



REPUBLIC OF RWANDA

**MINISTRY OF AGRICULTURE AND ANIMAL
RESOURCES (MINAGRI)**

**STRATEGY AND INVESTMENT PLAN FOR SMALL
ANIMAL INDUSTRY IN RWANDA**

FINAL REPORT

JULY, 2012

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ACRONYMS

| | |
|-----------|--|
| APEL | Programme d'Appui au Petit Elevage |
| ARMV | Association Rwandaise de Médecine Vétérinaire |
| DRC | Democratic Republic of Congo |
| EAC | East African Community |
| EDPRS | Economic Development and Poverty Reduction Strategy |
| FAO | Food and Agriculture Organization of the United Nations |
| HACCP | Hazard Analysis Control of Critical Points |
| IMF | International Monetary Fund |
| ISAE | Institut Supérieur d'Agriculture et d'Élevage |
| ISAR | Institut des Sciences Agronomiques du Rwanda |
| MDG | Millennium Development Goal |
| MINAGRI | Ministry of Agriculture and Animal resources |
| MINECOFIN | Ministry of Finance and Economic Planning |
| NGO | Non-Governmental Organization |
| NAEB | National Agricultural Export Development Board |
| PRSP | Poverty Reduction Strategy Paper |
| PSTA | Plan Stratégique pour la Transformation de l'Agriculture/ Strategic Plan for the transformation of Agriculture |
| PPP | Public-Private Partnership |
| RAB | Rwanda Agricultural Board |
| RBS | Rwanda Bureau of Standards |
| RDB | Rwanda Development Board |
| RTV | Rwanda Television |
| RWF | Rwandan Francs |
| SME | Small and Medium Enterprises |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| UN | United Nations |

EXECUTIVE SUMMARY

The study was initiated under the aegis of MINAGRI to develop and modernize the small animal industry in Rwanda within the period 2012-2017.

Following an overview on the global trends of the small animal worldwide, in Africa and in Rwanda, our strategic diagnosis highlighted the potentialities of the sector:

- A favorable framework, reflecting the will and the involvement of the public authorities to achieve the goals concerning the development of the sector;
- The relevance of the choice of small animals given the specific context of Rwanda: high population density inducing a lack of land for ranching (hence the «Zero Grazing»), suitability of small animals breeding to a low-input system, faster return to investment for low-resource poor farmers;
- Commercial opportunities in the regional and international markets for live animals and livestock by-products such as wool and skins.

However, to fully maximize this potential, major constraints should be lifted:

- Genetic issues: lack of good quality breeding stock;
- Nutritional issues: absence of animal feed factories, low-quality roughages, scarcity and high prices of crop residues...;
- Animal health.

The other constraints are related to land access and tenure, lack of entrepreneurship and involvement of the private sector, food taboos and relatively low public investments in small animal industry.

The challenges are:

- Maintaining the domestic market;
- Increasing market share;
- Becoming globally competitive;
- Increasing incomes of small-scale producers, improving livelihoods of the poorest;
- Developing exports opportunities.

These challenges will be met through this vision:

« *Launching a small animal industry: from a subsistence-based activity to an income-generating activity and export strength* »

This vision will be achieved through 3 strategic axes:

- Increasing small animals production;
- Value addition of small animal by-products;
- Marketing.

The strategic axes will include 8 components:

- Genetic improvement strategy;
- Animal nutrition strategy;
- Animal health strategy;
- Value addition of skin sector;
- Value addition of goat milk processing;
- Value addition of wool sector;
- Filling the domestic market;
- Increasing access to regional and international markets.

Control of the development targets set must be validated by a working group to ensure better visibility of the strategy.

The overall budget to lift the Small animals of Rwanda to the rank of a performing industry should be around 9 516 000 000 RWF

INTRODUCTION

Livestock currently contributes between 25 and 30% of the Agricultural GDP of developing countries and that is expected to rise to close to 50% over the next 20 years (Hoffmann, 2004).

While the livestock industry is growing seven times faster than smallholder livestock systems in emerging economies like Brazil and China, African livestock is still largely in the hand of smallholders.

70% of the world's rural poor depend on livestock (mainly sheep, goats, pigs and poultry) as an important component of their livelihoods. Livestock make a disproportionately higher contribution to income and welfare of the poorest smallholders, and particularly of women, and through them, children in such households.

The conventional objectives assigned to small animal breeding in developing countries aimed at enhancing the production to ensure food self-sufficiency, generate incomes for farmers and reduce trade deficits by reducing imports on a sustainable basis. Thus, livestock policies mainly emphasize production-enhancing strategies.

In Rwanda, livestock accounts for 30% of agricultural GDP and 12% of national GDP (Rwanda statistical yearbook 2011). The specific context aforementioned (executive summary) led to the strategic choice to promote small animal husbandry for meat production, with an overall objective to transform a subsistence activity to an income-generating activity and export strength.

This consultancy mission, undertaken by MINAGRI, assessed the current situation of the industry. A SWOT analysis identified the strengths (framework, relevance of small animals, commercial opportunities), the weaknesses (common and specific constraints to each specie), the opportunities and the threats of the industry.

Then 5 challenges were identified and declined into 3 strategic axes and 8 components to minimize the weaknesses and threats while the strengths and opportunities were highlighted.

Ultimately, a strategy and investment plan was set out, specifying the investment levels for the actors involved in its implementation: government, private sector and partners of development. The logical framework was also defined, emphasizing the potential contribution of a strong small animal industry in the achievement of Rwanda's targets in fight against poverty and economic development.

1 CONTEXT AND OBJECTIVES OF THE STUDY

The implementation under the aegis of the UN and the IMF of Poverty reduction strategies (PRS) in 1999 intended to provide essential links between the actions of national authorities, the assistance of donors and the results required to achieve the Millennium Development Goals (MDGs) of the United Nations to halve poverty between 1990 and 2015. Rwanda, as many other African countries, included livestock development as key pillars of its PRS.

Any policy or strategy for Livestock development strategy should be inserted within the framework defined by the major orientations of the Rwandan Government: Vision 2020 and PSTA II.

1.1 Physical context

Rwanda is a landlocked country of 26 338 km². The population growth of Rwanda is estimated at 2.9% per year. The population of Rwanda is 10,412,826 inhabitants and it would increase to 15 million in 2020 and 20 million in 2030. Rwanda is characterized by the highest population density in Africa, about 310 inhabitants per km². Some areas reached a density greater than 1000 inhabitants/km². The total cultivated land covering about 46% of the area of the country divided into small farms. Marshlands occupy an estimated area of 165 000 ha including 112 000 ha of small wetlands (less than 200 ha) and 53 000 ha of large Marshlands.

The total harvest area is approximately 94 000 ha or 57% of the area of the Marshlands of Country and represents about 8% of the acreage.

The climate is tropical and temperate with an average temperature of 19 °C and rainfall annually ranges between 900 and 1600 mm. The country has a small rainy season from September to November and a rainy season from February to May. The short dry season is between December and January and the long dry season from June to mid-September. Some parts of countries may suffer from prolonged drought affecting agricultural production and weakening the food security of populations that inhabit them.

1.2 Macroeconomic context

Despite this climatic advantage, Rwanda is one of the poorest countries in the world.

- The annual per capita income is 540 U.S. dollars;
- Over 60% of the population lived below the poverty line;
- Agriculture is a major source of foreign currency and livelihoods of people;
- Still in its infancy, the secondary sector consists essentially in manufacturing and building and contributes 15% of GDP;
- The tertiary sector is 47 % of GDP;
- GDP is approximately 3 277 RWF billions.

Today, Rwanda is at a crossroads in its evolution. The country has an overall planning framework to face the challenges of national Development and poverty reduction towards the year 2020.

The vision 2020 which the government of Rwanda has undertaken identified key pillars.

- Good governance and a capable state;
- Infrastructure development;
- Human Resource Development and a knowledge-based economy;
- Private sector-led development;
- Regional and International integration;
- Productive high value and market oriented agriculture.

1.3 Objectives of the study

There are two kinds of objectives:

- The major objective is the development of a strategic and investment plan to strengthen the small animal industry in Rwanda
- The specific objectives are:
 - Assessment of the state of small animal industry in relation with all key-players of the value-chain;
 - Development of an effective and coherent 6-year strategy (2012-2017) to enhance the small animals industry. The strategy should seek to attract the private sector into the development of the industry;
 - Implementation of a detailed plan that will set out the projected investments required from public and private sector to develop the industry of sheep, goats, pig, poultry and rabbits.

1.4 Comprehension of the terms of references

Three axes determine the comprehension of the terms of references:

- Assessment of the small animal industry in its current form and in a near future;
- Highlighting the potentialities of small animal industry in achieving MDG and EDPRS targets;
- Design of a strategic and investment plan to fill the domestic market and export small animal products.

2 METHODOLOGICAL APPROACH

The proposed approach includes 3 steps:

- Strategic diagnosis: This step includes literature and field surveys (data collection phase of the sector at the national level with all stakeholders). Following the scanning of the sector, the strategic diagnosis will establish the SWOT of the small animals industry in Rwanda.
- Elaboration of the seven-year recovery plan: The development of the seven-year recovery plan to revive the small animals sector for the period 2012-2017 will start by defining the strategic vision. This is the consolidation of the action plans for areas as presented in the sections following the identification of areas. It will decline the axes according to these themes:
 - Activities and tasks to be undertaken;
 - Expected results;
 - Monitoring and Evaluation Indicators;
 - Resources Required;
 - Institution and / or lead agency to implement;
 - Actors involved direct and indirect;
 - Timeframe.
- Workshop and validation of the report. This step includes:
 - Writing and submission of the interim report;
 - Organizing a workshop about the interim report to collect relevant amendments and improve the document;
 - Providing the final report.

3 GLOBAL TRENDS OF SMALL ANIMALS INDUSTRY

3.1 Small animals' populations worldwide

Asia has the largest small animals' populations, occupying the first rank for all the studied species. Asian production is mainly driven by China, world leader in pigs and poultry whereas most of the small ruminant populations are in Pakistan.

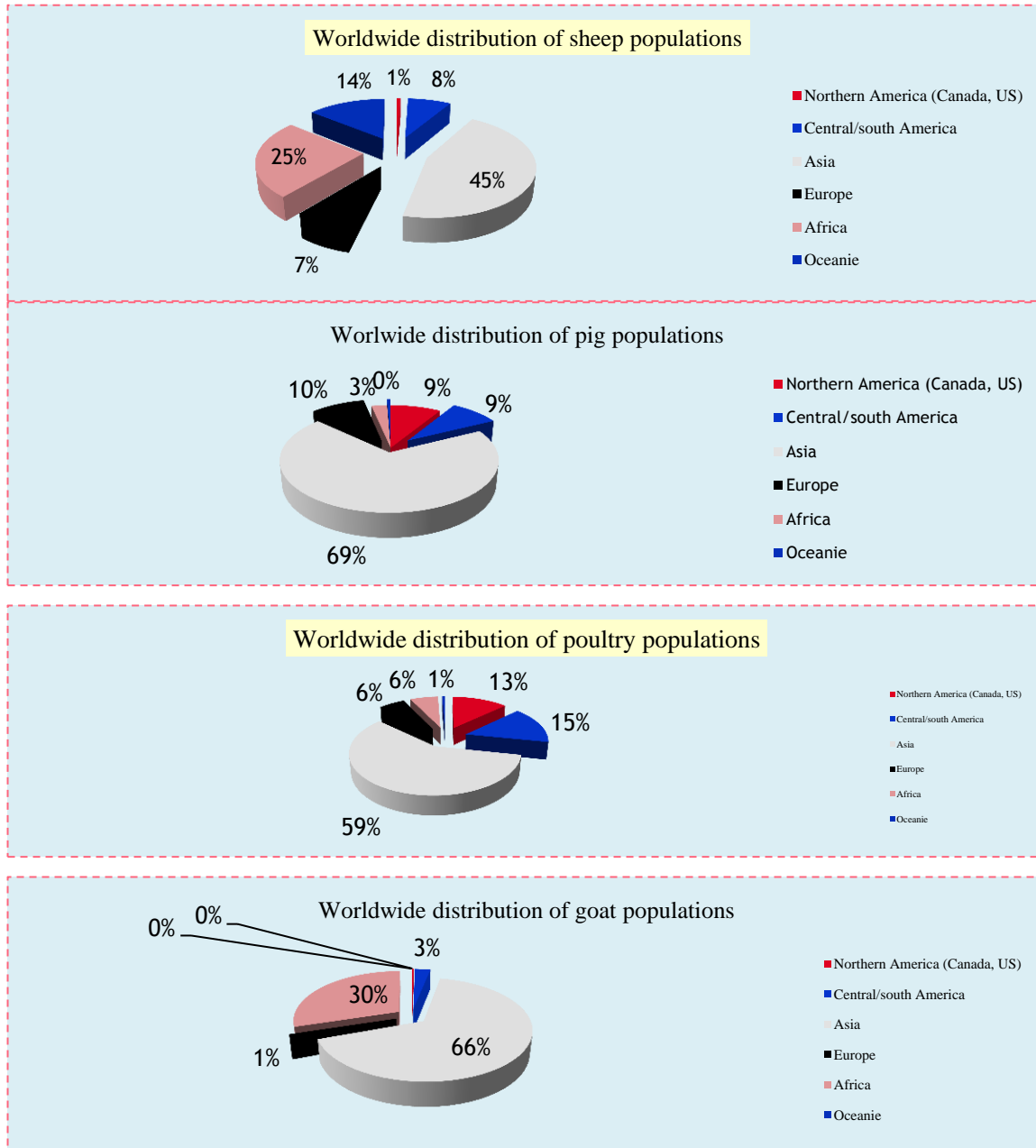


Figure 1. Worldwide distribution of small animal populations (adapted from FAO Stats)

The Asian region provides more than half of the global small animals' populations:

- 69% of pigs (593 140 541 heads);
- 66% of goats (519 442 354);
- 59% of poultry (10 003 796 800);
- 45% of sheep (457 730 925).

The contribution of Africa is very low regarding pigs (3%) and poultry (6%) while the region provides of 25% sheep and 30% of goat populations.

Statistics on live rabbit populations are difficult to collect, hence unavailable. So the data regarding this species are processed comparing the trade of rabbit meat.

The major importers of rabbit meat are Germany, Belgium, Italy, France, Russia and Netherlands, accounting for 70% of the global market.

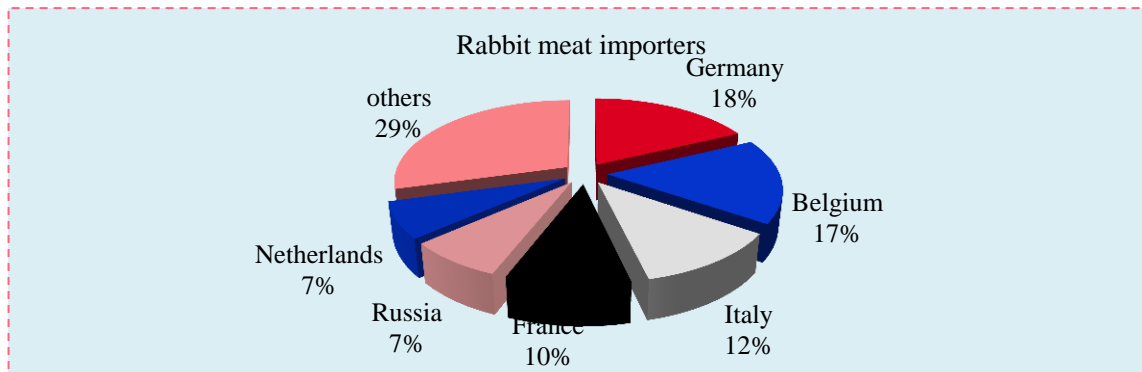


Figure 2. Rabbit meat imports (adapted from FAOStats, 2010)

The global export of rabbit meat was valued at \$ 200.3 million. In 2009 and is currently dominated by 5 countries namely China, France, Belgium, Hungary and Italy, accounting for 75% of the global exports.

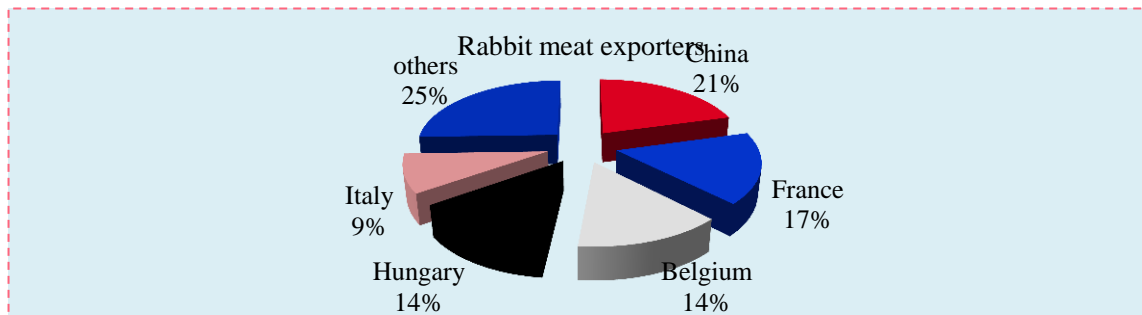


Figure 3. Rabbit meat exports (adapted from FAOStats, 2010)

The place of Africa in the rabbit global market is marginal and is limited to intra-regional trade e.g. from Kenya to Sudan (400 T in 2008).

3.2 Situation in Africa

Eastern Africa is the second provider in pigs (5 806 420 heads) and goats (66 724 000), the third in sheep (49 702 300) and the last in poultry (27 066 700).

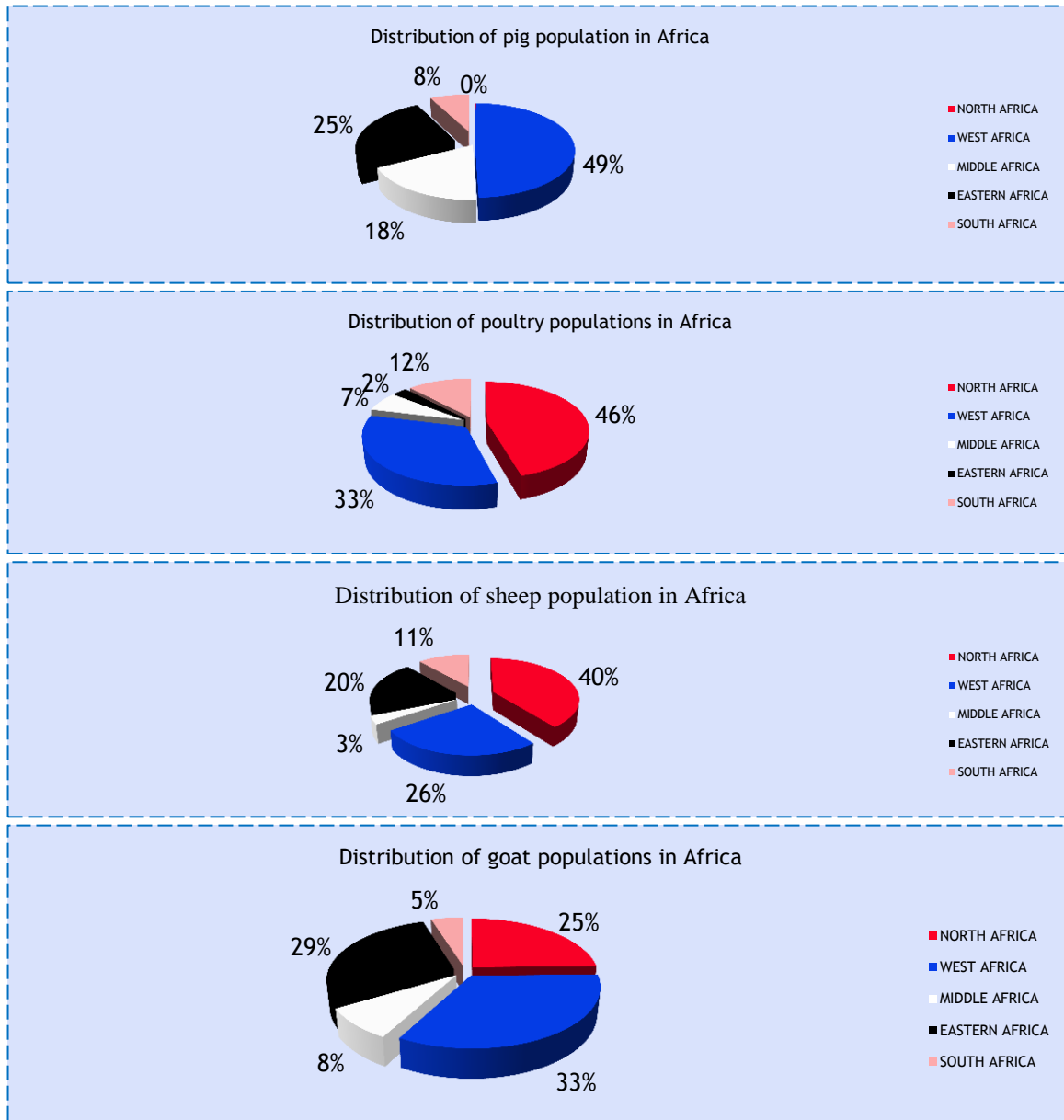


Figure 4. Distribution of small animals' populations in Africa (adapted from FAOStats, 2010)

3.3 Global market of small animals by products in summary: skins and wool

Worldwide production of sheep skins (410 000 T) is equally distributed between developed (177 600 T) and developing countries (232 600 T).

The main producers are:

- China (94000 T);
- EU (66700 T);
- Australia (32000 T);
- New Zealand (29100 T);
- Iran (13700 T);
- India (12000 T).

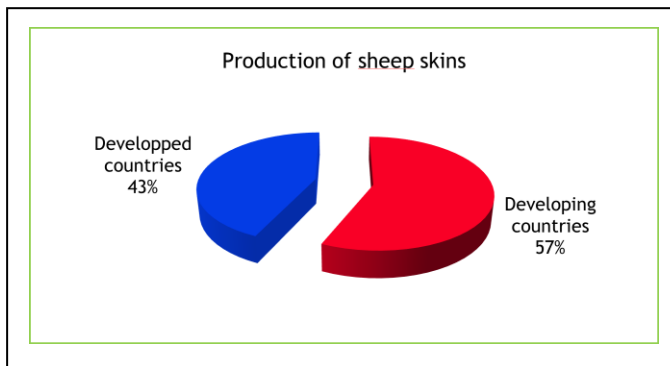


Figure 5. Production of sheep skins (Nation Master, 2010)

The situation is completely different regarding goat skins, since 95% of the world production (257100 T) is from developing countries. The main producers are:

- China (103600 T);
- India (48600 T);
- Pakistan (15900 T);
- Bangladesh (14200 T);
- Sudan (10900 T);
- Iran (5900 T).



Figure 6. Production of goat skins (Nation Master, 2010)

Worldwide exports of sheep skins (229 400 T) are dominated by:

- Australia (91 000 T);
- EU (63 200 T);
- New Zealand (31 400 T);
- Iran (9 400 T).

South Africa, thanks to the availability of an important stock of merino sheep, is the first African importer, accounting for 5% of the global market.

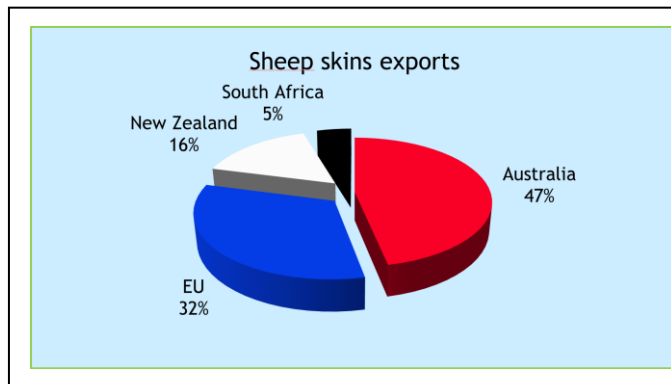


Figure 7. Sheep skins exports (Nation Master, 2010)

Worldwide exports of goat skins (16000 T) are dominated by:

- Uganda (7500 T);
- EU (2800 T);
- Ethiopia (900 T);
- China (700 T).

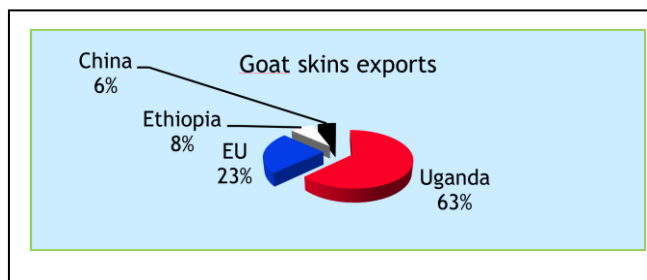


Figure 8. Sheep skins exports (Nation Master, 2010)

The good ranks of African countries in the global export market of goat skins mainly reflects the fact that the main producers (China, India, Pakistan) use the products in their domestic market, while skins processing industries are embryonic in Africa.

The global wool production (1.3 million T per year) is dominated by Australia, China, and New Zealand that share 55% of the global production. These 3 countries are the only major producers. 45% of the global production is shared between about 30 countries.

The major producers in Africa are Sudan and South Africa, with respectively 2% and 1% of the world production.

In the global market prices range are from 0.57 \$ to 5.75 \$ per pound, according to the grade and the thickness of the fiber.

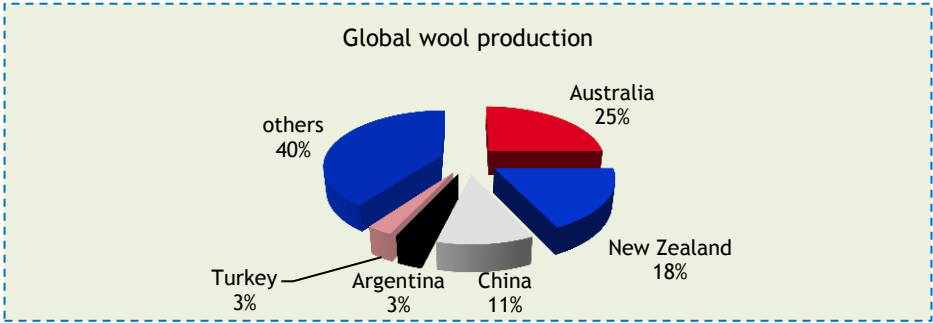


Figure 9. Global wool production (Nation Master, 2010)

4 DIAGNOSIS OF SMALL ANIMALS INDUSTRY IN RWANDA

4.1 Current situation

4.1.1 Livestock populations

The recovery of the animal stock following the drastic drop of the mid 90s is a great achievement. The current populations of small animals are:

- Poultry (4 081 000 heads);
- Goats (2 971 000);
- Rabbits (844 700);
- Pigs (706 000);
- Sheep (799 000).

4.1.2 Types of breeds

The livestock in Rwanda is a mixture of exotic, local and crossbreeds. Initially, the exotic breeds were introduced by NGOs and public authorities via agencies and research stations to improve the local breeds.

The extensive production system is predominant. Semi-intensive and intensive systems are rather scarce and mostly limited in the Kigali region.

Table 1 : Types of small animal breeds in Rwanda

| CATEGORIES | BREEDS | TYPES OF PRODUCTION |
|--|--|--|
| SHEEP | <ul style="list-style-type: none"> • Local breed • Exotic breeds <ul style="list-style-type: none"> <i>South African Meat</i> <i>Merinos</i> • Crossbreeds | <ul style="list-style-type: none"> • extensive • semi-intensive |
| GOATS | <ul style="list-style-type: none"> • Local breed (East African small goat) • Pure Exotic breed <ul style="list-style-type: none"> • <i>Boer goat (South Africa)</i> • <i>Saanen (South Africa)</i> • <i>Gala goat (Kenya)</i> • Crossbreeds | <ul style="list-style-type: none"> • extensive • semi-intensive |
| PIGS | <ul style="list-style-type: none"> • Local breed • Exotic breed <ul style="list-style-type: none"> • <i>Landrace</i> • <i>Large white</i> • Crossbreeds | <ul style="list-style-type: none"> • extensive • semi-intensive |
| RABBITS | <ul style="list-style-type: none"> • Local breed • Exotic breed (New Zealand, California) • Crossbreeds | <ul style="list-style-type: none"> • extensive • semi-intensive |
| POULTRY (HENS, DUCKS, TURKEYS, GEESE) | <ul style="list-style-type: none"> • Local • Exotics | <ul style="list-style-type: none"> • extensive • semi-intensive • intensive |

A majority of these breeds were introduced over the past decades, however many no longer exist as pure breeds because of multiple uncontrolled crossings.

4.1.3 Trends of livestock and animal products

Agriculture contributes 32% of the Rwandan GDP and of this, the livestock contribution stands at 2% (Rwanda statistical yearbook, 2011). Over 70% of all agricultural households are keeping livestock (National Agricultural Survey, 2008). The Livestock population is composed by 1 335 000 cattle, 799 000 sheep, 2 971 000 goats, 706 000 pigs and 4 081 000 poultry and 844 700 rabbits. Livestock population is in an increasing trend and the growth rate within the period 2005-2010:

- Cattle 23.9%;
- Sheep 15.8%;
- Goats 78.5%;
- Pigs 35.4%;
- Poultry 93%;
- Rabbits 97.8%.

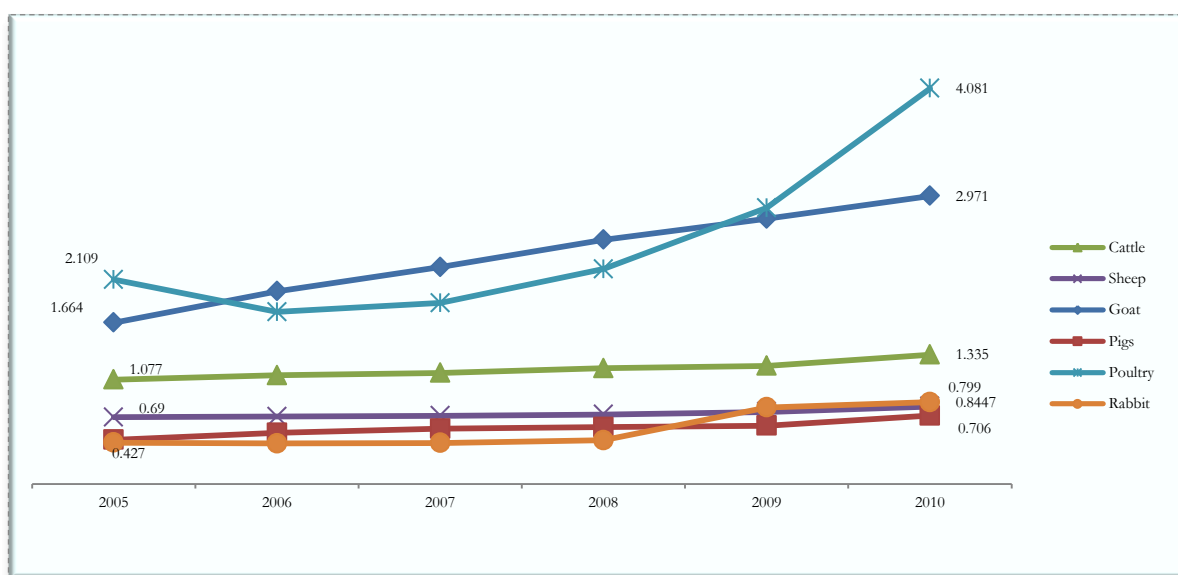


Figure 10 : Livestock population in Rwanda (MINAGRI, 2011)

Livestock products are in an increasing trend and the growth rates within the period 2005-2010 are:

- Milk 182%;
- Meat 58.5%;
- Hides & Skins 69.7%;
- Eggs 59.9%.

The growth of milk production is not commensurate with other products, reflecting the involvement of public authorities through the program "one cow per family".

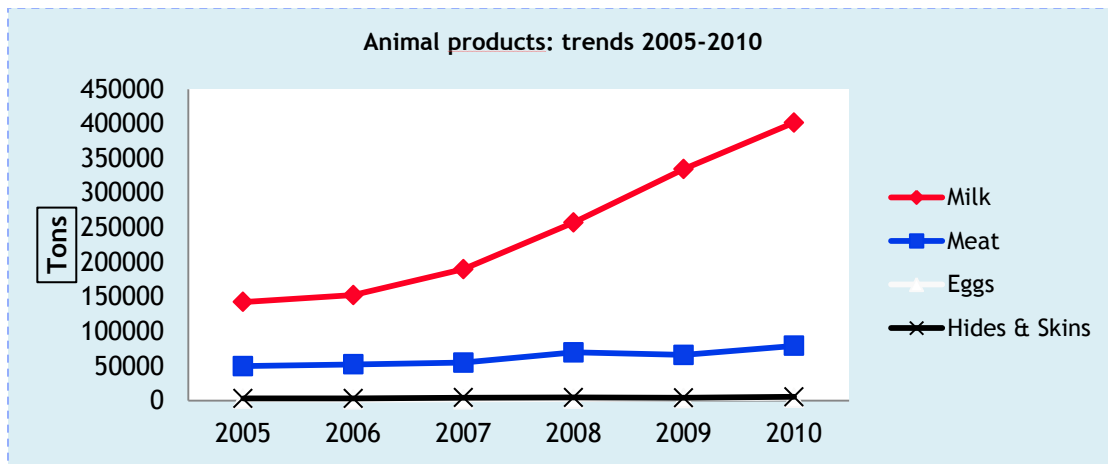


Figure 11 : Livestock products trends in Rwanda (MINAGRI, 2011)

4.1.4 Livestock populations as compared to bordering countries

Despite a relatively strong growth, efforts should be made to increase the relative contribution to overall livestock population of neighboring countries: Burundi, Uganda, Kenya, Tanzania and DR Congo. Rwanda accounts for barely 3% of poultry populations and 8% of pigs populations.

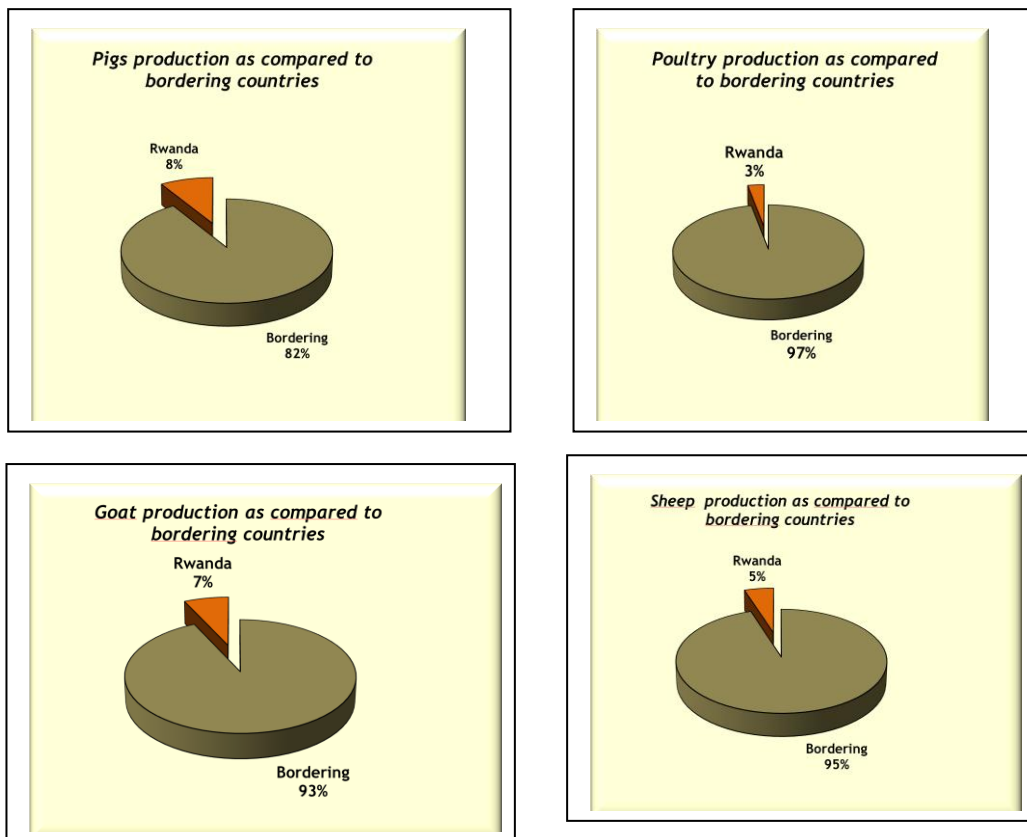


Figure 12 : Small animal's production compared to bordering countries (FAO, 2011)

The contributions in sheep and goats populations are respectively 5% and 7%. The absolute values of small animals populations indicate that Rwanda, as compared to bordering countries is relatively well supplied with pigs (3rd supplier after Uganda; 1 300 000 heads and DR Congo; 959 080) and goats (although 5th supplier after Tanzania; 12 550 000; Kenya; 12 000 000; Uganda, 7 700 000; DR Congo; 4 021 000, the goat population, 2 971 000, confers to Rwanda an enviable position considering the size of the country).

However, the sheep population is rather low far from those of Kenya (10 000 000 heads) and Tanzania (3 521 000). Poultry population is the lowest among the country considered, almost 10 times lower than countries such as Uganda (38 000 000 heads), Tanzania (35 000 000) and Kenya (30 000 000).

4.1.5 Hides and skins sector in summary

Current statistics indicate Rwanda has 799 000 sheep and 2 971 000 goats. With a take-off rate of 28% for goats and 29% for sheep the potential annual production of skin is 831 800 goat skins and 231 710 sheep skins. The exports of hides and skins were 5327 T in 2010 (RARDA, 2010). The small animal skins are mainly exported in a raw state (63%).

Available tanning capacity which if fully utilized can process a substantial amount of quality hides and skins. The main destinations of exports are Kenya and Hong Kong.

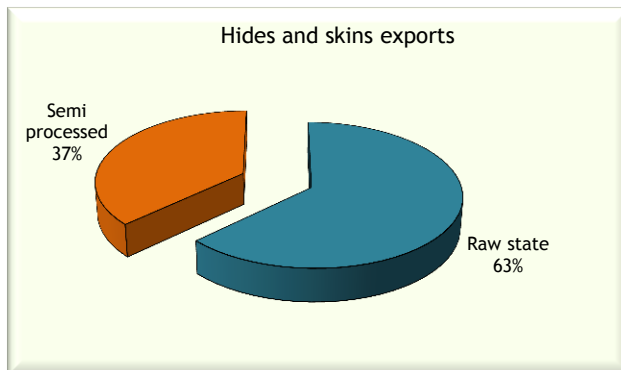


Figure 13 : Hide and skins exports (FAO, 2011)

4.2 Strategic diagnosis: the SWOT of the small animals industry

4.2.1 Strengths of the small animals industry

The tool SWOT is used to describe, analyze and diagnose the small animals industry in Rwanda.

4.2.1.1 *The framework for livestock development*

Various reform policies have given Rwanda a framework favoring the development of livestock and meat industry.

- The decentralization policy: adopted by the government of Rwanda to bring services close to populations, making «Umurenge» the focal unit for development. The presence of veterinary services in the «Umurenge» level should improve the supervision of farmers and allow better services deliveries.
- The new land policy: the aim is to secure land tenure to encourage investments in farming.
- The review of laws related to Animal Health: laws related to animal husbandry are currently reviewed by the government for adapting the context of livestock development and modernization.
- Strengthening of the veterinary profession: the veterinary profession in Rwanda through the Veterinary Association (ARMV) and the imminent Order of Veterinarians will play a significant role in veterinary service delivery and other aspects of animal husbandry; other organizations of animal scientists (zootechnicians) should be strengthened too.
- The Investment policy framework is in existence. It provides for tax exemption for agricultural inputs.

4.2.1.2 *The relevance of the focus on small animals*

The potential for livestock development in Rwanda is interesting in terms of growth potential and access to a regional market. The relevance of the focus on small animals is justified by:

- Zootechnical and economic assets:
 - The unique ability to adapt to the agricultural context of Rwanda : small animals more suited than cattle for meat and milk (goats) given the limited land resource in Rwanda;
 - Faster return on investment: small animal development is more rapid (shorter generation interval, age of weaning...) as compared to cattle development. For instance, a dairy goat starts to produce milk 1 year after its birth while a dairy cow needs 4 years. It is clear that maintenance of a dairy cow 4 years before benefit is not within the reach of the majority of the poor smallholders;
 - Suitability to a low input system: small animal production is more appropriate for the low-resource poor farmers.

- Commercial assets:
 - Unexploited livestock development opportunities;
 - Unexploited regional market.

Fields surveys revealed the existence of export markets of live small animals towards neighbouring countries. The main marketing channels are the exports of sheep, goats and pigs towards Goma (DRC), and to a lesser extent towards Burundi and Congo. However, this is outside of a formal and deliberate strategy; the need of a clear strategy to fully exploit the exports potentialities offered by neighbouring countries is highlighted by their lower level of development as compared to Rwanda.

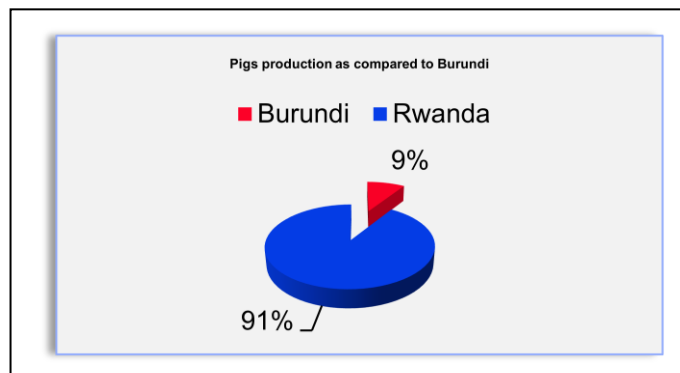
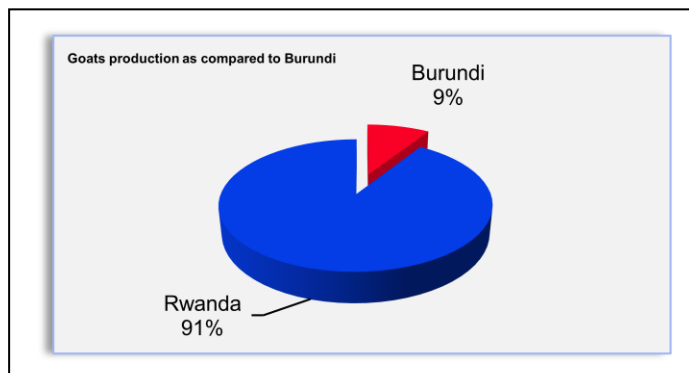


Figure 14 : Goats and pigs productions as compared to Burundi (FAO, 2011)

To fully exploit its potentialities the industry needs to remove common and specific constraints.

4.2.1.3 A climate favorable to animal husbandry

Having a long rainy season is an advantage. Indeed, livestock development in many African countries is burdened by the consequences of a long dry season: drought, lack of roughages and watering points.

4.2.2 Weaknesses and constraints of the Small animals Industry

4.2.2.1 The commons constraints

The common constraints are:

- Biological (genetic, nutrition, animal health);
- Socio-economic (access to new markets, lack of entrepreneurship, food taboos);
- Environmental (land access and tenure, soil fertility and forage quality, housing constraints due to the «zero grazing» policy). With a population of 10,412,826 inhabitants spread over 26,338 km² and a subsequent population density of 395 inhabitants/ km², access to land for an agricultural purpose is a serious problem in Rwanda. Although altitude, climate and rainfall regime are favorable to the production of pasture grasses, the availability of forages

for livestock is compromised by the competition of agriculture regarding the access to arable lands. Thus, the growth of cultivated land by 100% within the six past years is a serious limit to the traditional pastoral activities. As a consequence, "open grazing" is confined in some particular areas (Rubavu, Nyabihu and Ngororero... while a «zero grazing» system is predominant elsewhere in the country. A new land policy in progress will allow a better securitization of farmer's investments, which is a prerequisite for the advent of a modernized agriculture.

- Institutional; relative low public investment in Livestock development.

4.2.2.1.1 Genetic constraints

The country's objectives for the establishment of a small animal not fit well with the low productivity of indigenous breeds, due to the poor quality of genetic stock. There is a lack of productivity data regarding the local breeds. Given that in most cases records are not kept by farmers on the parameters measuring productivity, the study relied on farmer's observations and ancient publications undiscounted.

Ewe productivity is defined as the number or total weight of lamb weaned per ewe joined, which comprises of several component traits. The total weight of lamb weaned per year is the best single measure of a flock's productivity. It is a function of the number of lambs born, their survival and the individual lamb weight at weaning.

To measure the productivity of the different breeds (local, exotic, crossbreeds) and the impact of future genetic improvement measures, it should address the lack of data by implementing a system for collect and processing data on parameters as essential as:

- Average daily gain;
- Number of lambs per lambing;
- Pre weaning mortality.

There are others parameters that impact on productivity of the small ruminant unit:

- Average number of lambs/year;
- The weight at weaning;
- The age at market;
- The weight at market;
- Average age at first lambing;
- The dress-out percentage.

The low productivity of the local sheep can be exemplified by comparing local breed performance with the industry benchmark.

- The indigenous breed prolificacy is hardly 1.2 lambs per lambing, far from the benchmark average of 1.64;
- The average adult live weight is 30% less than the benchmark average;

- The indigenous breed is put on the market later; this is due to a lower growth rate illustrated by the differences in averages LW between the local breed and the industry benchmark.

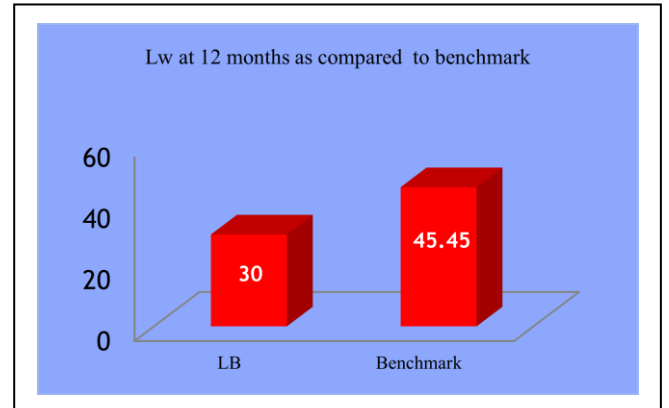
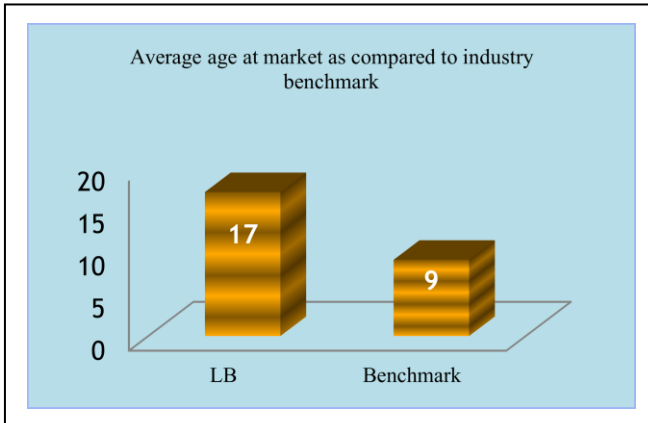
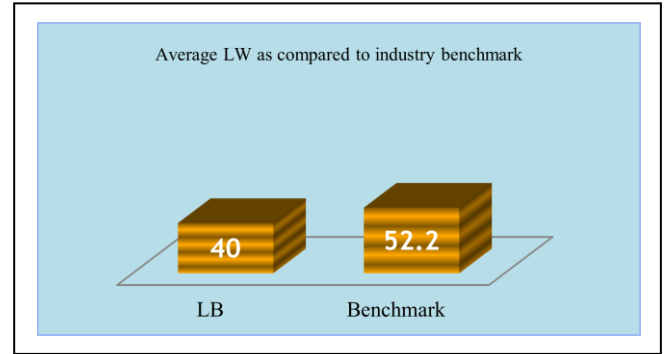
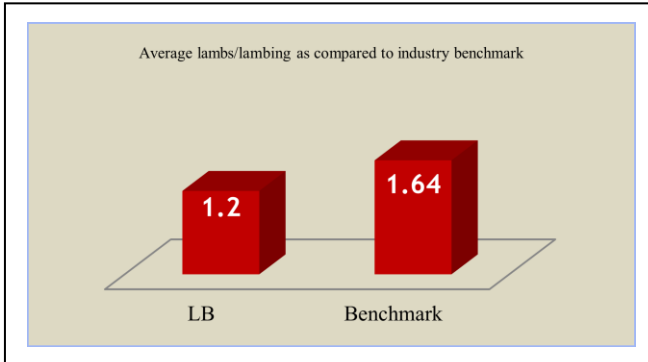


Figure 15 : Average parameters compared to industry benchmark (Bister, 2010; Singh, 2006, Seck, 1992)

The low productivity of the local goat can be exemplified by comparing local breed performance with the industry benchmark.

- The local goat Body Weight is less than those of Saanen and Boer crossbreeds;
- The weaning weight of the local goat is 80% less than the average WW of the crossbreeds;
- The 12-weeks weight is 35% less than the average 12-ww of the crossbreeds;
- The growth rate up to weaning (17 weeks) is 88% less than the average GR of the crossbreeds.

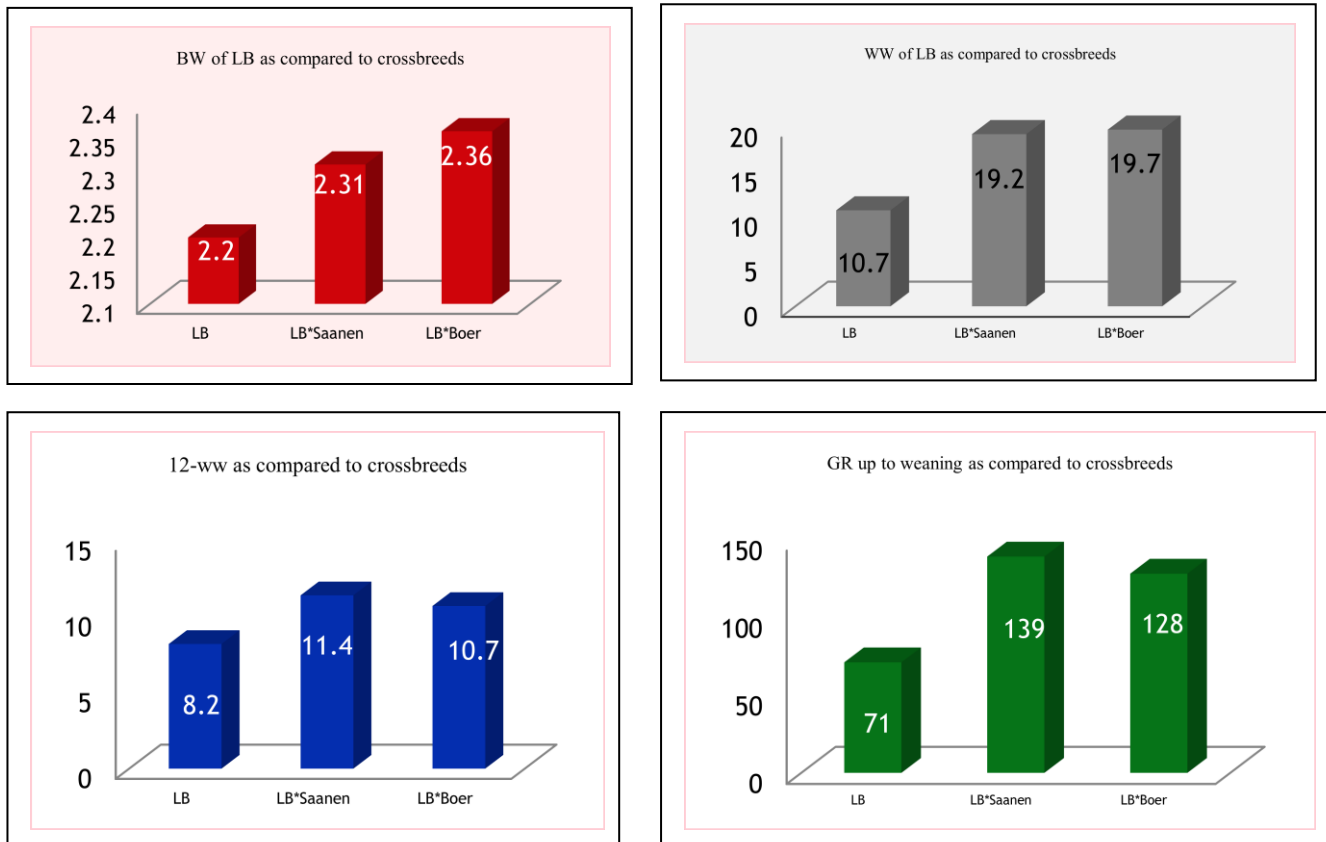


Figure 16 : Local breed performance compared to industry benchmark (Bister, 2010; Singh, 2006, Seck, 1992)

These examples illustrate the need to conduct a genetic improvement strategy because of the low potential of local breeds.

4.2.2.1.2 Nutritional constraints

Inadequate feed resources are recognized as an important constraint to the productivity of mixed crop-livestock systems throughout the tropics. Resource-poor farmers have to make difficult choices between which nutrients are returned to the soil and which are fed to livestock. Changing production systems throughout the world and the increasing demands for livestock products, particularly in developing countries, are causing drastic changes in feed demands.

To some extent, Rwanda is not shortage of resources to feed its livestock. Indeed, a favourable highland climate fosters the growth of high yielding pastures grasses and the production of fodder legumes that can be used as livestock feed. Contrary to many countries, particularly West Africans, there are two rainy seasons, around March-May and October-December. The rainfall, though uneven, allows the availability of pasture for most of the year. On the other hand, the growing trend of crop production over the last years is a major asset in a perspective of self-sufficiency in animal

feed: varied crop production from different agro-ecological regions offer many possibilities to feed the livestock using crop residues and by-products.

The nutritional constraints Rwandan livestock are well described in the document «Strategic Plan for Animal Nutrition Improvement Programme for Rwanda (MINAGRI, 2009) ».

4.2.2.1.3 Housing constraints

Housing problems are mainly related to the high price of the equipment (small ruminants) and the inadequacy to good husbandry practices (Rabbits).

4.2.2.1.4 Environmental constraints

Constraints related to land access and tenure, soil fertility and forage quality, are exhaustively described in the PSTA II Document).

In summary, the relative abundant average rainfall as compared to many African countries conceals large regional disparities. Thus, the western part of the country receives the heaviest rainfall while the eastern part is more subject to droughts, due to spatiotemporal irregular rainfall.

Moreover most of the soils are highly weathered, and combined effects of soil acidity, low cation exchange capacity and aluminum toxicity led to a relatively poor fertility in many areas.

4.2.2.1.5 Socioeconomic constraints

The main constraints are:

- Access to new markets: although export markets already exist (Congo, DRC, Kenya, U.S and Asia), the growing of livestock exports are dependent on quantitative and qualitative improvements;
- Lack of entrepreneurship: livestock husbandry is still largely considered a subsistence activity;
- Lack of skilled farmers;
- Food taboos: sheep and rabbit meats, goat milk.

4.2.2.1.6 Institutional constraints

Constraints are related to the relatively low public investments in livestock development.

Limited availability of reliable data on livestock production, arising from limited collaboration between different sector players.

4.2.2.2 *Specific constraints*

Some constraints are specific to each of the species studied:

- Sheep: Persistent taboos, less suited to the environment of most of the country, hence their relative confinement in the Northern province;
- Goats: Low performance of the genetic improvement program, taboo related to milk consumption;
- Rabbits: Fragility and susceptibility to diseases;
- Pigs: Feed costs, diseases (African Swine Fever, Swine erysipelas), no slaughterhouses, no processing;
- Poultry: Feed (availability and quality), National hatchery (status, role and functioning), Village poultry production.

4.2.2.3 *Constraints related to the value addition of small animals by-products*

Value addition of by-products and access to local market are hampered by the constraints below.

4.2.2.3.1 *Value addition of goat milk processing*

- Goat milk is not appreciated, due to food taboos;
- The dairy herd (Saanen, cross-breeds) is still too small;
- The processing activity is in its infancy and too few players are involved;
- Lack of institutional support and marketing of the products.

4.2.2.3.2 *Value addition of the wool sector*

Cross-cutting issues negatively impacting small sheep industry:

- Animal health;
- Animal nutrition;
- Poor husbandry practices;
- Disorganization of the sub-sector;
- Lack of processing capacity;
- Access to low-interest credit.

4.2.2.3.3 Local market's constraints

- Sheep are scarce in the other provinces except in the Northern and Western provinces.
- Industrial chicken's meat allegedly less savory than the local breed's;
- Despite real potential, goat milk value addition is hindered by taboos related to goat milk consumption.

4.2.2.3.4 Value addition of the skins sector

The development of the skin sector is hampered by the constraints below:

- **Poor quality skins:** Poor quality is attributed to poor animal husbandry practices, lack of appropriate slaughter facilities and tools, poor storage and preservation techniques, lack of incentives to producers to improve quality, price setting that does not encourage quality, lack of grading of raw skins, outdated law on hides and skins and cultural patterns and social styles of traditional livestock keepers.
- **Low recovery of skins:** This is attributed to poor quality leading to rejection, low awareness especially among primary producers on the economic value, low prices of skins.
- **Capacity utilization of tanneries and investment:** Although 37% of hides and skins are semi-processed, capacity utilization of tanneries remain low, due to worn out machinery and equipments and outdated technology, as well as a low investment capacity.
- **Effluent treatment problems and adherence to sound environmental management standards:** Most of the tanneries in Rwanda lack proper effluent treatment plants; as a result they contribute to environmental pollution.
- **Poor and deteriorating physical infrastructure:** The infrastructure which includes abattoirs, slaughter slabs are in most cases in poor condition and rehabilitation costs are usually relatively high.

4.2.3 Opportunities and threats of the small animals industry

Despite the constraints aforementioned, Rwanda has opportunities to launch a strong small animals industry if the threats that hinder its development are removed.

4.2.3.1 Opportunities

Three opportunities:

- Livestock populations show growing trends;
- Exports opportunities (live animals are the 7th export products in Rwanda; 3.1 million \$ in 2010; raw and tanned hides & skins are 13th and 14th, 1.8 million \$);
- Increase incomes and improve living standards of the Rwandan population.

Opportunities not fully exploited can be illustrated by the example case of goat milk. Indeed, the benefits associated with the consumption of goat milk are ignored by the majority of the consumers:

- Contrary to appearances, 65% of milk consumption worldwide is from goat's milk, and this popularity hasn't come about due to high profile marketing campaign or big-budget advertisements.
- Benefits of goat milk vs. cow milk:
 - Goat's milk is less allergenic: the level of alpha s1 casein is 89% less than in cow's milk;
 - Goat's milk is naturally homogenized: smaller fat globules and does not contain agglutinin;
 - Goat's milk is easier to digest: smaller fat globules and higher medium chain fatty acid;
 - Goat's milk rarely causes lactose intolerance: less lactose.
 - Goat's milk matches up to the human body better than cow's milk: superior source of essential fatty acids, vitamins B6, niacin and vitamin A, potassium, etc;
 - The production potential exists in Rwanda: 2971000 goats including the goat milk Saanen and crossbreeds.
- Know-how of the goat's milk processing already exists, as evidenced by the existence of cheese makers (fromage Karongi, « les Caves de l'Abondance»);
- Goat cheese is appreciated while almost all the cheeses on the market are imported.

4.2.3.2 Threats

Two main threats:

- In the future competition will increasingly fierce in the EAC market, the main destination of Rwandan livestock exports;
- The impediments to livestock productivity: poor breeding stock, animal nutrition and animal health situations.

5 CHALLENGES AND STRATEGIC OPTIONS FOR SMALL ANIMALS INDUSTRY

5.1 Vision by 2017

The challenge of launching a small animals industry can be divided into five major objectives:

- Maintaining domestic market;
- Increasing small stock meat market share;
- Becoming globally competitive;
- Developing export opportunities;
- Increasing incomes of small-scale producers, improving livelihoods of the poorest.

These targets will be structured around the vision for the industry by 2017:

«Launching a small animals industry: from a subsistence activity to an income-generating activity and export strength ».

Therefore, the industry will contribute significantly in achieving MDG and EDPRS targets: at the end of the recovery plan in 2017, the current small animal industry which is mainly a subsistence activity should be replaced by an income-generating activity and export strength.

This transformation should be mainly driven by a dynamic private sector with the advent of business-oriented farmers and a gradual disengagement of the public sector.

Rwanda should take advantage of differences of competitiveness with neighboring countries such as Congo, Burundi and Democratic Republic of Congo to become a major exporter of small animals, thus increasing livestock contribution to the country GDP.

5.2 Strategic options

Three strategic axes will achieve the vision which will increase small animals industry in Rwanda: enhancing production, value addition of by-products and marketing. The strategic axis will include 8 components:

- Strategic axis n°1: Enhancing production
 - Genetic improvement;
 - Animal nutrition;
 - Animal health.
- Strategic axis n°2: Value addition of by-products
 - Value addition of the skin sector;

- Value addition of goat milk processing;
 - Value addition of wool sector.
-
- Strategic axis n°3: Marketing
 - Filling the domestic market;
 - Increase the access to the regional and international market.

6 OPERATIONAL AND INVESTMENT PLAN

The overall budget to lift the small animal industry of Rwanda to the rank of a performing should be around **9 516 000 000 RWF**.

Table 2 : *Budget of investment plan for small animal's industry strategy in Rwanda*

| Strategic axis | Component | Amount in RWF | Amount in \$ |
|---|--|----------------------|-------------------|
| A1. Enhancing production | A1.C1.Genetic improvement | 3 386 000 000 | 6 600 003.90 |
| | A1.C2.Animal nutrition | 1 150 000 000 | 2 241 584.31 |
| | A1.C3.Animal health | 1 810 000 000 | 3 528 058.79 |
| | SUB TOTAL 1 | 6 346 000 000 | 12 369 647 |
| A2. Value addition of by-products | A2.C1. Value addition of Skin Sector | 900 000 000 | 1 754 283.38 |
| | A2.C2. Value addition of Goat Milk processing | 800 000 000 | 1 559 363.00 |
| | A2.C3. Value addition of Wool Sector | 400 000 000 | 779 681.50 |
| | SUB TOTAL 2 | 2 100 000 000 | 4 093 328 |
| A3. Marketing | A3.C1. Filling the Domestic Market | 470 000 000 | 916 125.76 |
| | A3.C2. Increasing access to regional and international markets | 450 000 000 | 877 141.69 |
| | SUB TOTAL 3 | 920 000 000 | 1 793 267 |
| Transversal action: Coaching for the implementation of the operational action plan | SUB TOTAL 4 | 150 000 000 | 292 381 |
| TOTAL | | 9 516 000 000 | 18 548 623 |

Source: *Dr Mactar SECK, 2012*

Table 3 : *Contribution of key actors*

| TIMEFRAME | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION | TOTAL |
|---------------------|----------------------|-----------------------------|--------------------------------------|----------------------|
| SHORT TERM | 136 000 000 | 78 000 000 | 652 000 000 | 866 000 000 |
| MEDIUM TERM | 642 500 000 | 350 000 000 | 2 132 500 000 | 3 125 000 000 |
| LONG TERM | 1 068 500 000 | 390 000 000 | 4 066 500 000 | 5 525 000 000 |
| TOTAL | 1 847 000 000 | 818 000 000 | 6 851 000 000 | 9 516 000 000 |
| Contribution | 19% | 9% | 72% | 100% |

Source: *Dr Mactar SECK, 2012*

6.1 The overall approach

Strategies for «*Small animals industry*» and «*Meat industry*» have many cross-cutting issues. Indeed, strategies regarding animal health, policy and regulatory framework, promotion of livestock and livestock products, capacity building for stakeholders, access to regional and international

market... cannot be dissociated. As a consequence, the need of consistency command the fusion of the 2 operational and investment plans while emphasizing the specificities of each study.

The budgets of the strategic axis are determined as follows:

- Taking into account of existing studies on costs of specific operation while adjusting these to the context of our studies: e.g. costs of brood-stock purchase in APEL document; costs of capacity building for senior scientists in PSTA II document;
- Adjusting to the Rwandan context assessments of costs studies made by CABINET AFRIQUE EMERGENCE CONSEIL in other countries: e.g. costs of HACCP system implementation, costs of updating food security laboratories, feasibility studies for the implementation of slaughterhouses;
- Adjusting to the Rwandan context assessments of costs undertaken in neighboring countries: e.g. modernization of tanneries (Tanzania); or by organizations such as ILRI (mapping of fodder resources).

6.2 Transversal actions

6.2.1 Management of the Approach & Harmonization of the Action Plans

Strategic approaches for «Meat industry» and «Small animals industry» were similar regarding the methodological approach and the strategic diagnosis.

Harmonization of the 2 Action Plans is a prerequisite for an overall success, namely the strategic axis n°1 of the 2 studies (related to increase of meat production and the increase of livestock) and the strategic axis n°3 (related to the marketing of livestock and livestock products).

6.2.2 Guarantee fund & Fund for financial support

The funds will aim at the development of a dynamic private sector. It will enable:

- The vitalization of Agri-business through actions such as loans guarantee programs, rural financial services and strengthening of stakeholder's organizations;
- The development of exports through actions such as subsidies for upgrading and labelling process, modernization of tanneries, promotion of livestock products.

6.3 Strategic axis 1: Enhancing livestock production

6.3.1 Component 1: Genetic improvement

6.3.1.1 The prerequisites

- Linkages between the state(s) agency (ies) conducting the breeding programme and research/teaching institutions where the "know how" in animal breeding could be found;
- Farmers' involvement in the breeding scheme which could lead to constant changes in breeding objectives of small animals in the country;

- Need of having a real organization of different stakeholders (farmers, research, marketing, government) is more than essential in order for the current small stock breeding strategy to be successful and to make better use of the country's animal genetic resources;
- The integration of different components such as breeding, animal health, husbandry and nutrition;
- The involvement of the private sector;
- A set of practical indicators for measuring progress;
- A wide stakeholder involvement, including clear allocation of responsibilities for implementing the actions that have been agreed upon.

6.3.1.2 *The breeding strategies*

- Selection and cross-breeding are the two main tools used to achieve genetic changes in livestock populations. Selection implies genetic improvement based on variation among individuals within the population (breed). This process is often referred to as straight breeding.
- In contrast, cross-breeding involves making use of variation among populations (breeds). Straight-breeding and cross-breeding programmes may represent components within a broader breeding strategy; they are not mutually exclusive and are often used in combination. However, such combinations depend on first developing the capacity to operate each element in a sustainable manner. Among the many factors that must be considered in the development of a breeding programme are:
 - the animal species involved;
 - the types of traits considered;
 - the availability, accessibility and affordability of different breeds;
 - the production environment;
 - the time frame for the planned genetic improvement;
 - the infrastructure of the livestock sector and the resources allocated to the program.
- The inclusion of these factors should lead to the choice of cross-breeding as the breeding strategy to increase the productivity of the livestock in Rwanda.
- The choice of exotic breeds, taking into account previous and current experiences (APEL, NGOs, and Research stations), as well as field surveys revealing the preferences of farmers, should focus on the following diagrams.

6.3.1.2.1 *The breeding strategies for small animals*

The first step in the genetic improvement program should be the build up of a nucleus herd. The breed of animal to comprise the herd will depend on the cross breeding program planned. The choice should be, as recommended by the specialists:

Sheep: Merinos (wool and meat);

Goats: Boer (meat) and Saanen (milk). Wool goats are very scarce in Africa (mostly confined in Maghreb). Cashmere goat of Central Asian origin (India, Iran) or Angora goat (Turkey) should be good choices for Rwanda. However, introduction should be done sparingly to test their adaptability.

Pigs: Landrace and Large white.

Rabbits: New Zealand and California.

Poultry: Bleu des Landes and Kabir (France), Kroiler (Uganda).

Only high quality breeding stock should be acquired. Given the limited stock in the country, the majority of the acquisition would need to be imported. A nucleus herd model development is proposed. Then a small ruminant development model is also proposed, taking into account the cross-cutting issues. The model is replicable for the pigs, poultry and rabbits. After ISAE, other research institutions may be involved such as Rwanda National University (NUR), Kigali Institute of Technology (KIST), IRST, and Umutara Polytechnic University (UPU).

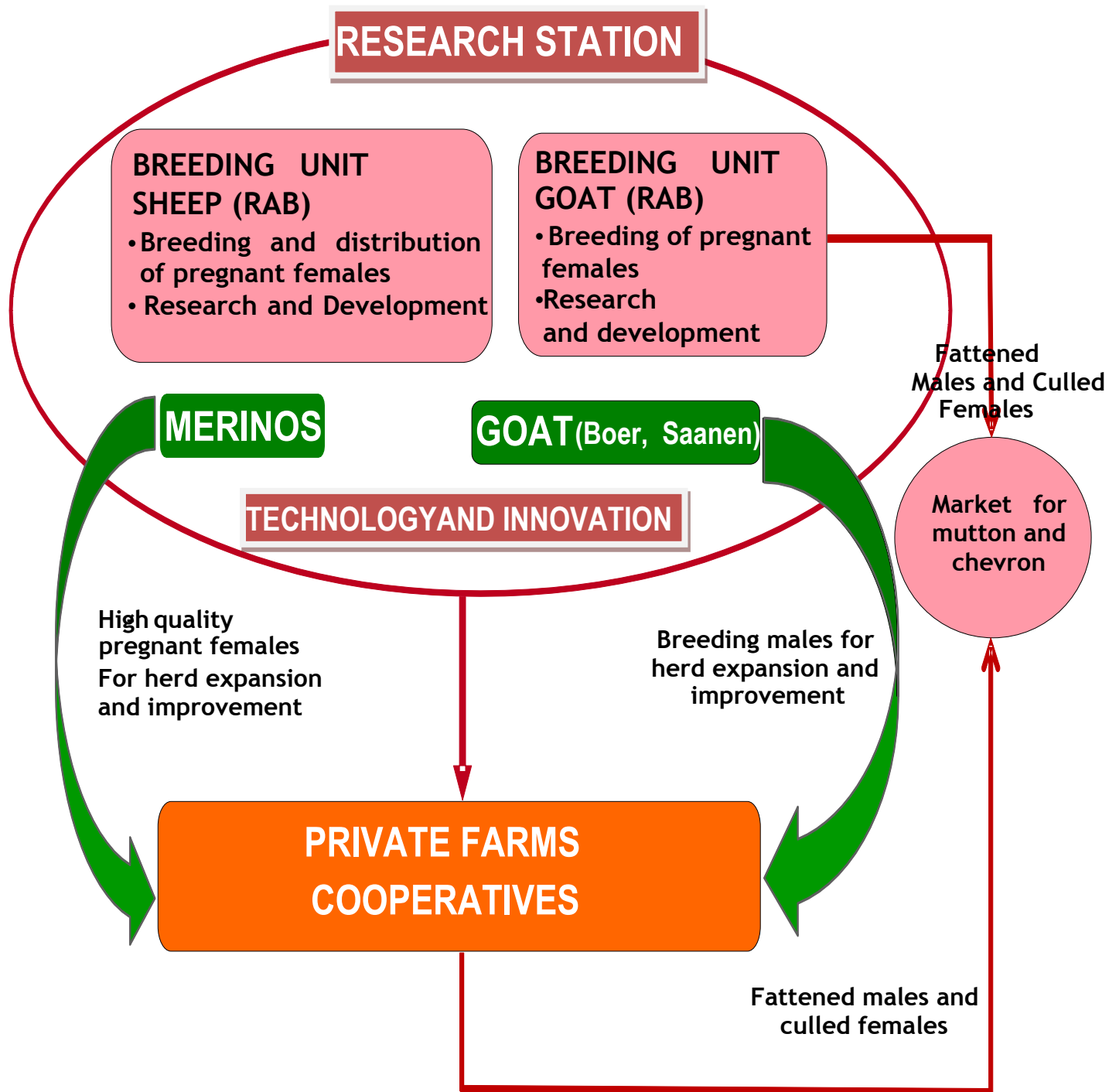


Figure 17 : Nucleus herd model development for small ruminants (Dr Mactar SECK, 2012)

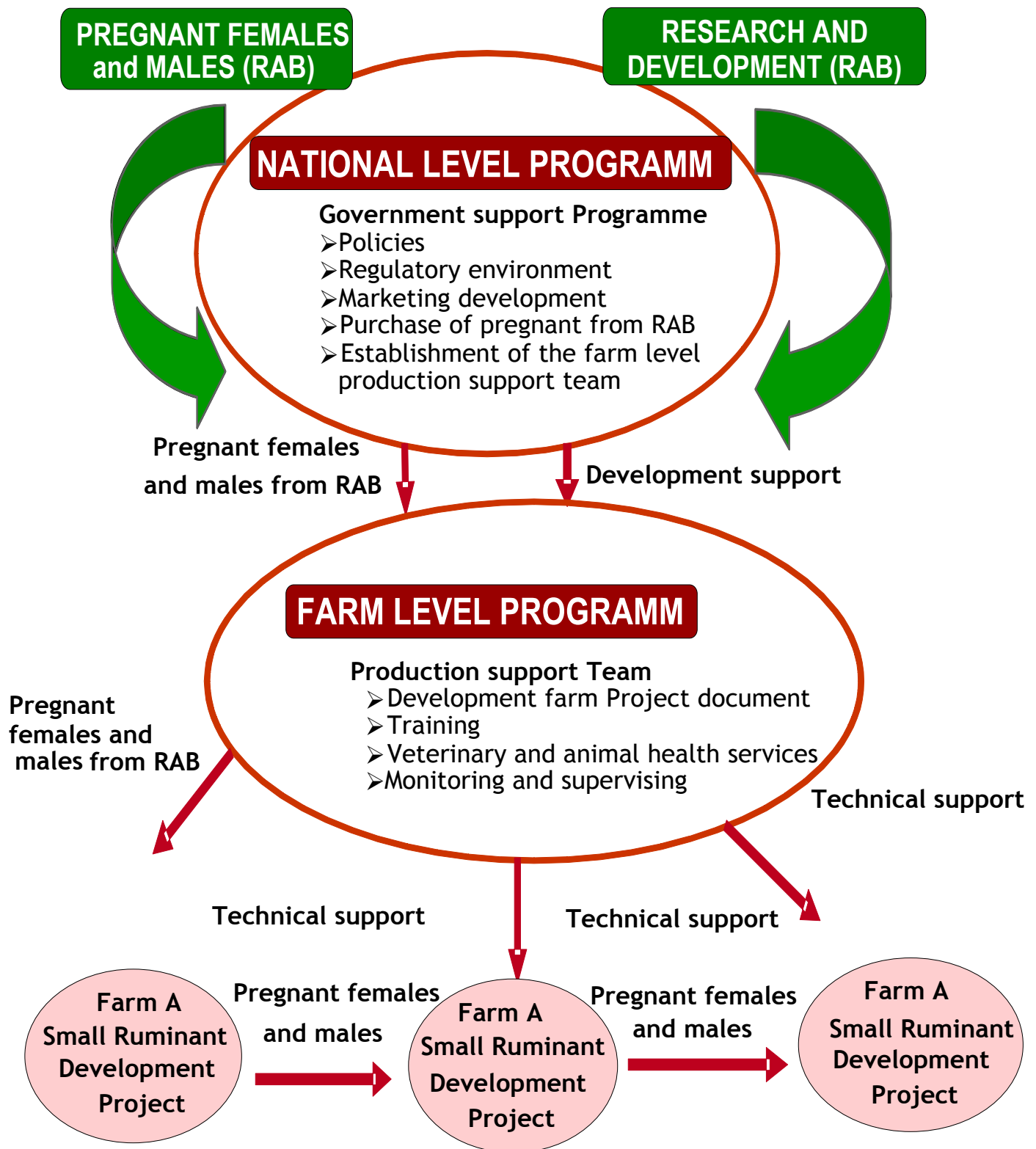


Figure 18 : Small ruminant development model (Dr Mactar SECK, 2012)

6.3.1.2.2 Cross-breeding options for pigs, rabbit and poultry

Table 4 : Crossbreeding options in Rwanda

| SPECIES | CROSSBREEDING |
|---------|--|
| PIGS | <ul style="list-style-type: none"> Local breed×landrace Local breed×large white |
| RABBITS | <ul style="list-style-type: none"> Local breed×California Local breed×New Zealand |
| POULTRY | <ul style="list-style-type: none"> Local breed×improved breed <p>(village poultry production)</p> |

- Pigs**

- **Landrace breed** was developed in Northern Europe (Denmark, Sweden). Landrace are white in color. Their ears droop and slant forward with its top edges nearly parallel to the bridge of a straight nose. Landrace are noted for their ability to farrow and raise large litters. Landrace is a prolific breed putting down an average of 13.7 piglets per litter and 24 piglets per year. It is also characterized by its sexual precocity (can be put to the reproduction from 8 to 9 months), and its excellent maternal behaviour. Its growth is rather good and it provided an average carcass quality. This is quite consistent with standards sought in industrial production since few stocked with fat, back fat thickness was 11.3 mm.
- **The large white** has an elongated rectangular body; erect ears open to the front and strong members. The color is uniformly light, white, without blemish, with white bristles on a white rind. It's a pig very active, despite the length of his body. The cuboid of the latter gives a good balance. The large white pig is large. The boar is 105 cm at the withers and weighs 380 kg and the female is 100 cm and weighs 320 kg.
- The large white breed is especially popular for breeders because it combines very well maternal qualities and abilities for fattening. It is an early and prolific race which produced an average of 24.9 piglets per sow per year. It also has good performance in terms of growth (a young neutered male reached 100 kg in 145 days) and feed efficiency. Thus, in castrated males for fattening, there has been an average daily gain of 944 g per day and a feed conversion of 2.691. The large white produces a high quality meat with low fat thickness (9.9 mm back fat). Moreover, it is a very hardy pig; members strong, which can adapt to different operating systems, outdoor or building. It adapts well to hot countries, particularly in western Africa.

The African pig comes from the Iberian breed and is roughly the same in all African countries where it exists. The format is small. The head, long, has a short front, almost flat and straight chamfer elongated snout. The ears are small, thick, horizontal or upright. The neck is short, slightly convex and the back long enough. The croup is sloping, provided little ham. Members are slender, slightly muscular. The nipples are often 10 in number. The bristles are long. The color is often black. It may

be pie black, gray, red or spotted. The performances of the African pig are very poor as compared to the exotic breeds: the height at the withers is 40-60 cm; the birth weight is 1-1.2 kg; the adult weight is 50-60 kg; fertility rate is 1.2 to 1.8 liters per year; age at first farrowing is 15 months; interval between farrowing is 9 months.

In Africa, various breeds were introduced by successive imports: Hampshire, Landrace, Duroc, Yorkshire, large black, Berkshire, Large white, and Piétrain. These exotic breeds are the most often crossed with local breeds to get crossbreeds having better performances than local breeds and better adaptability than exotic breeds.

Crossbreeding is a widely accepted and recommended practice in commercial swine production. The performances of the exotic breeds are rather similar; which selected the choice of landrace and large white breeds is their ancient presence in the country and their adoption by farmers.

- **Rabbits**

Choice is motivated by their performance as well as by their former presence in Rwanda and their adoption by farmers.

Table 5 : *Post weaning litter size and daily gain of New Zealand white rabbit (Ayyat, 1996)*

| Body weight (g) | | | Daily gain (g) | | |
|-----------------|---------|----------|----------------|------|-------|
| 4 weeks | 8 weeks | 12 weeks | 4-8 | 8-12 | 4-12 |
| 429 | 927 | 1512 | 17.9 | 20.9 | 19.45 |

Table 6 : *Slaughter traits of NZ and California (Ayyat, 1996)*

| | New Zealand | California |
|----------------------------|--------------------|-------------------|
| Slaughter age (days) | 97 | 105 |
| Feed intake, kg/kg gain | 4.18 | 4.2 |
| Daily gain, g | 23.6 | 23.1 |
| Carcass weight, g | 1205 | 1270 |
| Dressing percentage | 53.1 | 54.6 |
| Carcass content (%) | | |
| Meat | 80.4 | 80 |
| Bone | 18.2 | 17.3 |
| Fat | 1.3 | 2.5 |

- **Poultry**

The level of productivity of rural poultry is very low as compared to high-input systems; scavenging hens lay 30 eggs per year, while industrialized battery hens lay up to 300 eggs annually. Furthermore, it may take up to 12 months to raise a chicken for consumption.

It is unrealistic to consider the establishment of modern poultry in rural areas, it is quite possible to consider the improvement of rural poultry by the introduction of exotic breeds well adapted to the tropical conditions and that have worked well elsewhere in Africa, e.g. Bleu des landes, kabir: they are meaty chickens that can reach 3 kg in 9 weeks, whereas the adult rooster weighs 4.9 kg. Crossbreeding with the local breed will give offspring well adapted to the Rwandan conditions and much more efficient than the local breed. These breeds can be imported from France and Belgium (Bleu des Landes, Kabir) or Uganda (Broiler).

The implementation of improved village poultry should however be considered in a global perspective. Indeed, genetic improvement programme would be fruitless if the following issues are not considered: diseases prevention, feeding systems, marketing, etc...

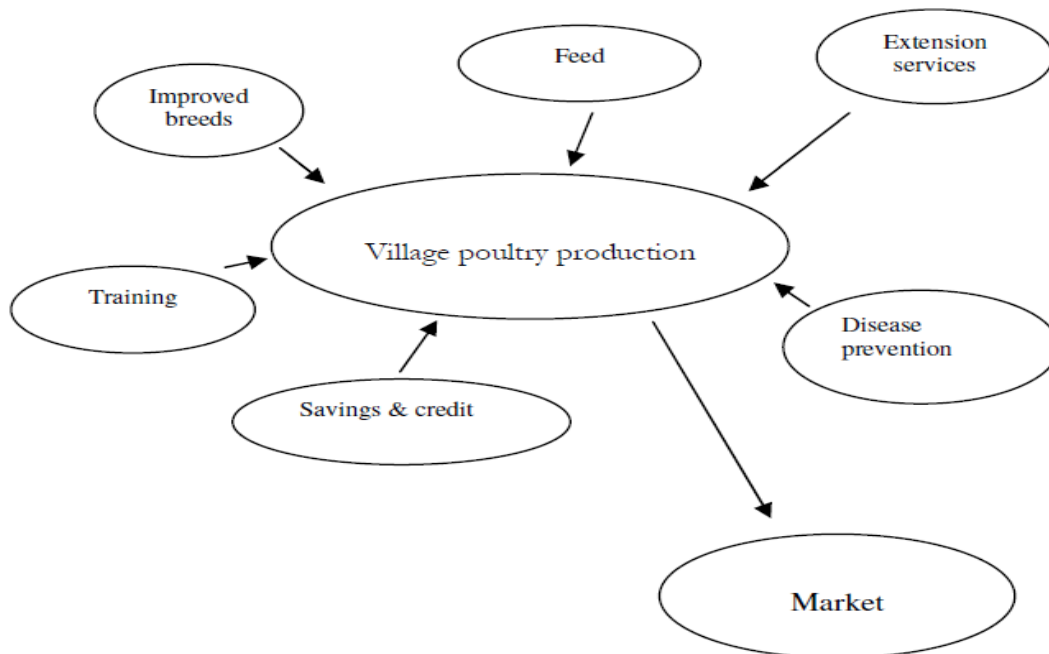


Figure 19 : Village poultry production model

6.3.1.3 The evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives.

| ACTIONS | EVALUATION INDICATORS |
|---|--|
| Genetic improvement of the national herd of Sheep | Increased rates of exotic breeds (merinos) and crossbreeds (merinos×local breed) |
| Genetic improvement of the national herd of Goats | Increased rates of exotic breeds (Boer, Saanen, wool goat) and crossbreeds (Boer, Saanen, wool goat×local breed) |
| Genetic improvement of the national herd of Pigs | Increased rates of exotic breeds (Large white, Landrace) and crossbreeds (Large white, Landracexlocal breed) |
| Genetic improvement of the national herd of Rabbits | Increased rates of exotic breeds (New Zealand, California) and crossbreeds (New Zealand, Californiaxlocal breed) |
| Genetic improvement of the national herd of Poultry | Increased rates of exotic breeds (Bleu des Landes, Kabir) and crossbreeds (Bleu des Landes, Kabir×local breed) |

6.3.1.4 The operational and investment plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 7: Operational and Investment plan for Genetic Improvement

| | BUDGET (in RwF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|---|--------------------|-----------------------------------|------|------|------|------|------|------|-------------|------------------------|-----------------------------------|--|
| Capacity building for research scientists including animal scientists, (nutrition, animal health, genetics...) | 400 000 000 | MINAGRI/RAB | | | | | | | LONG TERM | 150 000 000 | | 250 000 000 |
| Contests of best breeders, annual livestock exhibition at zonal level | 250 000 000 | MINAGRI/RAB, RTV | | | | | | | MEDIUM TERM | 50 000 000 | 50 000 000 | 150 000 000 |
| Training for small breeders | 120 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 40 000 000 | | 80 000 000 |
| Purchase of breeders: Sheep (Merinos) | 250 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 25 000 000 | 25 000 000 | 200 000 000 |
| Purchase of breeders: Goat (Boer, Saanen, wool goats) | 240 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 25 000 000 | 25 000 000 | 190 000 000 |
| Purchase of breeders: Pigs (Landrace, Large white) | 40 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 3 000 000 | 10 000 000 | 27 000 000 |
| Purchase of breeders: Rabbit (California, New Zealand) | 6 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 1 000 000 | 1 000 000 | 4 000 000 |
| Purchase of breeders: Poultry | 10 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 2 000 000 | 2 000 000 | 6 000 000 |
| Training of breeders specialists | 50 000 000 | MINAGRI/RAB | | | | | | | SHORT TERM | 5 000 000 | 5 000 000 | 40 000 000 |
| Housing rehabilitation in Stations (Karama station in Bugesera, the old goat houses have to be redesigned, or new ones have to be built, as they have design flaws) | 1 000 000 000 | MINAGRI/RAB, ISAE, KIST, NUR, UPU | | | | | | | MEDIUM TERM | 100 000 000 | | 900 000 000 |
| Scientific analyses and monitoring | 600 000 000 | MINAGRI/RAB, ISAE, KIST, NUR, UPU | | | | | | | LONG TERM | 100 000 000 | | 500 000 000 |
| Health management of breeders | 70 000 000 | MINAGRI/RAB, ISAE | | | | | | | LONG TERM | 21 000 000 | | 49 000 000 |
| Follow-up Research | 350 000 000 | MINAGRI/RAB, ISAE, KIST, NUR, UPU | | | | | | | LONG TERM | 100 000 000 | | 250 000 000 |

Source: Dr Mactar SECK, 2012

6.3.2 Component 2: Animal nutrition

6.3.2.1 *The strategic objectives*

The basic reason for the poor performance of livestock in developing countries is the seasonal inadequacy of feed, both in quantity and quality. These deficiencies have rarely been corrected by conservation and, or, supplementation, often for lack of infrastructure, technical know-how, poor management, etc. In addition, many feed resources that could have a major impact on livestock production continue to be unused, undeveloped or poorly used. A critical factor in this regard has been the lack of proper understanding of the nutritional principles underlying their utilisation.

Feeding standards as practiced in developed countries could be misleading when nonconventional feed resources are used in formulating rations for ruminant livestock in developing countries. The alternative approach to the use of feeding standards would be to ensure that the production system matches the available resources.

The development of animal nutrition strategies in Rwanda should be based on locally available and affordable feed resources.

- First step: Assessment of feed resources available for livestock in Rwanda

The availability of feed resources is determined by the land utilization pattern. This reflects the demand of the human population and the nature of the ecosystem which in turn is a function of land and soil characteristics including terrain, availability of water, rainfall, soil fertility, etc. Due to the ever increasing human population and the consequent increase in demand for food, livestock feed tends to be derived from residues and by-products of the food industry.

In Rwanda, the major feed resource is natural grazing, often in communal ownership. Over the past 50 years a rapidly expanding human population has markedly increased pressure on land, causing arable land to encroach on the best of the grazing land. In most of the country this has made zero grazing a necessity, especially for dairy cattle production, in place of the traditional grazing systems. Feed resources available for livestock production in Rwanda can be categorized into four groups. Natural pastures fall into the first and/or the second category depending on time of harvesting, the nature of the pasture species, climatic conditions, etc.

- High fiber-low protein feeds

These include fibrous residues arising from crops grown for human consumption, such as straws and stovers from rice, millet, sorghum and maize, and sugarcane bagasse. The production of crop residues and by-products can be estimated fairly accurately from estimates of the primary product (e.g. grain), using multipliers which assume grain: residue ratios. The nutritional characteristics are their high fibre content (>700 g of cell wall material/kg DM), low metabolizable energy (<7.5 MJ/kg dry matter), low levels of crude protein (20.60 g of crude protein/kg DM) and mineral nutrients and low to moderate digestibility (<30.45% organic matter digestibility).

- High fiber-high protein feeds

By-products derived from crop production (tops and haulms from ground nut, sweet potato vine, cassava leaves, bean straw) and industrial processing (bran from cereal milling rice, wheat and maize bran, brewer's grain), fall into this category of feeds. They are generally less fibrous (below 700 but above 400 g of cell wall material/kg of DM) than those in the first category but have relatively high amounts of crude protein (> 60 g/kg DM). Leaves from tree legumes and browse plants such as *Glyricidia*, *Leucaena* and *Erythrina*, that have around 250.350 g/kg of crude protein in DM, can also be considered in this category.

- Low fiber-low protein feeds

These include feed resources derived from crops grown for renewable energy such as sugarcane by-products and root crops. They are generally rich in energy and low in protein content. Examples of this category would be molasses, oil palm juice and waste material arising from the fruit processing industry (citrus pulp, pineapple waste) and root crops (cassava waste).

- Low fiber-high protein feeds

These are the feeds traditionally called concentrates and include oilseed meals and cakes (coconut cake, soybean meal, cotton seed cake, groundnut meal/cake) and animal by-products (fishmeal, blood meal, feather meal). They are valuable sources of good quality protein for both ruminant and non-ruminant animals.

Animal by-products are very good sources of high quality protein and can improve the nutritive value of low quality forage based diets for ruminants. Fishmeal is often used for balancing the amino acid content in monogastric feeds. Even for ruminants, fishmeal can provide a high proportion of rumen non-degradable protein acting as a reservoir of amino acids for high levels of production. Natural pastures fall into the first and/or the second category depending on time of harvesting, the nature of the pasture species, climatic conditions, etc.

- Second step: Determination of the feeding value of the feed resources

It will be done by Research – development linkages to formulate rations matched with the feed resources locally available;

- Third step: Launching an animal feed industry;

Lack of animal feed industry appears to be the major constraint in the development of a performing small animal industry. RBS should also be involved to manage the aspects related to quality control and definition of the industrial feed standards.

6.3.2.2 The evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives

- Mapping of fodder resources;
- Quantification of crop residues and agricultural by-products from the primary product using multipliers which assume the grain: residue ratio ;
- Availability of the basic nutritional parameters for the feed resources: Dry matter, digestibility, crude protein, NDF ;
- Availability of rations specific to each species previously tested in station and fields;
- Recovery of the animal feed and poultry feed factory in connection with private investors.

| ACTIONS | EVALUATION INDICATORS |
|---|--|
| Mapping of fodder resources | Map of fodder resources according to the ecological zones and seasons |
| Quantification of crop residues and agricultural by-products from the primary product using multipliers which assume the grain: residue ratio | Annual assessments of crop residues and agricultural by-products |
| Availability of the basic nutritional parameters for the feed resources: <i>Dry matter, digestibility, crude protein, NDF</i> | Tables of bromatological values |
| Availability of rations specific to each species previously tested in station and fields | Standard diets developed from local by-products for each species |
| Recovery of the animal feed and poultry feed factory in connection with private investors | Availability of industrial animal feed Feed standards controlled by RBS |

6.3.2.3 Operational and investment plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 8: Operational and Investment plan for Increasing Animal nutrition

| | BUDGET (RwF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | DEVELOPMENT PARTNERS' CONTRIBUTION |
|---|--------------|--|------|------|------|------|------|------|-------------|---------------------|-----------------------------|------------------------------------|
| Recovery of animal feed factory in PPP (participation in the capital) | 500 000 000 | MINAGRI/RAB, RDB, RPIA | | | | | | | MEDIUM TERM | 100 000 000 | 300000000 | 100 000 000 |
| Capacity building for feed production, through seedlings, cuttings, purchase and distribution and training for ruminants, poultry producers and pig fatteners | 150 000 000 | MINAGRI/RAB | | | | | | | LONG TERM | 50 000 000 | 25 000 000 | 75 000 000 |
| Mapping and quantification of fodder resources | 100 000 000 | MINAGRI/RAB, (General directorate Agr. Statistics) | | | | | | | LONG TERM | 20 000 000 | | 80 000 000 |
| Quantification of crop residues | 100 000 000 | MINAGRI/RAB, (General directorate Agr. Statistics) | | | | | | | MEDIUM TERM | 20 000 000 | | 80 000 000 |
| Determination of feeding values of feed resources | 100 000 000 | MINAGRI/RAB, Consultants | | | | | | | MEDIUM TERM | 30 000 000 | | 70 000 000 |
| Research - development linkages to formulate rations matched with the feed resources locally available | 200 000 000 | MINAGRI/RAB, ISAE, KIST,NUR, UPU, Feed industry | | | | | | | LONG TERM | 50 000 000 | 50 000 000 | 100 000 000 |

Source: Dr Mactar SECK, 2012

6.3.3 Component 3: Animal Health

6.3.3.1 Strategic objectives

6.3.3.1.1 Communication of animal diseases and zoonoses information

The objective is to communicate timely and accurate animal disease information, including information on zoonosis, by making the best use of scientific data modeling, modern information technologies, and non-official information tracking systems:

- There are two main streams of communication of animal disease information: scientific information gathering, analysis and official communication, and public communication based on this scientific analysis;
- Communicating timely and accurate animal disease information, including information on zoonosis, should be one of the core functions of the Veterinary services. That requires processing and real-time operating of data on epidemiological monitoring conducted in the laboratory of veterinary services;
- Dissemination of the official information in a transparent, responsive and efficient manner.

Implementation of a `sanitary alert system` based on epidemiological analysis of data in its information system and in cooperation with the bordering countries.

6.3.3.1.2 Development and implementation of scientifically based standards and guidelines

The objective is to Develop scientifically based standards and guidelines on all matters concerning animal health, veterinary public health, animal welfare, diagnosis and control of diseases, assessment and relevant recognition of animal health status, and sanitary safety in animal production and international trade in animals and animal products:

- Developing scientifically based standards and guidelines for safe trade in animals and animal products;
- Developing animal production food safety standards complementary to the food safety standards;
- Improving public and private sector awareness of the importance of the national standards for animal health and veterinary public health;
- Strengthening collaboration with relevant international and regional Organizations on technical and legal issues related to veterinary products, including legislation, registration and control and monitoring of use.

6.3.3.1.3 Prevention, control and eradication of animal diseases, including zoonoses

The objective is to provide scientifically based recommendations on measures for the prevention, control and eradication of animal diseases including zoonoses, taking into account the economic, social and environmental impacts of such measures:

- Develop, together with partner organizations at international and regional levels, common strategies concerning the control of transboundary diseases and their implications for trade;

- Cooperation with OIE in developing and carrying out coordinated regional programmes for preventing, controlling and eradicating priority animal diseases;
- With international and regional partners, address the animal and zoonotic disease risks of the smallholder farming sector, including communities in peri-urban areas;
- Strengthen cooperation and information exchange in relation to border control.

6.3.3.1.4 *Ensuring the scientific excellence of information and advice*

The objective is to ensure the scientific excellence and timeliness of information and advice available to national Veterinary Services and to other interested parties in the country:

- Meeting the scientific standards of OIE;
- Specialization among scientist to incorporate new subjects such as climatology, ecology or entomology as well as an increased degree of interaction and interdisciplinary across diverse areas of science;
- Encouraging comprehensive and continuing epidemiological studies to understand infection and disease transmission dynamics between wildlife, domestic animals and humans;
- Encouraging research into inter-species pathogen transmission and migration patterns, in collaboration with the wildlife sector;
- Encouraging research into the surveillance of antimicrobial resistance in pathogens and the possible causes leading to the development of antimicrobial resistance;
- Strengthening opportunities for interaction between the public and private sectors in scientific research to meet animal health and welfare challenges.

6.3.3.1.5 *Capacity building for national veterinary services*

The objective is to strengthen the capacity of Veterinary Services to achieve the improvement of animal health, veterinary public health and animal welfare, while improving their ability to participate in the development of international standards and guidelines on these matters; and strengthen their ability to apply these standards and guidelines:

- Strengthening the good governance of Members' Veterinary Services, including technical and management capacities and legislation;
- Upgrading the laboratory of the Veterinary services to reach the level 3;
- Implementing a laboratory of food analysis;
- Develop surveillance capacity, including the development of tools and monitoring processes for use at national, regional and global level;
- Encourage improved collaboration between the public health and animal health sectors and other competent ministries to improve preparedness for and response to potential natural or intentional infectious disease outbreaks;

- Encourage and evaluate the initial and continuing education of veterinarians and veterinary para-professionals;
- Working with veterinary statutory bodies for a better selection of, and the continuing education of, veterinarians and para-professionals.

Other objectives, not less significant are:

- The protection of public health by providing the consumer with meat free of any danger that could compromise his health;
- The protection of the country from all animal diseases threats.

6.3.3.2 *The evaluation indicators*

These indicators will enable the monitoring of the rates of achievements of the strategic objectives:

| ACTIONS | EVALUATION INDICATORS |
|---|--|
| <ul style="list-style-type: none"> ▪ Communication of animal disease and zoonoses information | <ul style="list-style-type: none"> • Availability of the official data on main diseases and zoonoses affecting the small stock |
| <ul style="list-style-type: none"> ▪ Development and implementation of scientifically based standards and guidelines | <ul style="list-style-type: none"> • Development of standards in relation with RBS |
| <ul style="list-style-type: none"> ▪ Prevention, control and eradication of animal diseases, including zoonoses | <ul style="list-style-type: none"> • Gradual decrease of the prevalence of the controlled diseases/zoonoses |
| <ul style="list-style-type: none"> ▪ Ensuring the scientific excellence of information and advice | <ul style="list-style-type: none"> • Integrating the OIE's network of reference centres |
| <ul style="list-style-type: none"> ▪ Capacity building for national veterinary services | <ul style="list-style-type: none"> • Implementation of food analysis laboratory • Level 3 status for the laboratory of the veterinary services |

6.3.3.3 Operational and invest plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 9: Operational and Investment plan for Animal Health

| | BUDGET (RWF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|---|--------------|---|------|------|------|------|------|------|-------------|---------------------|-----------------------------|--------------------------------------|
| Capacity building for the Veterinary Services (equipments) | 600 000 000 | MINAGRI/RAB/ ISAE, NUR, OTHER TERTIARY TRAINING INSTITUTIONS | | | | | | | MEDIUM TERM | 180 000 000 | - | 420 000 000 |
| Upgrading the laboratory of the veterinary services to level 3 | 400 000 000 | MINAGRI/RAB Veterinary services | | | | | | | MEDIUM TERM | 120 000 000 | - | 280 000 000 |
| Prevention, control and eradication of animal diseases including zoonoses | 625 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | LONG TERM | 187 500 000 | - | 437 500 000 |
| Improvement of information system on animal diseases and zoonoses | 100 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | LONG TERM | 30 000 000 | - | 70 000 000 |
| New Animal health policy | 25 000 000 | MINAGRI/RAB, Veterinary services, parliament and local government | | | | | | | MEDIUM TERM | 7 500 000 | - | 17 500 000 |
| Annual report on the animal health status in Rwanda | 60 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | LONG TERM | 20 000 000 | - | 40 000 000 |

Source: Dr Mactar SECK, 2012

6.4 Strategic axis 2: Value addition of by-products

6.4.1 Component 1: The skin sector

6.4.1.1 Strategic objectives

Current statistics indicate Rwanda has 799000 sheep and 2971000 goats. With a take-off rate of 28% for goats and 29% for sheep the potential annual production of skin is 831800 goat skins and 231710 sheep skins.

The exports of hides and skins were 5327 T in 2010 (RARDA). The small animal skins are mainly exported in a raw state (63%). Available tanning capacity which if fully utilized can process a substantial amount of quality hides and skins. The main destinations of exports are Kenya and Hong Kong.

«The sector will focus on improving the quality of hides and skins, increase capacity utilization of tanneries, competition between local products and imports, capacity building of stakeholders including technical personnel, strengthening of stakeholder organizations, acquisition of modern technology for innovation and product development and environmental aspect of the tanning industry.»

6.4.1.2 The evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives which can be summarized in the 8 major actions listed below.

| ACTIONS | EVALUATION INDICATORS |
|--|---|
| ▪ Control of diseases (lumpy skin, FM diseases) | • Gradual decrease of the prevalence |
| ▪ Upgrading slaughter facilities | • Decrease of slaughter defects (bruises, gorges) |
| ▪ Preservation and storage techniques (PST) | • Guidelines for PST |
| ▪ Grading knowledge and skills | • Skins prices according to the grade |
| ▪ Effluent treatments and environmental management standards | • Effluent treatment plans, awareness creation of effluent discharge treatment guidelines |
| ▪ Attracting investments in the tanning sector | • Emergence of leather goods sub-sector |
| ▪ Working capital | • SMEs credit guarantee scheme |
| ▪ Marketing of products | • Increase of market share |

6.4.1.3 Operational and investment plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 10: Operational and Investment plan for the skin sector

| | BUDGET (RWF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|---|--------------|--|------|------|------|------|------|------|-----------|---------------------|-----------------------------|--------------------------------------|
| Modernization of tanneries | 600 000 000 | MINAGRI/RAB, Tanneries cooperatives, RBS, NAEB | | | | | | | LONG TERM | 50 000 000 | 100 000 000 | 450 000 000 |
| Training of skins processors (skills, grading, storage technics) | 200 000 000 | MINAGRI/RAB, Tanneries cooperatives, RBS, NAEB | | | | | | | LONG TERM | 50 000 000 | | 150 000 000 |
| Strengthening organizations of the skin sector | 50 000 000 | MINAGRI/RAB, Tanneries cooperatives, RBS, NAEB | | | | | | | LONG TERM | 25 000 000 | | 25 000 000 |
| Guidelines for skins processing effluent treatments and environmental standards | 50 000 000 | MINAGRI/RAB, Tanneries cooperatives, RBS, NAEB | | | | | | | LONG TERM | 10 000 000 | - | 40 000 000 |

Source: Dr Mactar SECK, 2012

6.4.2 Component 2: Value addition of goat milk

6.4.2.1 Strategic objectives

The valorization of the goat milk sector can be a major contribution in the implementation of a strong small animals industry. Contrary to appearances, 65% of milk consumption worldwide is from goat's milk (Cooke, 2010), and this popularity hasn't come about due to high profile marketing campaign or big-budget advertisements.

Moreover, there is not many information on benefits of goat milk vs. cow milk:

- Goat's milk is less allergenic: the level of alpha s1 casein is 89% less than in cow's milk;
- Goat's milk is naturally homogenized: smaller fat globules and does not contain agglutinin;
- Goat's milk is easier to digest: smaller fat globules and higher medium chain fatty acid;
- Goat's milk rarely causes lactose intolerance: less lactose;
- Goat's milk matches up to the human body better than cow's milk: superior source of essential fatty acids, vitamins B6, niacin and vitamin A, potassium, etc...

The production potential exists in Rwanda: 2971000 goats including the goat milk Saanen and crossbreeds.

Know-how of the goat's milk processing already exists, as evidenced by the existence of cheese makers (fromage Karongi, « les Caves de l'Abondance »)

Goat cheese is appreciated while almost all the cheeses on the market are imported.

These potentialities are however hindered by the constraints below:

- Goat milk is not appreciated, due to food taboos;
- The dairy herd (Saanen, cross-breeds) is still too small ;
- The processing activity is in its infancy and too few players are involved;
- Lack of institutional support and marketing of the products.

The strategic objectives will be declined in 5 major actions:

- Include the importation of dairy goats (Saanen) next to meat goats in the Genetic Improvement program;
- Information and awareness on the benefits of goat's milk;
- Promotion of locally produced cheese;
- Institutional support for cheese producers.

6.4.2.2 Evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives listed below:

| ACTIONS | EVALUATION INDICATORS |
|--|---|
| Include the importation of dairy goats (Saanen) next to meat goats in the GI program | <ul style="list-style-type: none">• Increase of the relative proportion of dairy goats (Saanen, crosses) in the overall national herd |
| Information and awareness on the benefits of goat's milk | <ul style="list-style-type: none">• Reduction of taboos related to goat's milk consumption |
| Promotion of locally produced cheese | <ul style="list-style-type: none">• Increase of market share |
| Institutional support for cheese producers | <ul style="list-style-type: none">• Access to low-interest credit• Define quality standards |

6.4.2.3 Operational and invest plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 11: Operational and Investment plan for value addition of goat milk production

| | BUDGET (RWF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|--|--------------|--------------------------------|------|------|------|------|------|------|------------|---------------------|-----------------------------|--------------------------------------|
| Technical assistance and technological equipment for cheese makers | 500 000 000 | MINAGRI/RAB, RDB | | | | | | | LONG TERM | 50 000 000 | 50 000 000 | 400 000 000 |
| Promoting labels for Rwandan cheese | 250 000 000 | MINAGRI/RAB, MINICOM, RBS, RDB | | | | | | | LONG TERM | 25 000 000 | 25 000 000 | 200 000 000 |
| Implement a federation of cheese makers | 50 000 000 | MINAGRI/RAB, MINICOM, RBS, RDB | | | | | | | SHORT TERM | | 10 000 000 | 40 000 000 |

Source: Dr Mactar SECK, 2012

6.4.3 Component 2: Value addition of the wool sector

6.4.3.1 Strategic objectives

The wool sector is not fully exploited due to:

- Cross-cutting constraints negatively impacting the sheep industry (animal health, animal nutrition, poor husbandry practices);
- Disorganization of the sub-sector;
- Lack of processing capacity;
- Access to low-interest credit.

The potentials are however promising:

- Availability of merinos sheep (6 kg wool per year);
- Presence of wool processors;
- Existence of export market (U.S);
- Associations of wool exporters (Umuzabibu w' ukuri, COODERU) ;
- Relatively good price for raw wool (3000 RWF per kg).

The strategic objectives to fully exploit the wool sector can be embodied via the actions below:

- Increase availability of merinos breed;
- Increase availability of wool goats (cashmere and/or angora);
- Strengthen associations of merinos breeders and associations of wool buyers;
- Capacity building for wool processors;
- Low-interest credit for breeders and processors.

6.4.3.2 Evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives listed below:

| ACTIONS | INDICATORS |
|--|---|
| Increase availability of merinos breed Increase availability of wool goats breeds | Increase of the relative proportion of merinos and wool goats breeds in the national sheep herd |
| Strengthen associations of merinos breeders and associations of wool buyers | Increase of the number of associations and/or members |
| Capacity building for wool processors | Increase of the relative proportion of processed wool |
| Low-interest credit for breeders and processors | Establishment of bank guarantees for borrowers |

6.4.3.3 Operational and Invest plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 12: Operational and Investment plan for valorization of wool sector

| | BUDGET (RwF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|---|--------------|----------------------------------|------|------|------|------|------|------|-----------|---------------------|-----------------------------|--------------------------------------|
| Strengthening organizations of wool processors (Technical assistance and equipment) | 400 000 000 | MINAGRI/RAB, organizations of WP | | | | | | | LONG TERM | 20 000 000 | 40 000 000 | 340 000 000 |

Source: Dr Mactar SECK, 2012

6.5 Strategic axis 3: Marketing

6.5.1 Component 1: Filling the domestic market

6.5.1.1 Strategic objectives

Numerous food taboos constitute a major impediment to the livestock development. Sheep are disliked in most of country, except in Northern Province; taboos related to rabbit meat and goat milk consumption. Moreover, industrial chicken's meat is allegedly less savory than the local breed's.

The strategic objectives will be met via the actions listed below:

- Promoting livestock (top breeding contests, shows and exhibitions);
- Awareness on the benefits of rabbit meat (lowest calories, fat and cholesterol among all meat);
- Awareness on the benefits of goat milk (less allergenic, more homogenized, more vitamins, easier to digest...);
- Quality standards for livestock products (meat, milk, cheese).

6.5.1.2 Evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives listed below:

| ACTIONS | INDICATORS |
|--|---|
| Promoting livestock | Transversal indicators |
| Awareness on the benefits of rabbit meat | Increase of domestic consumption |
| Awareness on the benefits of goat milk | Increase of domestic consumption |
| Quality standards for livestock products | Labeling |
| Organization of the market of livestock products | Integrated market of livestock products |

6.5.1.3 Operational and invest plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 13: Operational and Investment plan for filling the domestic market

| | BUDGET (RwF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|--|--------------|-------------------------------|------|------|------|------|------|------|-------------|---------------------|-----------------------------|--------------------------------------|
| Establish a livestock statistic desk with real-time market information on livestock and livestock products | 50 000 000 | MINAGRI/RAB, G.D of SP and PC | | | | | | | SHORT TERM | 10 000 000 | | 40 000 000 |
| Train stakeholder's organizations in entrepreneurship | 100 000 000 | MINAGRI/RAB, RDB | | | | | | | LONG TERM | 20 000 000 | | 80 000 000 |
| Organization of the market of livestock products | 100 000 000 | MINAGRI/RAB, RBS | | | | | | | MEDIUM TERM | 10 000 000 | | 90 000 000 |
| Strengthen the sanitary, phytosanitary and food safety system | 100 000 000 | MINAGRI/RAB, RBS | | | | | | | LONG TERM | 10 000 000 | - | 90 000 000 |
| Advertisement campaigns to fight food taboos and promote food security | 120 000 000 | MINAGRI/RAB, RTV | | | | | | | LONG TERM | 10 000 000 | 30 000 000 | 80 000 000 |

Source: Dr Mactar SECK, 2012

6.5.2 Component 2: Increase access to regional and international markets

6.5.2.1 Strategic objectives

The willingness of public authorities to transform Rwanda into export strength in livestock products is not realistic in the short term.

In the regional market, Rwanda comes from too far to bridge in few years the gap of competitiveness as compared to Kenya, Tanzania and Uganda which have among other benefits a size of national herd that allow economies of scale.

In the international market, the reason evocated above are reinforced by the fact that non-tariff barriers related to quality, hygiene and standards are for now an insuperable obstacle.

Rwanda is however not devoid of assets. Indeed, an access to the regional market already exists for live animals (Congo, DRC, and Burundi). Live bovine animals are the 7th export product of Rwanda (3.1 million \$).

On the other hand, livestock products such as skin and wool have access to the international market (Asia, US). Raw and tanned hides and skins are the 13th and 14th export products of Rwanda (1.2 and 0.6 million \$). Thus, the short-term strategy should focus on increasing the penetration in the already existing foreign markets.

The basis of the strategy remains the increase of the supply and the quality of livestock and livestock products. Four major actions are needed to meet the objective of increasing access to regional and international markets:

- Increasing supply of live animals;
- Export of live animals (Sheep, Pigs, Goat), focusing on most promising targets: Congo, DR Congo;
- (Goma, Bukavu), Burundi;
- Export of Skins: Raw (Kenya, China) and tanned (Hong Kong);
- Export of wool (U.S).

6.5.2.2 Evaluation indicators

These indicators will enable the monitoring of the rates of achievements of the strategic objectives listed below:

| ACTIONS | INDICATORS |
|-----------------------------------|--|
| Increasing supply of live animals | During the period 2012-2017 the livestock growth should be at least 20% higher than the averages of the period 2005-2010 |
| Export of live animals | Statistics regarding small animal exports |
| Export of Skins | Exports growth rate during the period 2012 - 2017 |
| Export of wool | Exports growth rate during the period 2012 - 2017 |

6.5.2.3 Operational and invest plan

The operational and invest plan includes the stakeholders involved and the timeframe for each strategic objective.

Table 14: Operational and Investment plan for Increasing access to regional and international markets

| | BUDGET (RwF) | STAKEHOLDERS | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | PRIORITY | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTION | PARTNERS of DEVELOPMENT CONTRIBUTION |
|---|--------------|---------------------------------|------|------|------|------|------|------|------------|---------------------|-----------------------------|--------------------------------------|
| Subsidize producer's costs of obtaining quality certifications | 360 000 000 | MINAGRI, RAB, RBS, RDB | | | | | | | LONG TERM | 50 000 000 | 150 000 000 | 160 000 000 |
| Harmonize quality standards of livestock products with the EAC region | 15 000 000 | MINAGRI, RAB, RBS, MINICOM, RDB | | | | | | | SHORT TERM | 15 000 000 | | |

Source: Dr Mactar SECK, 2012

SUMMARY TABLES

Table 15: *Operational and Investment plan- Short term*

| | BUDGET (RWF) | STAKEHOLDERS | 20 12 | 20 13 | 20 14 | 20 15 | 20 16 | 20 17 | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTI ON | PARTNERS of DEVELOPME NT CONTRIBUTIO N |
|--|-----------------|--------------------------------|----------|----------|----------|----------|----------|----------|------------------------|---------------------------------------|--|
| Establish a livestock statistic desk with real-time market information on livestock and livestock products | 50 000 000 | MINAGRI/RAB, G.D of SP and PC | | | | | | | 10 000 000 | - | 40 000 000 |
| Regrouping the cooperatives into 5 Unions | 50 000 000 | MINAGRI/RAB, MINICOM, RBS, RDB | | | | | | | - | 10 000 000 | 40 000 000 |
| Training for small breeders | 120 000 000 | MINAGRI/RAB | | | | | | | 40 000 000 | - | 80 000 000 |
| Purchase of breeders: Sheep (Merinos) | 250 000 000 | MINAGRI/RAB | | | | | | | 25 000 000 | 25 000 000 | 200 000 000 |
| Purchase of breeders: Goat (Boer, Saanen) | 240 000 000 | MINAGRI/RAB | | | | | | | 25 000 000 | 25 000 000 | 190 000 000 |
| Purchase of breeders: Pigs (Landrace, Large white) | 40 000 000 | MINAGRI/RAB | | | | | | | 3 000 000 | 10 000 000 | 27 000 000 |
| Purchase of breeders: Rabbit (California, New Zealand) | 6 000 000 | MINAGRI/RAB | | | | | | | 1 000 000 | 1 000 000 | 4 000 000 |
| Purchase of breeders: Poultry | 10 000 000 | MINAGRI/RAB | | | | | | | 2 000 000 | 2 000 000 | 6 000 000 |
| Training of breeders specialists | 50 000 000 | MINAGRI/RAB | | | | | | | 5 000 000 | 5 000 000 | 40 000 000 |

Source: *Dr Mactar SECK, 2012*

Table 16: Operational and Investment plan- Medium term

| | BUDGET (RWF) | STAKEHOLDERS | 20 12 | 20 13 | 20 14 | 20 15 | 20 16 | 20 17 | RWANDA CONTRIBUTION | PRIVATE SECTOR CONTRIBUTI ON | PARTNERS of DEVELOPME NT CONTRIBUT ION |
|---|-----------------|--|----------|----------|----------|----------|----------|----------|------------------------|---------------------------------------|---|
| Capacity building for the Veterinary Services (equipment) | 600 000 000 | MINAGRI/RAB | | | | | | | 180 000 000 | - | 420 000 000 |
| Upgrading the laboratory of the veterinary services to level 3 | 400 000 000 | MINAGRI/RAB | | | | | | | 120 000 000 | - | 280 000 000 |
| Recovery of animal feed factory in PPP (participation in the capital) | 500 000 000 | MINAGRI/RAB, RDB, RPIA | | | | | | | 100 000 000 | 300 000 000 | 100 000 000 |
| Organization of the market of livestock products | 100 000 000 | MINAGRI/RAB, MINICOM | | | | | | | 10 000 000 | - | 90 000 000 |
| Contests of best breeders, annual livestock exhibition | 250 000 000 | MINAGRI/RAB, RTV | | | | | | | 50 000 000 | 50 000 000 | 150 000 000 |
| Quantification of crop residues | 100 000 000 | MINAGRI/RAB, (General directorate Agr. Statistics) | | | | | | | 20 000 000 | - | 80 000 000 |
| Determination of feeding values of feed resources | 100 000 000 | MINAGRI/RAB, Consultants | | | | | | | 30 000 000 | - | 70 000 000 |
| Housing rehabilitation (Stations) | 1 000 000 000 | MINAGRI/RAB, ISAE, KIST, NUR, UPU | | | | | | | 100 000 000 | - | 900 000 000 |
| New Animal health policy | 25 000 000 | MINAGRI/RAB | | | | | | | 7 500 000 | - | 17 500 000 |

Source: Dr Mactar SECK, 2012

Table 17: Operational and Investment plan- Long term

| | BUDGET (RWF) | STAKEHOLDERS | 20 12 | 20 13 | 20 14 | 20 15 | 20 16 | 20 17 | RWANDA CONTRIBUTIO N | PRIVATE SECTOR CONTRIBU TION | PARTNE RS of DEVELO PMENT CONTRI BUTION |
|---|-----------------|-------------------------------------|----------|----------|----------|----------|----------|----------|----------------------------|---------------------------------------|--|
| Train stakeholder's organizations in entrepreneurship | 100 000 000 | MINAGRI/RAB, RDB | | | | | | | 20 000 000 | - | 80 000 000 |
| Subsidize producer's costs of obtaining quality certifications | 350 000 000 | MINAGRI/RAB, RBS | | | | | | | 30 000 000 | 70 000 000 | 250 000 000 |
| Strengthen the sanitary, phytosanitary and food safety system | 100 000 000 | MINAGRI/RAB, RBS | | | | | | | 10 000 000 | - | 90 000 000 |
| Harmonize quality standards of livestock products with the EAC region | 100 000 000 | MINAGRI/RAB, RBS | | | | | | | 10 000 000 | - | 90 000 000 |
| Modernization of tanneries | 600 000 000 | MINAGRI/RAB, Tanneries cooperatives | | | | | | | 50 000 000 | 100 000 000 | 450 000 000 |
| Capacity building for ruminants and pig fatteners | 150 000 000 | MINAGRI/RAB | | | | | | | 50 000 000 | 25 000 000 | 75 000 000 |
| Training of skins processors (skills, grading, storage technics) | 200 000 000 | MINAGRI/RAB | | | | | | | 50 000 000 | - | 150 000 000 |
| Strengthening organizations of the skin sector | 50 000 000 | MINAGRI/RAB | | | | | | | 25 000 000 | - | 25 000 000 |
| Technical assistance and technological equipment for cheese makers | 500 000 000 | MINAGRI/RAB, RDB | | | | | | | 50 000 000 | 50 000 000 | 400 000 000 |
| Strengthening organizations of wool processors (technical assistance and equipment) | 400 000 000 | MINAGRI/RAB, «Umuzabibu w'ukuri» | | | | | | | 20 000 000 | 40 000 000 | 340 000 000 |
| Advertisement campaigns to fight food taboos and promote food security | 120 000 000 | MINAGRI/RAB, RTV | | | | | | | 10 000 000 | 30 000 000 | 80 000 000 |
| Capacity building for research Scientifics (genetics, animal health, nutrition) | 400 000 000 | MINAGRI/RAB | | | | | | | 150 000 000 | - | 250 000 000 |

| | | | | | | | | | | | |
|--|-------------|--|--|--|--|--|--|--|-------------|------------|-------------|
| Promoting labels for Rwandan cheeses | 250 000 000 | MINAGRI/RAB, MINICOM, RBS, RDB | | | | | | | 25 000 000 | 25 000 000 | 200 000 000 |
| Mapping and quantification of fodder resources | 100 000 000 | MINAGRI/RAB, (General directorate Agr. Statistics) | | | | | | | 20 000 000 | - | 80 000 000 |
| Research - development linkages to formulate rations matched with the feed resources locally available | 200 000 000 | MINAGRI/RAB, ISAE, Feed Industry | | | | | | | 50 000 000 | 50 000 000 | 100 000 000 |
| Prevention, control and eradication of animal diseases including zoonosis | 625 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | 187 500 000 | - | 437 500 000 |
| Improvement of information system on animal diseases and zoonosis | 100 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | 30 000 000 | - | 70 000 000 |
| Scientific analyses and monitoring | 600 000 000 | MINAGRI/RAB , ISAE , KIST, NUR, UPU | | | | | | | 100 000 000 | - | 500 000 000 |
| Health management of breeders | 70 000 000 | MINAGRI/RAB, ISAE | | | | | | | 21 000 000 | - | 49 000 000 |
| Follow-up Research | 350 000 000 | MINAGRI/RAB, ISAE, KIST, NUR, UPU | | | | | | | 105 000 000 | - | 245 000 000 |
| Annual report on the animal health status in Rwanda | 60 000 000 | MINAGRI/RAB, Veterinary services | | | | | | | 20 000 000 | - | 40 000 000 |
| Guidelines for skins processing effluent treatments and environmental standards | 50 000 000 | MINAGRI/RAB, RSB | | | | | | | 10 000 000 | - | 40 000 000 |

Source: Dr Mactar SECK, 2012

7 LOGICAL FRAMEWORK

The logical framework is given by the tables below.

Table 18: *The logical framework*

| OBJECTIVES | Indicators | Means of verification | Assumptions |
|---|---|--|---|
| <p>Overall objective: Launching a small ruminant industry: from a subsistence activity to an income-generating activity and export strength</p> | <ul style="list-style-type: none"> • Increase of livestock to agricultural GDP | <ul style="list-style-type: none"> • MINAGRI REPORTS • MINICOM REPORTS | By the end of the action plan, the small animal industry will enable increasing incomes for farmers but also the improvement of the trade balance |
| <p>Specific objectives: Increased rates of small animal growth and modernization of the small animals' industry</p> | <ul style="list-style-type: none"> • Livestock populations' growth rates | <ul style="list-style-type: none"> • MINAGRI REPORTS | The availability of a large national herd will enable the filling of the domestic market and exports to regional and international markets |
| <p>Outputs:</p> <p>1. Genetic improvement</p> | <ul style="list-style-type: none"> • Increased rates of exotic breeds (merinos) and crossbreeds (merinosxlocal breed) • Increased rates of exotic breeds (Boer, Saanen, wool goats) and crossbreeds (Boer, Saanenxlocal breed) • Increased rates of exotic breeds (Large white, Landrace) and crossbreeds (Large white, Landracexlocal breed) • Increased rates of exotic breeds (New Zealand, California) and crossbreeds (New Zealand, Californiaxlocal breed) • Increased rates of exotic breeds (Bleu des Landes, Kabir) and | <ul style="list-style-type: none"> • MINAGRI REPORTS • RAB REPORTS | By the end of the action plan, availability of a sock of exotic breeds and crossbreeds to sustain the objective of overall genetic improvement |

| | | | |
|--|---|---|--|
| <p>5. Goat milk value addition</p> | <p>sector</p> <ul style="list-style-type: none"> • SMEs credit guarantee scheme • Increase of market share | <ul style="list-style-type: none"> • MINAGRI REPORTS • RBS REPORTS | <p>Widespread acceptance of goat milk and cheese</p> |
| <p>6. Wool sector value addition</p> | <ul style="list-style-type: none"> • Increase of the relative proportion of dairy goats (Saanen, crosses) in the overall national herd • Reduction of taboos related to goat's milk consumption • Increase of market share • Access to low-interest credit for cheese makers • Define quality standards | <ul style="list-style-type: none"> • MINAGRI REPORTS • MINICOM REPORTS | <p>By the end of the action plan wool will be a major export product</p> |
| <p>7. Filling the domestic market</p> | <ul style="list-style-type: none"> • Increase of the relative proportion of merinos breed in the national sheep herd • Increase the proportion of wool goats in the national goat herd • Increase of the number of associations of wool processors and/or members • Increase of the relative proportion of processed wool • Establishment of bank guarantees for borrowers | <ul style="list-style-type: none"> • Transversal indicators • Increased domestic consumption of sheep meat • Increased domestic consumption of rabbit meat • Labeling of livestock products from Rwanda | <ul style="list-style-type: none"> • MINAGRI REPORTS • MINICOM REPORTS • RBS REPORTS <p>Rwandan products will gain market share as compared to foreign products</p> |

| | | | |
|--|--|--|--|
| <p>8. Increase access to regional and international markets</p> | <ul style="list-style-type: none"> • During the period 2012-2017 the livestock growth should be higher than the averages of the period 2005-2010 • Statistics regarding small animal exports • Exports growth rate during the period 2012 - 2017 • Exports growth rate during the period 2012 - 2017 | <ul style="list-style-type: none"> • MINAGRI REPORTS • MINICOM REPORTS | <p>Live animals and livestock products exports will have a major contribution to the trade balance</p> |
|--|--|--|--|

| ACTIVITIES | BUDGET | STARTING CONDITIONS |
|--|---|--|
| <p><u>Output 1: Operational and Investment plan for Genetic Improvement</u></p> <p>1.1. Capacity building for research scientists including animal scientists, (nutrition, animal health, genetics...)</p> <p>1.2. Contests of best breeders, annual livestock exhibition</p> <p>1.3. Training for small breeders</p> <p>1.4. Purchase of breeders: Sheep (Merinos)</p> <p>1.5. Purchase of breeders: Goat (Boer, Saanen, wool goats)</p> <p>1.6. Purchase of breeders: Pigs (Landrace, Large white)</p> <p>1.7. Purchase of breeders: Rabbit</p> | <p>9 191 000 000 RWF</p> <hr/> <p><u>3 386 000 000 RWF</u></p> <p>400 000 000</p> <p>250 000 000</p> <p>120 000 000</p> <p>250 000 000</p> <p>240 000 000</p> <p>40 000 000</p> | <ul style="list-style-type: none"> • <i>Harmonization of the 3 Action Plans: «Meat industry strategy»; «Small animal industry strategy» and «Poultry industry strategy»</i> • <i>Communication plan of the strategy with stakeholders, authorities and development partners which support 34% of the budget</i> • <i>Calls for expressions of interest to select the private investors, which support 52% of the budget</i> • <i>Deposit of the government counterpart (14%)</i> |

| | | |
|---|---------------------------------|--|
| (California, New Zealand) | 6 000 000 | |
| 1.8. Purchase of breeders: Poultry | 10 000 000 | |
| 1.9. Training of breeders specialists | 50 000 000 | |
| 1.10. Housing rehabilitation (Stations) | 1 000 000 000 | |
| 1.11. Scientific analyses and monitoring | | |
| 1.12. Health management of breeders | 600 000 000 | |
| 1.13. Follow-up Research | 70 000 000 | |
| | 350 000 000 | |
| <u>Output 2: Operational and Investment plan for Increasing Animal nutrition</u> | <u>1 150 000 000 RWF</u> | |
| 2.1.Recovery of animal feed factory in PPP (participation in the capital) | 500 000 000 | |
| 2.2.Capacity building for ruminants, poultry producers and pig fatteners | 150 000 000 | |
| 2.3.Mapping and quantification of fodder resources | 100 000 000 | |
| 2.4.Quantification of crop residues | | |
| 2.5.Determination of feeding values of feed resources | 100 000 000 | |
| 2.6.Research – development linkages to formulate rations matched with the feed resources locally available | 100 000 000 | |
| | 200 000 000 | |
| <u>Output 3: Operational and Investment plan for Animal Health</u> | <u>1 810 000 000 RWF</u> | |
| 3.1.Capacity building for the Veterinary Services (equipment) | 600 000 000 | |
| 3.2.Upgrading the laboratory of the veterinary services to level 3 | 400 000 000 | |
| 3.3.Prevention, control and eradication of animal diseases including zoonosis | 625 000 000 | |
| 3.4.Improvement of information system on animal diseases and | | |

- *Implementation of operational action plan through coaching (regular meetings, monitoring and evaluation, strategic dashboard). this component could be done in collaboration with a consultancy firm*

| | | |
|--|-------------------------------|--|
| zoonosis | 100 000 000 | |
| 3.5. New Animal health policy | | |
| 3.6. Annual report on the animal health status in Rwanda | 25 000 000 | |
| | 60 000 000 | |
| <u>Output 4: Operational and Investment plan for the skin sector</u> | <u>900 000 000 RWF</u> | |
| 4.1. Modernization of tanneries | | |
| 4.2. Training of skins processors (skills, grading, storage techniques) | 600 000 000 | |
| | 200 000 000 | |
| 4.3. Strengthening organizations of the skin sector | | |
| 4.4. Guidelines for skins processing effluent treatments and environmental standards | 50 000 000 | |
| | 50 000 000 | |
| <u>Output 5: Operational and Investment plan for value addition of goat milk production</u> | <u>800 000 000 RWF</u> | |
| 5.1. Technical assistance and technological equipment for cheese makers | 500 000 000 | |
| 5.2. Promoting labels for Rwandan cheese | 250 000 000 | |
| 5.3. Implement a federation of cheese makers | 50 000 000 | |
| <u>Output 6: Operational and Investment plan for valorization of wool sector</u> | <u>400 000 000 RWF</u> | |
| 6.1. Strengthening organizations of wool processors (Technical assistance and equipment) | 400 000 000 | |
| <u>Output 7: Operational and</u> | | |

| | | |
|---|-------------------------------|--|
| <u>Investment plan for filling the domestic market</u> | <u>220 000 000 RWF</u> | |
| 7.1 Establish a livestock statistic desk with real-time market information on livestock and livestock products | 50 000 000 | |
| 7.2 Train stakeholder's organizations in entrepreneurship | 100 000 000 | |
| 7.3 Organization of the market of livestock products | 100 000 000 | |
| 7.4 Strengthen the sanitary, phytosanitary and food safety system | 100 000 000 | |
| 7.5 Advertisement campaigns to fight food taboos and promote food security | 120 000 000 | |
| <u>Output 8: Operational and Investment plan for Increasing access to regional and international markets</u> | <u>375 000 000 RWF</u> | |
| 8.1. Advertisement Subsidize producer's costs of obtaining quality certifications | 360 000 000 | |
| 8.2. Harmonize quality standards of livestock products with the EAC region | 15 000 000 | |
| <u>Output 9: Transversal action: coaching of the Action Plan</u> | <u>150 000 000 RWF</u> | |

8 INVESTMENT IN LIVESTOCK; A WISE CHOICE FOR AFRICAN COUNTRIES

The implementation of the strategic and investment plan must involve three categories of stakeholders: government, private sector and partners of development: yet the major impetus must come from the government in relation to its goals of economic growth and poverty reduction. The World Bank has developed an instrument for measuring the impacts of public investments in livestock in economic growth of African countries.

8.1 Relationships between Livestock development and economic growth

The relevance of the implementation of livestock development projects in developing countries must be judged by their contribution in economy growth and poverty alleviation.

The World Bank World Development Report on Agriculture for Development (WDR) advocated in 2008 for a smallholder-based 'productivity revolution', particularly for staple food in agriculture based countries of sub-Saharan Africa.

A test of the causal relationship between growth in livestock sector productivity and per capita GDP in a sample of 18 African countries shows that increases in livestock sector productivity tended to precede growth in per capita GDP in the majority (16/18) of sample countries, many of which are agricultural -based.

The test was developed by the Pro-Poor Livestock Policy Initiative (PPLPI), launched in 2001 by the Animal Production and Health Division of the FAO.

- *The hypothesis:* a wide array of economic literature has documented that increased agricultural productivity triggers economic growth and poverty alleviation in developing countries (Datt and Ravallion, 1998; Gallup et al., 1997; Irz et al., 2001; Winters et al., 1997). Given the share of livestock value-added in agriculture increases as economic development progresses, up to over 50 percent in most industrialized countries, the PPLPI research group hypothesized that increases in livestock productivity act as a stimulus of economic growth on their own right.
- *The methodology:* Drawing on the World Bank's World Development Indicators Database (World Bank, 2007) and FAO's Internal Statistical Database (FAO, 2007), a panel dataset spanning the period 1961 to 2003 for a total of 18 African countries was assembled. Per capita GDP (constant 2000 US\$) is taken as an indicator of level of development as well as of the demand for animal food; livestock productivity (constant 2000 US\$) is measured by value added per tropical livestock unit (TLU).

To trace the causality between GDP growth and livestock productivity Granger causality test (1969) was used and the methodology developed by Toda and Yamamoto (1995) applied (See Appendix 1).

- *The results:* The following table summarizes the empirical results for the African countries in which a significant relationship (at 5 percent level) was found between GDP growth and livestock productivity growth.

Table 19: Countries exhibiting causality between growth of livestock productivity (VA) and growth in per capita GDP

| Country | Livestock VA \Rightarrow GDP | | GDP \Rightarrow Livestock VA | |
|-----------------------|--------------------------------|-------|--------------------------------|-------|
| | Stat. | Prob. | Stat. | Prob. |
| Burundi** | 9.48 | 0.01 | 22.31 | 0.00 |
| Central African Rep.* | 4.56 | 0.03 | 1.62 | 0.20 |
| Congo DRep.* | 53.13 | 0.00 | 1.76 | 0.62 |
| Congo rep.* | 4.06 | 0.04 | 1.12 | 0.29 |
| Gambia* | 13.09 | 0.00 | 3.08 | 0.21 |
| Guinea Bissau* | 39.88 | 0.00 | 1.10 | 0.58 |
| Ghana* | 15.14 | 0.00 | 2.57 | 0.28 |
| Kenya* | 8.90 | 0.01 | 1.63 | 0.44 |
| Lesotho* | 9.21 | 0.01 | 0.59 | 0.74 |
| Madagascar* | 7.22 | 0.03 | 1.87 | 0.39 |
| Malawi** | 41.39 | 0.00 | 9.63 | 0.01 |
| Niger* | 40.54 | 0.00 | 12.77 | 0.00 |
| Nigeria** | 21.13 | 0.00 | 7.64 | 0.02 |
| Senegal* | 8.83 | 0.00 | 0.67 | 0.41 |
| South Africa** | 8.25 | 0.02 | 6.85 | 0.03 |
| Sudan* | 18.71 | 0.00 | 1.04 | 0.6 |
| Togo*** | 0.43 | 0.51 | 4.22 | 0.04 |
| Zambia*** | 0.99 | 0.61 | 6.20 | 0.05 |

* Countries exhibiting causality from growth of livestock productivity to growth in per capita GDP; ** countries exhibiting bi-directional causality; *** countries exhibiting causality from growth in per capita GDP to growth in livestock productivity

In 16 of the 18 countries analyzed, that is in almost 90 percent of the sample, a statistically significant causal relationship was found between livestock sector development and economic growth. Almost all these countries are agricultural-based. In 16 of the 18 countries in which a statistically significant relationship was found, livestock sector development appears to be / have been a driver of per capita GDP growth; in four of these countries a bi-directional causality was also found. Only in two countries (Togo, Zambia), increases in livestock sector productivity appear

to be / have been driven by per capita GDP growth.

8.2 Findings and policy implications

The finding that increases in livestock sector productivity are associated with economic growth in 16 of the 18 countries in which a statistically significant relationship was found appears plausible. There is a large body of economic literature which shows that increased agricultural productivity is anticipated to lead to lower food prices that directly benefit the poor and also generate a surplus of products and factors that can be exported from agriculture to the rest of the economy, thereby facilitating economic growth and poverty alleviation. Historical evidence largely supports this hypothesis. First, globally prices for agricultural products, including those of livestock products, have declined by about 0.5 to 0.7 percent per year relative to those of other goods since 1900 (Mundlak, 1990), though some major increases have been recorded in the last years. Second, a number of studies have empirically documented that agricultural growth supports broad-based economic growth. Timmer (2002) finds that over the period 1960 to 1985 in a sample of 65 developing countries past growth in agricultural GDP has a significant impact on current non-agricultural sector growth; Bravo-Ortega and Lederman (2005) replicate the analysis by Timmer for the 1960 to 2000 period and obtain similar results, although they find some heterogeneity across regions. For instance, in the case of Latin America, the impact appears weaker than in the case of other developing regions, such as in our results. They also find a significant impact of non-agricultural growth rates on agricultural growth, which suggests that the causality can run both ways. Tiffin and Irz (2006) test for the direction of causality between agricultural value-added per worker and gross domestic product in 85 countries and conclude that agricultural value-added is the 'causal' variable in the majority of developing countries, such as our results suggest too.

Overall, PPLPI findings indicate that the orthodox paradigm of increased agricultural productivity being a driver of economic growth in developing countries also applies to the livestock sector on its own right, possibly because of the increased contribution to the sector in agricultural value added along the process of economic development. The implications of these findings are that the WDR's vision of the livestock sector as primarily driven by exogenous demand factors can be misleading in terms of policy conclusions. Whereas some priority should certainly be given to policies which allow smallholders to profitably sell meat and milk in high-value markets, policies which address the fundamental constraints to livestock sector development, such as for instance inadequate access to forage, water and basic animal health services appear equally relevant.

In others words, the productivity revolution the WDR envisages for smallholder farmers should not

only include basic staples but also livestock products, which are not only high-value products for better-off consumers but also basic food items for many rural communities in developing countries.

8.3 Appendix

Granger (1969) defined a simple concept of causality by which a cause has to precede the effect: if per capita GDP growth affects productivity in the livestock sector, knowledge of the former should improve predictions of the latter (or vice versa). To avoid issues related to non-stationarity and co-integration, we apply the methodology developed by Toda and Yamamoto (1995) who showed that, irrespective of whether the variables involved are stationary or not and regardless of the existence of a co-integrating relationship among them, tests for Granger non-causality can be performed by estimating a Vector Autoregression Model VAR($p + d_{max}$), where p is the optimal lag length in the original VAR system and d_{max} is the maximum order of unit roots in the variables of the model. The following VAR model are estimated:

$$gdp_t = \alpha_{11} gdp_{t-1} + \dots + \alpha_{1d} gdp_{t-d} + \beta_{11} live_{t-1} + \dots + \beta_{1d} live_{t-d} + \varepsilon_{1t} \quad (1)$$

$live_t = \alpha_{21} live_{t-1} + \dots + \alpha_{2d} live_{t-d} + \beta_{21} gdp_{t-1} + \dots + \beta_{2d} gdp_{t-d} + \varepsilon_{2t} \quad (2)$ Where gdp_t is per capita GDP in year t ; $live_t$ is livestock value added per TLU in year t ; $d = p + d_{max}$ is the number of time lags included in the model; ε_t is the error term. The Granger non-causality test is a modified Wald test on the parameters of the true VAR (p) model, i.e. it involves testing $\beta_{i1} = \beta_{i2} = \dots = \beta_{ip} = 0$ for each equation with the remaining d_{max} parameters regarded as zeros. This test has an asymptotic χ^2 distribution when the augmented VAR ($p + d_{max}$) is estimated. Estimating the above VAR requires three steps. First, Augmented Dickey Fuller (ADF) tests was used with trends to determine the number of units roots for both GDP and livestock productivity in the sample countries. The Schwarz Information Criterion (SIC) is used to determine the lag structures in the ADF tests. Second, the Akaike's Final Prediction Error (FPE) criterion was used to select the optimal lag length in the VAR models for each sample country. Finally, Seemingly Unrelated Regressions (SUR) are used to estimate the VAR systems and perform the modified Wald tests on the relevant coefficients, as these tests experience efficiency improvement when SUR models are used in the estimation (Rambaldi and Doran, 1996). The null hypotheses are tested at the 5 percent significance level.

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ANNEX

Table 20: Meetings with stakeholders

| LOCATION | STAKEHOLDERS | FUNCTION |
|---|---|--|
| MINAGRI | Dr Theogene RUTAGWENDA, PhD | Director General of Animal Resources |
| MINAGRI | Raphael RURANGWA | Director General of Planning & Programme coordination |
| MINAGRI | Didace RUSHIGAJIKI | Professional in charge of Poultry & Pigs |
| RWANDA AGRICULTURE BOARD | Dr Alphonse NSHIMIYIMANA | Animal Production RAB |
| PROGRAMME D'APPUI AU PETIT ÉLEVAGE (APEL) | Luc de Bruyne Dr Fabrice NDAYISENGA | Director APEL Coordinator Small Stock Program RAB & Director of Operations APEL Program |
| NGOMA DISTRICT | Xaverine UWIMANA Innocent KARURANGA | Entreprise development coordinator, Heifer International Goat milk farmer, Maître fromager (Les Caves de l'Abondance) |
| KICURIKO | M.Claire INGABIRE Maurice MWIZERWA | Technicians SATRA Coop Slaughterhouse |
| NYABUGOGO | Peace MUKESHIMANA | Technician SABAN Coop Slaughterhouse |
| RWANDA DEVELOPMENT BOARD (RDB) | Clare AKAMANZI | Chief Operating Officer |
| DIRECTION VETERINARY SERVICES | Dr David KIIRA Dr Otto Vianney MUHINDA | Virology specialist Director of Veterinary Services |
| KICURIKO | Dominique GAKWAYA | Pig farmer |
| BISAGARA | Naphtali NSHOGOZABAHIZI | Goat meat farmer |
| MINAGRI | Felix NYIRISHEMA Dr Vincent NIYIRAGIRA | Cattle Development MINAGRI Veterinary inspection ARE/RAB |
| BUSOGO | P. Céleste NIYIBIZI Thomas BISHIZEHAGABI | President COODERU Busogo President Association des exportateurs de laine UMUZABIBU W'UKURI |
| MUHOZA | Jean-de-Dieu MANIRAKIZA | Poultry farmer |
| KIGALI | Jean-Claude RUZIBIZA Oleg STENBOCK | Managing Director RWANDA BEST, Poultry farmer |

| LOCATION | STAKEHOLDERS | FUNCTION |
|---|---|---|
| | | Director RWANDACHICK Ltd, Poultry farmer |
| RWANDA BUREAU OF STANDARDS (RBS) | Prisca MUKARUMONGI Angeline WIBABARA Yves Severin RWIGIMBA Eric NIGABA | Librarian RBS Librarian RBS Certification Bureau Market Surveillance |
| ISAR (INSTITUT DES SCIENCES AGRONOMIQUES DU RWANDA) | Dr Théogène SAFARI Jules MUTABAZI | Veterinary ISAR Zootechnician ISAR |
| MINICOM | Gaudence MUKAMURENZI | A.g Director International trade Department |
| MINAGRI | Peter Clever NKUNDABAGENZI | Budget officer/MINAGRI |
| KICURIKO | Athanase KARAMBIZI | Rabbit Producer |
| KICURIKO | Immaculée MUHAVE Donatha NIYOYITA | CODEPAE (Coopérative de Développement Intégré pour l'Auto-Promotion Economique) |
| RWANDA AGRICULTURAL BOARD (RAB) | Dr Joy NDUHURA MUHUMUZA | Small Stock Program |
| KIGALI | Anton VAN ENGELEN | Consultant in charge of genetic improvement |