place to identify other sources of contamination and spoilage between the milk collection centre and processor or retailer. Incentives should be provided for better quality and disincentives for lower quality. Incentives can be higher prices and disincentives can be lower prices or outright rejection.

Lack of good quality dairy products has been ranked high amongst main factors leading to uncompetitive ness of Rwandan dairy products. To address the issue of quality and standards through out the dairy value addition chain, Rwanda National Bureaux of standards (RNBS) should develop a certification system along the dairy chain. The certification standards will be a tool to get to quality milk harvesting and transportation beginning from the smallholder farm through to the processing plant via the MCC's.

The objective of this innovation would be to improve the quality and safely of milk from the producer to the consumer. Throughout its implementation, the certification standards would enhance the income of the producer, milk vendors/bicycle milk transporters, milk collection centres (MCC), bulk milk truck transporters to processors as well as the traders.

The complete certification should be issued after an inspection by RBS technicians showing that the business or individual met the requirements. In addressing this issue, RBS and RARDA should conduct a strong quality campaign all through the dairy value addition chain starting with the small holder farmer who is key if the quality of milk and hence the dairy products is to improve to the desired standards.

7.1.1 Quality Assurance at smallholder level

For this to be assured at the end side of the chain which is the consumer, preliminary work need to be done right from the smallholder farmer on how he/she cares for his cows, the milking, the utensils used, and transportation from the farmer to the MCC.

RARDA and RBS should make an effort to train the smallholder farmers in different technologies that shall include modern and hygienic milking techniques, hygienic way of handling of milk, simple transformation techniques especially in areas not easily accessible. Training should also touch on proper feeding of dairy cows for the production of milk with standard ingredients. Cross cutting issues of availability of water and sanitary facilities should be emphasized during hygienic training. Farmers should be taught on the importance of delivering milk in good time to the MCC. For any farmer who would like to supply milk to an MCC should first be assessed by the RARDA and RBS technicians for basic hygiene compliance to ensure the quality of milk that will be delivered from his/her farm. Even after the initial acceptance, random spot checks should be made to farmers' farms to ensure maintenance of the milk quality certificate.

7.1.2 Quality assurance at Milk vendors/Cyclists level

The young cyclists that transport milk from the farmers to the MCCs present another critical point in ensuring the quality of the dairy products. RARDA should facilitate their organization into functional associations; train them in their physical hygiene, basic milk testing techniques, hygienic milk handling and transportation as well as the importance of timely delivery of milk to the MCC. The cyclists should be expected to test the farmers' milk before loading it for transportation to the MCC. In case the milk is short of the required quality, it should not be accepted by the cyclist. However, once the milk is accepted by the cyclist, then he should be responsible to deliver it to the MCC in the same condition, else he should face the loss when the milk is rejected by the MCC.

For quality standard to be maintained at this level, after the training of the cyclists on the various hygienic issues, they should be given a certificate to qualify them as local milk transporters. The certified cyclists should be differentiated from others by having a uniform and carrying an identity card. RARDA/RBS should facilitate cyclists by providing them with lactometers, bicycle and cans on loan paid through milk transport.

7.1.3 Quality assurance at the MCCs

The MCCs should be a vital point for ensuring milk quality control in the dairy value chain. National Bureau of Standards in collaboration with RARDA should assess the MCC for hygiene and standards and thereafter be certified once they qualify.

The MCCs quality control technician and other staff should be trained on various aspects that among others would include **milk testing, hygienic handling, storage, maintenance of required temperatures and transformation technologies.** Management of milk storage and preservation equipment would require serious attention especially on the damages/ cracks on the containers that could harbour milk and fatty droplets hence facilitating bacterial growth. Cooling of incoming raw milk should be done as fast as milk is poured into the collection tank. Before receiving the milk from the smallholder farmers or from the cyclists, the MCC should be expected to maintain high level of hygienic environment. The MCC should allow in milk that has been tested for quality using the standard set by the National Bureau of Standards that would also match with the EAC Bureau of Standards. Any milk that would not meet these standards should not be accepted at the MCC. The MCC's laboratories should be upgraded to be able to conduct advanced tests such as butter fat content (BF), solids not fat (SNF) over and above the current specific gravity and pH tests. These advanced tests would act as

catalysts for improved dairy cattle management in terms of feeding since milk grading would consider in future the butter fat content as the first criteria, i.e. Milk with high BF % will score higher.

7.1.4 Quality assurance by Transporters from MCC to Processing Plant

Given that milk from MCC is transported to the Processing plant using trucks, in order to have quality milk for processing, RARDA should conduct training for transporters/drivers that take milk from the MCC to plant. They should be trained on proper hygienic milk handling techniques (stainless steel containers, insulated bulk milk tanks connected to the cold chain of the truck), importance of timely delivery. The drivers should be trained on testing of milk before milk is loaded on trucks, they should witness the milk tested and paper work done to include the results of tests done, time of departure, quantity loaded. Copies of the paper work should be carried with the driver for delivering milk to the processing plant. At the plant again the milk should be tested for quality and the transporters would be aware that once the milk does not meet the required standard based on the results at loading time, then they should carry the burden themselves since the milk will be rejected. For quality standards to be maintained at this level, the milk transporters should be trained on the various hygienic issues, after which they should be given a certificate to qualify them as bulk milk transporters.

7.1.5 Quality assurance at the Processing Plant

RBS and RARDA should organize training for the plant technicians on the appropriate milk handling, quality testing, packaging all aiming at a quality level that is competitive and consumer satisfying as per Rwanda Bureau of Standards requirement. Bearing in mind that some processing plants already have hygienic measures governing dairy products production, it would be imperative to have them re-assessed for harmonization with others in the region.

The processing plants should be encouraged to send their products for laboratory testing so as to grow to ISO (International Organization for Standardization) standards that would allow them to export to regional markets when volumes allow.

The process above is not as easy as it is illustrated. However for Rwandan dairy industry to be competitive in the region, there is no shortcut to that. The best advise is to start now and grow gradually with experience.

Support and business service markets for dairy sub-sector in Rwanda.

For production to increase and milk quality assured, small holder farmers need to have a steady and reliable source of supplies and inputs. Milk collection centers should be the one stop centre where farmers supplying milk daily can buy in puts. The MCC should have a room meant for vet drugs and other farm supplies. Business people dealing in dairy farm supplies (concentrated feeds, salt and minerals, seeds for forage, fertilizers, pharmaceuticals, biologicals, etc) and timely farm services – breeding, pregnancy checking, animal health, milk quality testing to milk collection centres for farmers to be able to access them with ease. There is a very high demand for all these services and inputs. Microfinance institution can take advantage of the associations and reach out to farmers who can access credits and pay through milk payments. Input suppliers should access farmers through MCC's and supply them with milk cans, milk delivery trucks and cooling tanks. The organization of dairy cooperatives in Rwanda makes these opportunities ripe for services providers and input suppliers. Packaging industries can reach farmers through processing plants and supply appropriate packaging materials depending on desired volume of packaging.

9.0 Milk marketing is still constrained by infrastructure (roads and electricity) issues.

Rural producers who cannot access dairy plants either produce cheese or sell milk to bicycle boys who trade the milk in towns and trading centres. Gishwati area in Northern province is of special interest as there is a great potential for milk production but is still faced by lack of all weather roads and electricity. Most of other areas in Rwanda are relatively accessible, but the volume of milk produced is still low and does not attract investment in cooling units and other inputs. The Eastern Province (Nyagatare district produces about 45% of all milk produced from small holder systems and has attracted a number of donors and cooperative movement is strong.

Kigali peri-urban is still strongest in terms of commercial dairy production and has more access to input and services.

10 SWOT analysis of Rwanda dairy sector

SWOT analysis was made all along the preceding chapters and the following are collective indications from stakeholders from farmers to policy makers.

➤ Strengths:

- The Government of Rwanda has put in place enabling environment for empowering the poor to keep dairy cattle.
- Rwandan people have a long culture of milk consumption
- Rwandan temperature and altitude favor dairy production
- There is a growing demand for milk and other dairy products
- The small size of the country makes possible to transport milk from one corner of the country to the other in one day
- Strong telecommunication industry have a great positive effect on communication for input and services
- Presence of BDS's at province level

➤ Weaknesses:

- Low milk supply to most collection centres.
- Low milk supply to processing plants (operating at about 20% of installed capacity).
- Low hygienic handling of milk
- Poor infrastructure
- Lack of input and service providers in rural areas
- The milk value chain stakeholders not linked

➤ Opportunities:

- Increasing production goes hand in hand with increase in demand.
- Dairy farmers are demanding for services and inputs
- Harmonization of quality standards will increase trade
- Input and service providers will have more clientele because of increased dairy cattle population.
- A big number of donor support in the dairy industry

➤ Threats

- Disease from neighboring countries through different borders.
- Insufficient recognition of adherence to quality standards might hinder trade and reduce profits to farmers
- Long tradition of keeping bigger number of cattle on fewer resources
- Competition on use of manure on pasture or vegetable production might reduce feed resources for cattle
- Micro-finance Institution still resistant to provide loans for cattle.

- Insurance companies resistant to insure cattle
- Strong habit of consumption of raw milk will hinder processing and industry could stagnate
- Expensive packaging materials as plastic sachets are not allowed due to environmental concerns
- Poor organizational and management capacity of dairy cooperatives.

11. Long and Medium dairy trends at country

The role of livestock particularly cattle in the socio-economy of Rwanda need not therefore be overemphasised. Emphasis should however, be directed towards good general management and animal husbandry practices including the adoption and use of appropriate improved feeding technologies and judicious exploitation of the complementarities between crops and livestock. The Government priority is increasing milk production through crossbreeding with dairy breeds and therefore reduce the number of traditional cattle that need more grazing land without producing milk. The One cow per poor household will continue through 2012. The objective is to increase quality and quantity so as to be able to export in regional markets within a span of few years. MINAGRI projects to have less cattle numbers but of higher dairy qualities. Table 8 shows the projected decrease in number of cattle but with increased productivity.

Table 13. Livestock and livestock products projections by MINAGRI for the next 12 years.

Species	2005	2010	2020
Bovine	752 558	680 253	505 816
Goats	955 166	1 278 227	1 872 346
Sheep	387 422	518 458	759 347
Pigs	300 935	332 257	433 644
Rabbits	406 691	449 263	586 357
Poultry	2 630 310	2 904 074	3 790 258

Production (Tons)	2005	2010	2020
Milk	178 598	403 325	483 693
Meat	53 227	61 979	83 291
Eggs	16 766	19 531	38 546

12. Conclusion and recommendations

While analyzing dairy sub-sector as source of employment and a business opportunity for poverty alleviation, it should be understood in the context of the contribution of livestock production to livelihoods and income generation for smallholder farmers through the production of higher-value products compared to most crops. Of key importance are the differences in policies that can condition those outcomes in terms of benefits to different communities and social groups. Elements of the outcomes for the poor include income and

employment generation, which includes not only self-employment of farmers and market agents but also hired labour on farm and in the market.

Less tangible returns to milk production include the value of livestock assets for finance and insurance functions. Dairy development is also linked to nutrition, both among farm families and resource-poor consumers of dairy products and also in terms of farm soil nutrients. Consumption of even small amounts of milk can have dramatic effects on improving the nutritional status of poor people and is especially important for children and nursing and expectant mothers. Further, as long as low soil fertility remains a major constraint to agriculture in most developing countries, manure from dairy cows can provide a critical source of organic matter and nutrients, boosting smallholder's crop yields on farms where chemical fertilizers are often unavailable and unaffordable. Policy interventions, as well as market forces, can help to determine whether dairy development follows more or less equitable development paths. An equitable development path occurs when shifts towards farm and market commercialization are associated with increased alternative off farm employment opportunities, in urban areas and in alternative agricultural enterprises or industries.

Nature of Investments.

Investment opportunities exist along the dairy value chain from farm inputs, veterinary services, milk handling equipment , hygiene materials, and feeds. At transport level, bicycles, milk testing tools, cans, protective ware, and scales. At collection centres, supply of cooling tanks, cans, cleaning materials, water supply, accounting software, micro-credits, feeds, AI services, training materials and services, milk transport and quality control tools. At transport level after collection centres, opportunity for investment exist in milk transport trucks, quality control tools and chemicals, micro-credits. At processing level, investment in packaging materials, hygiene materials, lab equipment, scales, cooling equipment , cooling tanks, protective gear, spare parts, accounting software, training, milk transport . At retail level, milk kiosks and bars, cooling facilities, crates, appropriate packaging.

Scale of Investment

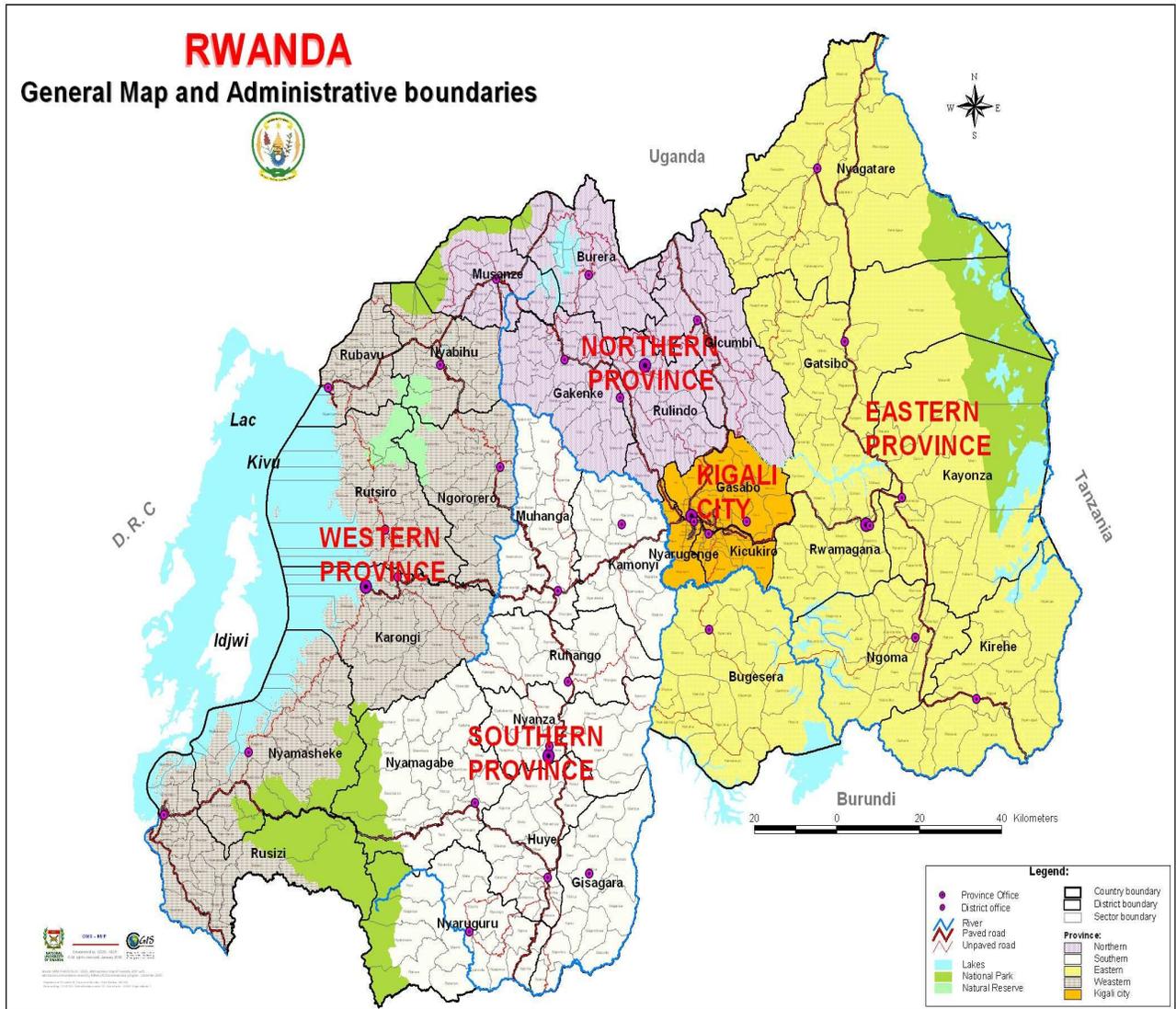
The scale of investment will vary from place to place and will depend on number of dairy farmers in a certain area, the volume of milk produced and collected. There is usually a critical volume of market potential sufficient to attract private investment. It is important for

NGO's and other support institutions to strategise their interventions to stimulate private investment as that will be more sustainable.

Location of investment.

The most appropriate location of investment is close to where the clientele is. In this case, once a central location for a milk collection centre has been identified, its logical to add other services and inputs at the same place to make it a one stop centre for the farmer. Apart from processing plants that are normally located where there is sufficient infrastructure base such as a road, water, electricity and telephone facilities, dairy product outlets should be located at high population densities like trading centres and shopping malls.

Fig. 11. Map of Rwanda



13. References.

1. EDPRS-2008
2. Gitahi.C (2003)- Revamping the dairy sector
3. ILRI- (2003)Enhancing milk market-vital to poor
4. ILRI-(2003)-Bridging the regulatory gap-for small scale Milk Traders
5. LOL (2008)- The tipping point- Rwanda Dairy Competitiveness
6. Ministry of Finance and Economic planning- national census 2002
7. RUTAMU (2004): Dairy Industry in Rwanda- Constraints and way forward-2004
8. ODI- Pro-poor –Livestock Research projects.