The Czech University of Life Sciences Prague

Institute of Tropics and Subtropics

Market analysis of plant production suitable for feeding ration composition for poultry (Angola)

Thesis Supervisor: Ing. Petra Holíková Ph.D.

Magdalena Výborná

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Statement

I affirm that this M.Sc. thesis Market analysis of plant production suitable for feeding ration composition for poultry (Angola) is my work and there were used only sources that are enumerated in the part of reference.

Prague 28.4. 2008 ……..

Magdalena Výborná

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Abstract

Thesis refers to situation of availability and quality of crop production intended for poultry feeding on agricultural markets in province Bié. The main objectives of thesis were to describe and provide analysis of current situation of agricultural crops that are suitable for poultry feeding and provide laboratory analysis of nutrition quality of selected crop samples. Because of this analysis was possible to destine quality of selected samples and evaluate if quality of feed is one of the factors that unfavorably affect improvement of poultry production in province Bié. Selected method to get the information about agricultural markets was used so-called data collection method by means of structuralized questionnaires. Questionnaires were intended for small holders on agricultural markets. Qualitative analysis was provided in the Research Institute of Alimentation of Livestock in Uhříněves. Poultry production is integral part of agricultural activity of small holders in province Bié. Improvement of poultry production can effectively contribute to ensuring food security in whole Angola.

Key words: Poultry production, small holders, Angola, Bié province, food security

Abstrakt

Diplomova práce se zabývá dostupností a kvalitou rostlinné produkce určené jako krmivo pro drůbež, na trzích v provincii Bié. Hlavními cíly této práce bylo popsat a zanalyzovat současný stav rostlinné produkce, která je vhodná k sestavení krmné dávky pro drůbež na místních zemědělských trzích, a dále vypracovat laboratorní rozbor nutričních hodnot z vybraných rostlinných vzorků. Na základě tohoto rozboru bylo možné určit kvalitu plodin a zhodnotit, zda kvalita krmiva je jedním z faktorů negativně ovlivňujících rozvoj produkce drůbeže v provincii Bié. Vybranou metodou k získaní informací o zemědělských trzích byla tzv. metoda kvantitativní analýzy realizována pomocí strukturovaných dotazníků, které byly určeny pro farmáře obchodujících na těchto tržištích. Kvalitativní analýza byla provedena v Ústavu Živočišné Výroby v Uhříněvsi. Chov drůbeže je nedílnou součástí zemědělských aktivit farmářů v této provincii a jeho rozvoj může velmi efektivně přispět k zajištění potravinové bezpečnosti země.

Klíčová slova: Produkce drůbeže, farmáři, Angola, provincie Bié, potravinová bezpečnost

Abbreviations

AGOA	African Growth and Opportunity Act
CARE	Christian Action Research and Education
CEAB	Centre of Agricultural Education in Bié Province
CFC	The Common Fund for Commodities
CIA	Central Intelligence Agency
COMESA	Common Market for Eastern and Southern Africa
CPLP	The community of Portuguese Language Countries
CTA	Technical Centre for Agricultural and Rural Cooperation
FAO	Food and Agricultural Organization
FNLA	National Front for the Liberation of Angola
FP	Family Poultry
IBRD	International Bank for Reconstruction and Development
ICO	International Coffee Organization
ICCAT	International Convention of the Conservation of Atlantic Tunas
IFAD	International Fund for Agricultural Development
IMF	International Monetary Found
LIFDC	low income, food-deficient countries
MINADER	Ministério da Agricultura e Desenvolvimento Rural (Ministry of Agriculture and Rural Development)
MPLA	Popular Movement for the Liberation of Angola
SADC	Southern African Development Community
SEAFO	South East Atlantic Fisheries Organization
SFRB	Scavengeable Feed Resource Base
UNDP	United Nation Development Programme
UNIDO	United Nation Industrial Development Organization
UNITA	National Union for the Total Independence of Angola
VUZV	Výzkumný Ústav Živočišné Výroby
WB	World Bank
WFP	World Food Program
WTO	World Trade Organization

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Content

1. Introduction

Angola is slowly rebuilding its country after the end of a 27-year civil war in 2002. Angola has consistently run a large trade surplus due to the growing sales of crude oil (which accounts for about 90 percent of total export earnings) and diamonds. From 2001 to 2005, oil export revenue increased five times as a consequence of rising international oil prices. Although agriculture accounts only for about 8 percent of Angola's GDP, it is the main source of employment in the country. Prior to independence (1975), food production was high and the country was a major exporter of maize and coffee. During the years of conflict, agriculture fell to an almost subsistence level in many areas, with little or no marketable surpluses and very limited trade activity.

Poultry play an important role in the production system of Angolan smallholders. Poultry production in Angola is a traditional domestic activity practiced mainly by women and children. The peasants are mainly crop-producers, but many keep cattle or pigs, and almost all households keep poultry, mostly chicken.
After Angolan independence, commercial poultry production was given special attention. The central body of the Ministry of Agriculture practiced it in big State-owned institutions that were supervised until the start of privatization in 1988.

The topic of this thesis is related with poultry production in Angola. The results of the survey are based on author personal experience from Angola during field research, which was made in the frame of the Czech development projects: The Centre of Agricultural Education in Bié province (Angola), and the project The Consultancy in fish and poultry production(Angola) Survey was done from July to September 2007 in Kuito, capital city of province Bié.

2. Objectives

Poultry production in Angola was a traditional domestic activity before long term civil war. In Angola are many governmental and non-governmental organizations that try to restore original conditions of agricultural sector. Poultry production in developing countries has many advantages. It is a good source of nutrition and marketing of poultry products is one of the few opportunities for poor rural households to generate cash income.

Poultry production is still fighting with many difficulties in developing countries especially in Angola. There are several factors that influence whether directly or indirectly development of poultry production. Lack of vaccination against Newcastle disease, poor conditions of hygiene and non-existent application of appropriate preventive health measures are still problematic issues. Deficiency of knowledge, poor accessibility and high prices of crops suitable for poultry feed on agricultural markets, are also some of them.

The main objective of the thesis is to evaluate quality of agricultural crops suitable for poultry feeding on agricultural market in Bié province.

The specific objectives of the study are:

- Identify crops suitable for poultry feeding on agricultural markets in Bié province
- Compare prices of crops on agricultural markets
- Describe and evaluate conditions and processing of crop production for poultry breeding
- Provide qualitative analysis of selected samples of crops suitable for poultry breeding

The hypothesis is that quality of agricultural crops suitable for poultry feeding on agricultural markets is low and can unfavorably affect poultry production.

The conclusions and recommendations could help to find new solutions and improvement of poultry production in Angola and consequential improvement of food security in this region.

Results of the analysis will be available for local smallholders, local government and development projects that are presently running in the frame of the Czech Official Development Assistance in Angola.

3. Methodology

3.1. Methods of data collection

The analyses in the thesis are based on three core elements. The secondary data were studied from available publications related with similar topic and the list of references is available in the thesis. The primary data are based on survey in field, which took place in Angola, province Bié. The Czech University of Life Sciences Prague, especially Institute of Tropics and Subtropics is realizing development project *Consultancy in Fish and Poultry production* in Angola, province Bié and development project *Centre of agriculture education in Bié province* in the frame of the Czech Official Development Assistance. The Ministry of Agriculture of the Czech Republic finances the project. This project is aimed on improvement of fish and poultry production in Angola.

My diploma thesis research methods can be divided into the two main phases:

1. Quantitative survey of crops suitable for poultry feeding and
2. Qualitative analysis of selected grain samples of crops suitable for poultry feeding

Quantitative research is a formal, objective, systematic process in which numerical data are utilized to obtain information about the current survey. Quantitative research is research involving the use of structured questions where the response options have been predetermined and a large number of respondents are involved. Perhaps the most common quantitative technique is the 'market research survey'. These are basically projects that involve the collection of data from multiple cases – such as consumers or a set of products. The method used in this research was personnel interview and completing of specialized questionnaires. The questionnaire is one of the more common tools for collecting data from a survey.

Qualitative analysis of selected grain samples plays an important role in improvement of poultry production.

3.2. Agricultural market survey

The survey was conducted during my staying in province Bié especially in the capital city Kuito, from 2.7. – 30.8. 2007. The survey was provided by questionnaires intended for small holders on agricultural markets. Research took place on three main agricultural markets in Kuito. Which are Chissindo, Catemo and Pedro. The research contained also personal interviews.
The primary aim for the sample was to achieve overview in each of the priority areas. The survey achieved 62 competent respondents that were willing to cooperate during the visiting markets. 15 respondents did not want to participate on the survey.

On survey, I cooperated with students and engineers from CEAB (Centre of Agriculture Education, province Bié). Small holders have used mainly local language Umbundo. They have small knowledge of Portuguese. Students were essential part for my survey because of their knowledge of local conditions and well knowledge of local language. Students were from course of extension. Leadership of course of extension was Msc. Hynek Ciboch (project team of CEAB). I worked with twelve students from 12 Th class and with 22 students from 9 th, 10 th and 11 th classes.

Group of twelve students made a research on the largest agricultural market Chissindo. There was reached 21 respondents. The second group was divided to two smaller groups. The first made a research on agricultural market Pedro. There was reached 25 respondents. The second smaller group made a research on agricultural market Catemo. There was reached 16 respondents.

Structure of questionnaires:

First part

This part contained two types of questions. The first one was only about the crops that we can find on agricultural markets. This part especially finds out spectrum of agriculture commodities on market places in Kuito. In the second question, we asked about the market prices of maize, manioc, peanuts, rice, bean, soya bean and potatoes. This survey was used for possibility of comparing with other survey from year 2004-2005 provided by CARE (CARE, 2005) and survey from year 2006 provided by FAO (FAO, 2006). This part is elaborate in detail in the part results and discussion.

Second part

Questions were designed especially for small holders.

1. Question: *What is an origin of your products?*

This question should find out origin of products on agriculture markets. By following questions used in the survey is possible to recognize how many respondents have own production on agricultural markets, how many respondents buy products in different towns or use other sources.

2. Question: *Do you have your own storehouse?*

Use of this question is for analysis of storage conditions. Storage conditions and processing of products have important influence on quality of crops.

3. Question: *What is the distance from your house to agricultural market?*

Bad and destroyed infrastructure has an influence on market access of small holders. Because of low markets frequency, many of small holders have to do long way to markets every day.

4. Question: *What type of transport do you usually use?*

This question was used for define what methods small holders use to get to the market.

Special part of Questionnaires

We designed a special part of questionnaire with students from course of extensionism. This part is for their practice in valuating quality of agricultural products. Based on knowledge, students should evaluate a quality of products. They valued size, color, aroma and spoil of specified crop seeds. We created a scale of notation. Type A was high quality, type B was a middle quality and type C was pure quality. This part of the questionnaire is based only on subjective classification. This type of survey was new experience for students and they had many difficulties to manage it.

3.3. Nutritional analysis of selected agricultural crops (Maize, Millet, Soya been and Bean)

This part of research is for specification quality of selected samples. This survey provided VUZV (The Research Institute of Alimentation of Livestock) in Uhříněves. Analysis was provided from five samples. There have been two samples from different kind of maize and one sample of millet, beans and soya beans. Selected samples were collected only on agricultural markets in Kuito. Samples of maize are from small holders from province Bié. Origin of sample of Millet is on demonstration school farm. Soya bean was imported to Bié from other province in Angola.

Methods used for analyze of particular elements:

- **Dry matter (DM)**

Determination of DM in feed is important to insure that animals are receiving the proper amount of nutrients through their diet. Determining the DM content of feed provides a measure of the amount of a particular feed that is required to supply a set amount of nutrients to the animal. Increases or decreases in feed DM content result in over or under feeding of nutrients. Methods for providing dry matter use residue of forage. Preliminary dried sample of fodder is parching in 103˚C

- **Crude protein**

Unlike animals, plants make proteins from minerals, such as nitrates that they absorb from the soil and carbohydrate produced in photosynthesis. Therefore, it is plants that make the protein those animals need to have in their diet.

Kjeldahl method is in analytical chemistry, procedure widely used for estimating the nitrogen content of foodstuffs, fertilizers, and other substances, invented in 1883 by a Danish chemist, Johan G.C.T. Kjeldahl. The method consists essentially of transforming all nitrogen in a weighed sample into ammonium sulfate by digestion with sulfuric acid, alkalizing the solution, and determining.

- **Crude fibre**

Crude fiber is indigestible part of foods.

Crude fiber by Henneberg-Stohman method using 1.25% H2SO4 and 1, 25% KOH. Defined as the residue left after successive extraction under closely specified conditions with petroleum ether, 1.25% sulphuric acid, and 1.25% sodium hydroxide, minus ash.

- **Ash**

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food.

The most widely used methods are based on the fact that minerals are not destroyed by heating, and that they have a low volatility compared to other food components. Crude ash is make up by burning the feed in a furnace at 550-650˚C

(Zeman, al., 1995)

4. Poultry in developing countries and markets with crops for their feeding

4.1 Livestock in developing countries

Livestock production constitutes an important component of the agricultural economy of developing countries, a contribution that goes beyond direct food production and includes multipurpose products and uses, such as skins, feathers, fiber, manure for fertilizer and fuel, power and transportation, as well as a means of capital accumulation and as a barter product in societies where there is no circulation of currency. Furthermore, they are closely linked to the religious and socio-cultural lives of several million resource-poor farmers for whom animal ownership ensures varying degrees of sustainable farming and economic stability.
(Maker, 1996)

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 continues to be unused, undeveloped or poorly utilized. A critical factor in this regard has been the lack of proper understanding of the nutritional principles underlying their utilization. (FAO/IAEA, 2004)

***Fig. 1.** Human and livestock population statistics 1960 and 1990 (millions)*

	Humans	Large ruminants	Small ruminants	Pigs	Poultry
	1960 – 1990 (% increase)				
World	3074-5389 (+75)	1035-1434 (+36)	1365-1808 (+32)	406-856 (+111)	3922-10770 (+175)
Developed countries	977-1251 (+28)	343-404 (+18)	573-591 (+3)	235-341 (+45)	2274-4465 (+96)
Developing countries	2097-4138 (+97)	692-1029 (+49)	792-1217 (+54)	171-515 (+201)	1648-6305 (+283)

Source: Branckaert & Guéye, 2000

In developing countries, family poultry represent an appropriate system to feed the fast growing human population and to provide income to poor small farmers, especially women. It makes one of the best uses of locally available resources. Although requiring low resource inputs and generally considered secondary to other agricultural activities by smallholder farmers, this type of production has an important contribution in supplying local populations with additional income and high quality protein. Family poultry are also valued in religious and socio-cultural lives. However, high mortality, mainly due to Newcastle disease, especially in growers, constitutes one of the greatest constraints on development. Other problems are related to breeding, feeding and marketing. (CTA, 1990)

4.1.1. Socio – economic importance of poultry in developing countries

Family poultry which is mainly used in developing countries is rarely the sole means of livelihood for the family but is one of a number of integrated and complementary farming activities contributing to the overall well-being of the household. Poultry provide a major income-generating activity from the sale of birds and eggs. Occasional consumption provides a valuable source of protein in the diet. Poultry also play an important socio-cultural role in many societies. Poultry keeps using family labor, and women (who often own as well as look after the family flock) are major beneficiaries. (Bessei, 1989)

For smallholder farmers in developing countries (especially in low income, food-deficient countries [LIFDC]), family poultry represents one of the few opportunities for saving, investment and security against risk. In some of these countries, family poultry accounts for approximately 90 percent of the total poultry production (Branckaert, 1999). Poultry are the smallest livestock investment a village household can make. Yet the poverty-stricken farmer needs credit assistance even to manage this first investment step on the ladder out of poverty. Poultry keeping is traditionally the role of women in many developing countries. (Tadelle *et al.,* 2000)

Over the last decade, the consumption of poultry products in developing countries has grown by 5.8 percent per annum, faster than that of human population growth, and has

created a great increase in demand. Family poultry has the potential to satisfy at least part of this demand through increased productivity and reduced wastage and losses, yet still represent essentially low-input production systems. If production from family poultry is to remain sustainable, it must continue to emphasize the use of family labor, adapted breeds and better management of stock health and local feed resources.

Socio - cultural constraints to development

Socio-cultural factors contribute to the wide variety of response of livestock keepers even under identical economic conditions. Many socio-cultural factors affect livestock production. One of the major constraints to poultry production is the high value placed upon crop production rather than livestock production. This affects the willingness to put much time, expense and effort into livestock production. Theft is also a great constraint. Villagers who have lost all their poultry to theft may be reluctant to face the expense of starting again. Another constraint is the social norm that determines ownership of livestock. Typically, where crop farming is the men's main activity, keeping livestock is perceived as a peripheral activity relegated to women and children. However, when the number of livestock increases, men usually take over the activity.

It should not be assumed that socio-cultural factors could be changed. However, by incorporating socio-cultural factors into development strategies, the programms and technologies may encounter less resistance. Development programs, which combine local knowledge with western science, yield strategies that are culturally more acceptable. Socio-cultural factors are thus not seen as a problem, but rather as a factor to be considered or used in finding a solution (Olawoye and di Domenico, 1990).

4.2 Poultry production in developing countries

4.2.1. Production systems

Family poultry are kept under a wide range of conditions, which can be classified into one of four broad production systems (Bessei, 1987):

- free-range extensive;
- backyard extensive;
- semi-intensive; and
- Intensive.

In developing countries are most used free – range extensive systems and backyard extensive systems. Semi – intensive and intensive systems are mostly used in urban and peri - urban areas and in large – scales commercial enterprises. For this diploma thesis are most important first two systems.

In Africa, Asia and Latin America, 80 percent of farmers keep poultry in the first two extensive systems. Under free-range conditions, the birds are not confined and can scavenge for food over a wide area. Rudimentary shelters may be provided, and these may or may not be used. The birds may roost outside, usually in trees, and nest in the bush. The flock contains birds of different species and varying ages. Backyard Extensive Systems means that poultry are housed at night but allowed free-range during the day. They are usually fed a handful of grain in the morning and evening to supplement scavenging. (Sonaiya, 1990)

In many developing countries, poultry production is based mainly on traditional extensive poultry production systems (Branckaert, 1996). All over the developing world, these low input/low output husbandry systems have been a traditional component of small farms for centuries and are assumed to continue for the foreseeable future. For example, it has been estimated that 80 percent of the poultry population is found in traditional family based poultry production systems, which contribute up to 90 percent of poultry products in some countries. Approximately 20 percent of the protein consumed in developing countries originates from poultry (i.e. meat and eggs). Yet, despite the importance of family poultry, relatively few field programs have been initiated to improve the output. Over the last decade, poultry population has grown

spectacularly throughout the world: 23 percent in developed and 76 percent in developing countries, respectively. (Branckaert & Guéye, 2000)

If land is arable, and production from it is sustainable, it should be used to produce food for people. The products of land suitable neither for cultivation nor for tree crops, and the byproducts of crop production and processing, are then available for animal production for the benefit of the human population, including nutrition. Ruminants can utilize all animal feeds, but monogastric species such as poultry and pigs utilize some feeds more efficiently. The monogastrics do not make efficient use of high fiber diets, or diets that are low in essential amino acids and vitamins. Whereas ruminants can handle a large bulk of fibrous feed, and the organisms in the rumen break down some of the fiber as well as producing the essential amino acids and some vitamins. In some circumstances, ruminants utilize high quality feed as a supplement to roughage as efficiently as for the production of meat and/or eggs by monogastrics (Preston & Leng, 1987).

Superficially, the rational distribution of animal feed resources seems obvious; but in practice, the choice may not be clear-cut. There are cultural aversions to some species, the need for draught power may make large ruminants essential, and the preferences and purchasing power of consumers will influence production. Moreover, for the poorer families, trading of livestock and their products is often driven by family need and social obligations, rather than by market forces. (Roberts, 2000)

4.2.2. Feeding of poultry in developing countries

The size and productivity of the village flock ultimately depend on the human population and its household waste and crop residues, and on the availability of other scavengable feed resources. Gunaratne *et al.* (1993; 1994), Roberts and Senaratne (1992), Roberts *et al.* (1994) and Roberts (1999) have researched and classified the feed resources available for scavenging poultry in Southeast Asia, which they named the Scavengeable Feed Resource Base (SFRB). The SFRB was defined as the total amount of food products available to all scavenging animals in a given area and we can apply that for others developing countries.

It depends on the number of households, the types of food crops grown and their crop cultivating and crop processing methods, as well as on the climatic conditions that determine the rate of decomposition of the food products. Seasonal fluctuations in the SFRB occur due to periods of fallow or flooding, cultivation, harvesting and processing. The SFRB includes termites, snails, worms, insects, and grain from sowing, harvesting by-products, seeds, grass, fodder tree leaves, water-plants and non-traditional feed materials. Several types of poultry scavenging can make together more effective use of this resource.

Feed resources:

1. Household waste
2. Materials from the environment including:
    1. metazoans such as worms, snails and insects. There is a conception that the village environment is a cornucopia of high quality feed - worms, snails, insects, green pick and seeds. In fact a village with a significant chicken population is stripped bare, an observation which is loudly endorsed by folk who do not keep chickens; but who wish to keep a kitchen garden.
    2. grain products from cultivating, harvesting and processing
    3. green pick
    4. seeds
3. Cultivated and wild fodder materials: *grasses, herbs, and fodder trees - grazed*
4. Nontraditional feed materials.

(J.A.Roberts, 2000)

4.2.3. Crops suitable for poultry feeding

Following crops are staple used in central Africa for poultry feed ratio and are instantly accessible on traditional market with agricultural products.

Cereals and cereals by – products

- ***Rice grain***

  This can be used with vegetable and animal protein supplements for all types of poultry. Rough or paddy rice, off-colored rice and broken rice have been used up to 20 to 30 percent in poultry rations. It is rich in phosphorus and B vitamins. Because

of its high oil content, (14 to 18 percent) it easily goes rancid. For this reason, it should make up no more than 25 percent of the ration. This also applies to rice polishing. Rice bran usually includes rice polishing, but often adulterated with rice hulls/husks, which are very high in fiber and silicon, and have a low nutritive value. Nevertheless, rice bran is still an important feed resource.

- ***Maize starch residue***

This is a by-product of the extraction of starch from fermented, wet-milled maize, which is used as a breakfast cereal in West Africa. It usually has more than 16 percent Crude Protein, although the amount varies according to the maize variety and processing method.

Legumes and legumes by - products

- ***Soybean (Glycine max)***

This crop is being grown increasingly for human consumption. If the cotyledons (fleshy beans) are used for human food, the testa (bean-seed coat) is given to poultry. Raw soybeans heat-treated by boiling for 30 minutes and then fed to scavenging birds in amounts of up to 35 percent of the ration resulted in satisfactory performance in broilers and laying hens.

Roots and tubers

- ***Cassava (Manihot esculenta)***

This is grown in large quantities in Africa, Asia and Latin America, both for human consumption and as a livestock feed. Cassava and its by-products (in the form of leaves, small tubers, pulp, peels, chaff, *gari* [fermented grated tubers], *gari* sieving, whole fermented roots and ensiled cassava meal) are used. The dried chips are high in energy and fiber but low in protein. In regions where cassava is used for human food, the peels are the most useful part of the cassava plant for feeding livestock. Amounts of 20 to 45 percent cassava peel meal (CPM) have been fed to chickens, but its use is limited because of the high content of the poison hydrogen cyanide (HCN), as well as high Crude Fibre, low protein content and dust.

- ***Sweet potato (Ipomoea batatas)***

  Dried sweet potato forming up to 35 percent of the ration has been fed successfully to ayes. The tubers are boiled before use, which overcomes any problems with dust or fungal growth from storage. (Haan, 1992)

In different regions, the importance of these feed resources for family poultry depends on their availability in sufficient quantities for farm use, simple preparation and processing methods, knowledge of the potential nutritive values and (for comparison) the price and availability of conventional commercial feeds. (Haan, 1992)

4.3. Market with poultry products in developing countries

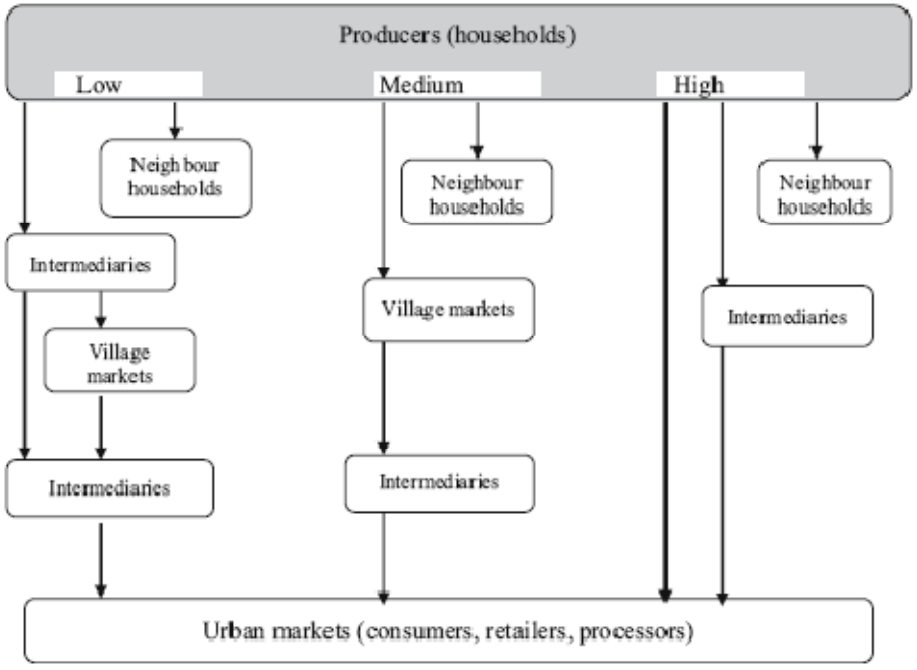
Poultry products in most developing countries, especially in Africa, are still expensive. The marketing system is generally informal and poorly developed. Unlike eggs and meat from commercial hybrid birds (derived from imported stock), local consumers generally prefer those from indigenous stocks. The existence of a local market offering good sales opportunities and adequate transport facilities are obvious prerequisites for family poultry development. As most consumers with greater purchasing power live in and around cities, intensification of poultry production should be initiated in peri-urban areas or, at least, in areas having a good road network (Branckaert *et al.,* 2000).

Economic restructuring has brought about economic difficulties. This is shown by the low budget distributed to the agricultural sector, which contributes to a lack of human and material resources. Thus, stockbreeders and village farmers must share in the costs of preventive services, especially vaccines and laboratory analysis. Changes are needed in the structure of livestock, veterinary and extension services, and farming organizations. Therefore, rural areas must change to strategies worked out many years ago for the semi industrial and industrial poultry sectors. Of course, the introduction of new measures must be done gradually. (Sauer, 1987)

Traditional dealers and intermediaries, who collect eggs and birds from the villages, facilitate the marketing of FP products in most developing countries. Such traditional marketing structures are often overlooked, bypassed or criticized. There has been a regrettable tendency in some countries to use government extension services or

parastatals to market family poultry products. This practice should be discouraged, as it is not sustainable. (WFP, 2005)

Fig.2. ***Poultry marketing channels in locations representing low, medium and high market access in developing countries***



Source: Aklilu, 2007

5. Angola

5.1. Geography of Angola

Angola is located in southern Africa. With 4,837 Km long borderline, Angola is bordered with Congo-Brazzaville at the Northern province of Cabinda, the Democratic Republic of Congo (former Zaire) to the North and East, Zambia to the East, and Namibia to the South. Angola has a total area of 1,246,700 square kilometers (481,351 square miles). It has a coastline of 1,610 kilometers (1,000 miles) on the South Atlantic Ocean. The country's major ports include Luanda, Lobito, and Namibe.

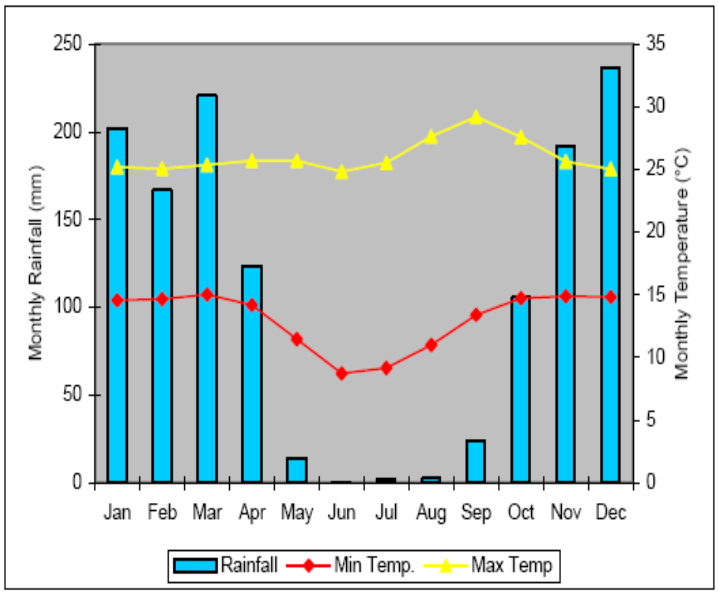
Source: MZV, 2008

With a privileged continental hydrographic system, Angola's main rivers are Kwanza, Zaire, Cunene, and Cubango.The capital of Angola, Luanda, is located on the north-central coastline. Angola also includes the exclave of Cabinda (an exclave is an area of land that is part of another country but separated physically from that country). A province of Angola, Cabinda's size is roughly 7,300 square kilometers (2,800 square miles), and it lies south of the Republic of Congo on the Atlantic coast. The country is divided into 18 provinces, being Luanda the capital.

5.1.1. Climate

Like the rest of tropical Africa, Angola experiences distinct, alternating rainy and dry seasons. In the north, the rainy season may last for as long as seven months--usually from September to April, with perhaps a brief slackening in January or February. Rainfall varies from over 2000 mm/y during six months (November to April) in the north to less than 20 mm/year in the south-west. (CTA, 2006)

Fig. 3. ***Average rainfall and temperatur***



Source: WFP, 2005

In the south, the rainy season begins later, in November, and lasts until about February. The dry season (*cacimbo*) is often characterized by a heavy morning mist. In general, precipitation is higher in the north, but at any latitude, it is greater in the interior than along the coast and increases with altitude. Temperatures fall with distance from the equator and with altitude and tend to rise closer to the Atlantic Ocean. Thus at Soyo, at the mouth of the Congo River, the average annual temperature is about 26°C, but it is under 16°C at Huambo on the temperate central plateau. The coolest months are July and August (in the middle of the dry season), when frost may sometimes form at higher altitude. (WFP, 2005)

5.1.2. Drainage

Most of the country's many rivers originate in central Angola, but their patterns of flow are diverse and their ultimate outlets varied. A number of rivers flow in a westerly course to the Atlantic Ocean, providing water for irrigation in the dry coastal strip and the potential for hydroelectric power, only some of which had been realized by 1988. Two of Angola's most important rivers, the Cuanza and the Cunene, take a more indirect route to the Atlantic, the Cuanza flowing north and the Cunene flowing south

before turning west. The Congo River, whose mouth and western end form a small portion of Angola's northern border with Zaire, is also navigable.

North of the Lunda Divide a number of important tributaries of the Congo River, flow north to join it, draining Angola's northeast quadrant. South of the divide some rivers flow into the Zambezi River and thence to the Indian Ocean, others to the Okavango River (as the Cubango River is called along the border with Namibia and in Botswana) and thence to the Okavango Swamp in Botswana. The tributaries of the Cubango River and several of the southern rivers flowing to the Atlantic are seasonal, completely dry much of the year.
(Encyclopedia Britannica, 2006)

5.1.3. Terrain

Angola has three principal natural regions: the coastal lowland, characterized by low plains and terraces; hills and mountains, rising inland from the coast into a great escarpment; and an area of high plains, called the high plateau (planalto), which extends eastward from the escarpment. The highest point in Angola is Morro de Moco, at 2,620 m (8,596 feet).

- **Coastal Lowlands**

The coastal lowland rises from the sea in a series of low terraces. This region varies in width from about 25 kilometers near Benguela to more than 150 kilometers in the Cuanza River Valley just south of Angola's capital, Luanda, and is markedly different from Angola's highland mass. Even where, as around Luanda, the average annual rainfall may be as much as fifty centimeters, it is not common for the rains to fail. Given this pattern of precipitation, the far south is marked by sand dunes, which give way to dry scrub along the middle coast. Portions of the northern coastal plain are covered by thick brush.

- **Hills and Mountains**

The belt of hills and mountains parallels the coast at distances ranging from 20 kilometers to 100 kilometers inland. The Cuanza River divides the zone into two parts.

The northern part rises gradually from the coastal zone to an average elevation of 500 meters, with crests as high as 1,000 meters to 1,800 meters. South of the Cuanza River, the hills rise sharply from the coastal lowlands and form a high escarpment, extending from a point east of Luanda and running south through Namibia. The escarpment reaches 2,400 meters at its highest point, southeast of the town of Sumbe, and is steepest in the far south in the Serra da Chela mountain range.

- **High Plateau**

The high plateau lies to the east of the hills and mountains and dominates Angola's terrain. The surface of the plateau is typically flat or rolling, but parts of the Benguela Plateau and the Humpata Highland area of the Huíla Plateau in the south reach heights of 2,500 meters and more. The Malanje Plateau to the north rarely exceeds 1,000 meters in height. The Benguela Plateau and the coastal area in the immediate environs of Benguela and Lobito, the Bié Plateau, the Malanje Plateau, and a small section of the Huíla Plateau near the town of Lubango have long been among the most densely settled areas in Angola. (Encyclopedia Britannica, 2006)

5.2. Brief history of Angola

The area of current day Angola was inhabited in prehistoric times, as attested by remains found in Luanda, Congo and the Namibe desert, but it was only thousands of years later, at the beginning of recorded history that more developed peoples arrived. In 1482, Portuguese caravels commanded by Diogo Cão arrived in the Congo. Other expeditions followed, and close relations were soon established. The Portuguese brought firearms and many other technological advances, as well as a new religion (Christianity); in return, the King of the Congo could offer plenty of slaves, ivory, and minerals. The Portuguese colony of Angola was founded in 1575 with the arrival of Paulo Dias de Novais with a hundred families of colonists and four hundred soldiers. Luanda was granted the status of city in 1605. From 1764 onwards, there was a gradual change from a slave-based society to one based on production for domestic consumption. (Ferro, 1997)

Meanwhile, the slave trade was abolished in 1836, and in 1844, Angola's ports were opened to foreign shipping. By 1850, Luanda was one of the greatest and most developed Portuguese cities in the vast Portuguese Empire outside Mainland Portugal, full of trading companies, exporting (together with Benguela) palm and peanut oil, wax, copal, timber, ivory, cotton, coffee, and cocoa, among many other products. Maize, tobacco, dried meat and cassava flour also began to be produced locally. With regard to the economy, colonial strategy was based on agriculture and the export of raw materials. Trade in rube and ivory, together with the taxes imposed on the population of the Empire (including the mainland), and brought vast income to Lisbon. (Leonard, 2006)

Portuguese policy in Angola was modified by certain reforms introduced at the beginning of the twentieth century. The fall of the Portuguese monarchy and a favorable international climate led to reforms in administration, agriculture, and education. With the advent of the New State, extended to the colony, Angola becomes a province of Portugal (Ultramarine Province).

The situation was calm and stable, with notable developments in the fields of local economy, education, civil rights, standard of living and transportation across the territory. However, in the second half of the twentieth century, this calm was disrupted by the appearance of the first nationalist movements. More overtly political organizations first appeared in the 1950s, and began to make organized demands for their rights, initiating diplomatic campaigns throughout the world in their fight for independence. The Portuguese regimen, meanwhile, refused to accede to the nationalist's demands of separatism, thereby provoking the armed conflict that started in 1961 and came to be known as the Colonial War. In this struggle, the principal protagonist were the MPLA (Popular Movement for the Liberation of Angola), founded in 1956, the FNLA (National Front for the Liberation of Angola), which appeared in 1961, and UNITA (National Union for the Total Independence of Angola), founded in 1966. After many years of conflict, the nation gained its independence on 11 November 1975, after the 1974 coup d'état in the metropolis’s capital city of Lisbon against the Portuguese regimen. Portugal's new leaders began a process of democratic change at home and acceptance of its former colonies' independence abroad. New period of civil life has started in Angola after gaining independence. The Angolan Civil war, one of the largest and deadliest Cold war conflicts, erupted shortly after and lasted 27 years,

ravaging the economy, disturbing social order and disrupting social stability in the newly independent country. Over 500 000 people lost their lives, mostly in the 1990s. Thousands of Angolan refugees suffered with the conflict and left the country. The Civil war ended in 2002 by death of Savimbi. (Leonard, 2006)

5.3. Socio - Economical characteristic

5.3.1. Demographic data

Total population:	16, 7 million (IMF, 2006)
Population growth rate:	2, 45%
	51% female
	49% male
Age structure:	0 -14 years: 43.7% (male 2,678,185/female 2,625,933) 15 - 64 years: 53.5% (male 3,291,954/female 3,195,688) 65 years and over: 2.8% (male 148,944/female 186,367) (IMF, 2006)
Density:	13, 6
Life expectancy:	38, 62 years
Ethnic groups:	Ovimbundu 37%, Kimbundu 25%, Bakongo 13%, Mestico (mixed European and Native African) 2%, European 1%, other 22%
Languages:	Portuguese (official), Bantu and other African languages

5.3.2. Population

The population of Angola was estimated by the CIA to be a little over 10 million in July 2000. Although the World Bank put the figure at 12.4 million for 1999, in 2006 were estimated 16, 7 million. The growth rate for the year 2000 was estimated at 2.15 percent. In 2000, the birth rate stood at 46.89 births per 1,000, while the death rate was 25.01 per 1,000. (WTO, 2006)

The population density in 1995 was 8.8 people per square kilometer. The urban population has increased slowly but steadily from 31 percent in 1995 to 33.6 percent in 1999. The illiteracy rate in Angola is very high only 42 percent of people over the age

of 15 can read and write. There is a significantly higher number of men who are literate than women (56 percent versus 28 percent). (IMF, 2005)

Estimates of the working population of Angola range from 6 million in 2002 (ESSA, 2004) to 5.41 million in 2004 (CIA, 2005). Estimates of the number of people working in the agricultural sector vary from two thirds (IFAD, 2005), via 71 percent in 2002 (ESSA, 2004) to 85 percent in 2003 (CIA, 2005). The latter two sets of estimates lead to an estimated from 4.2 to 4.5 million workers in the agricultural sector. An estimated 80 percent of the farm holders are engaged in subsistence agriculture (IFAD, 2005). In the central highlands, 95 percent of the households are engaged in subsistence agriculture (WFP, 2005). Together, these farmers cultivate less than 5 percent of all arable land (FAO, 2004) and agriculture and fisheries contribute about 8 percent to Angola's GDP. (IMF, 2005)

5.3.3. Industry and development

Industry is the most important sector in Angola's economy, accounting for 53 percent of the GDP. The three important industrial sectors are mineral resources, energy, and manufacturing, the former two being by far the most significant. All of these were severely affected by the war, but since 1994 have increased significantly. (WTO, 2006)

Heavy industry and energy

Oil is the backbone of the Angola's economy. This sector makes up over 90% of the Country's exports. The first oil surveys date back to 1906, and it was not until 1955 that the first oil well was discovered. In 1966, Cabinda Gulf Oil Company discovered important oil reserves in Cabinda. From then on, oil started playing one of the most important roles in the Angolan economy, having surpassed coffee in oil exports as of 1973. Second to oil, diamonds are Angola's main export product. Major diamond reserves are located in northeastern Angola, a region endowed with the finest and top quality stones. In fact, 70% of diamonds discovered are of great quality, listing the country among the main diamond producers.

(UNIDO, 1990)

Angola has a wide variety of mineral resources. Apart from diamonds, these include iron ore, marble, granite, and to a lesser degree gold, manganese, copper lead, zinc, tin,

tungsten, vanadium, titanium, chromium, phosphates etc. Under the Constitutional Law, all minerals belong to the State. (WTO, 2006)

The oil industry has been the major contributor to Angola economy and public finances for many years. The petroleum sector accounts for over 50% of Angola's GDP and about 80% of government revenue in 2004. Petroleum has been Angola's largest export since 1973. During the 1990s, output expanded rapidly, with the exploitation of deep-water fields off the north and central coastlines. Angola is now sub-Saharan Africa second largest oil producer.
(UNDP, 2005)

Hydroelectric power has been a priority of the Angolan government. In 2000, 75.03 percent of the electricity produced was hydro-generated. Several large rivers flow through the country and give an enormous potential for hydroelectricity. The current generating capacity exceeds demand locally and output is increasing. This makes Angola a potential regional exporter of hydroelectric energy. However, the power supply has been irregular, partially due to sabotage by the warring factions, and a deteriorating infrastructure due to poor maintenance and lack of investment. However, the potential for regional export is vast when stability returns, even though Angola exported no electricity as of 1998. (UNDP, 2003)

Manufacturing

Angola had about 4,000 manufacturing enterprises before the civil war, which employed 200,000 people. However, this was significantly reduced by the onset of the war. The only products that are manufactured and exported from Angola today are cement and refined petroleum products. There is potential for establishing the pre-war levels of production, but this will require stability and outside investment. It would also necessitate the creation of an infrastructure. (UNDP, 2005)

The manufacturing sector in Angola accounted for 16% of GDP in 1973, essentially contributed by foodstuffs and others consumer goods. IMF data for 2003 estimated the share of manufacturing at 3, 8% of GDP and the authorities' estimated manufacturing production to account for some 10% of GDP in 2002. Oil refining, drinks, and construction materials are the principal industries currently active. (WTO, 2006)

Services

Services in Angola are not very developed, again a direct consequence of the war. The government has begun to encourage investment in tourism. However, with the continued strife and breached peace agreements it is doubtful whether such projects will take place. Foreign investors will shy away from investing in tourism in such a volatile society. Not only will it take substantial time before there will be investors in tourism, but the entire infrastructure to support such an expansion is at present lacking. The willingness of tourists to go to such an area is also in doubt. Financial and human services are in a similar state of disarray. The service sector, including commerce, accounts for approximately 30% of Angola's GDP, lower than in many develop and developing countries. Angola is opening up its services sector, especially in banking, finance, and telecommunications. (WTO, 2006)

5.4. Economy environment

In the early 1970s, before the civil war, Angola's economy was relatively diversified. The country had a wide range of agricultural production and exports (a healthy fishery industry, including both fishing and fish processing and manufacturing sector serving the local market. The combination of the civil war and the economic experimentation of the past thirty years, swinging from central planning to state-dominated capitalism, left the principal sectors of Angola economy, other than oil and diamonds, in shreds. Road and rail infrastructure was largely destroyed. The widespread of landmines made it impossible to farm in many areas, movement of population to towns and the development of large shanty-towns meant that subsistence and commercial agriculture no longer had the human or material resources necessary to function. Industries deriving from the primary sectors or supplying goods to the rural population lost their markets and the services sector became virtually non-existent outside the main centers. (WTO, 2006)

Subsistence agriculture provides the main livelihood for half of the population, but half of the country's food must still be imported. In 2005, the government started using a $2 billion line of credit from China to rebuild Angola's public infrastructure, and several large-scale projects are scheduled for completion by 2006. The central bank in 2003

implemented an exchange rate stabilization program using foreign exchange reserves to buy kwanza out of circulation, a policy that was more sustainable in 2005 because of strong oil export earnings, and has significantly reduced inflation. Consumer inflation declined from 325% in 2000 to about 18% in 2005, but the stabilization policy places pressure on international net liquidity.
(CTA, 2006)

Angola's high growth rate is driven by its oil sector, with record oil prices and rising petroleum production. Oil production and its supporting activities contribute about half of GDP and 90% of exports. Increased oil production supported 12% growth in 2004, 19% growth in 2005, and nearly 17% growth in 2006. (OECD, 2006)

However, economic growth remains largely dependent on the performance of the oil and diamonds sectors, relatively little progress have yet made in the rebuilding of agriculture and industry, and there is a large informal economy. Greater security in the country, combined with greater macroeconomic stability, is two essential preconditions for the rebuilding process. There is still a severe shortage of skills; many markets are still distorted by subsidies, price controls, and extensive State or parastatal participation. Much of the infrastructure is still destroyed or damaged, with landmines remaining a significant hazard. (WTO, 2006)

Angola and trade agreements and arrangements

Multilateral organizations related to trade

- WTO – Angola became a member of World Trade Organization on November 1996, qualifying as an original member of the WTO and thus not being required to go trough a process of accession. It has submitted Schedules on goods and services. Angola's notifications to the WTO relate three areas: services, sanitary and phytosanitary measures and trade-related aspects of intellectual property rights.
- UN agencies – UNCTAD, FAO, and the others.
- ICO – The International Coffee organization
- ICCAT – The International Convention of the Conservation of Atlantic Tunas
- CFC – The Common Fund for Commodities

Regional agreements

- African Union – economic and monetary union. Ongoing AU activities include peace keeping, increased sub-regional integration programs, the establishment of an African standby force, and harmonization of education policies.
- COMESA – The Common Market for Eastern and Southern Africa
- SADC – The Southern African Development Community. Angola is a co-founder. Main aim is to create a common market among the member states by 2015.
- ECCAS/CEEAC – The Economic Community of Central African States

Other agreements and arrangements

- CPLP – The Community of Portuguese-Language Countries
- SEAFO – The South East Atlantic Fisheries Organization
- AGOA – African Growth and Opportunity Act

(WTO, 2006)

5.5. Agriculture in Angola

Agriculture can work in concert with other sectors to produce faster growth, reduce poverty, and sustain the environment. Agriculture contributes to development as an economic activity, as a livelihood, and as a provider of environmental services, making the sector a unique instrument for development. (IBRD, 2007)

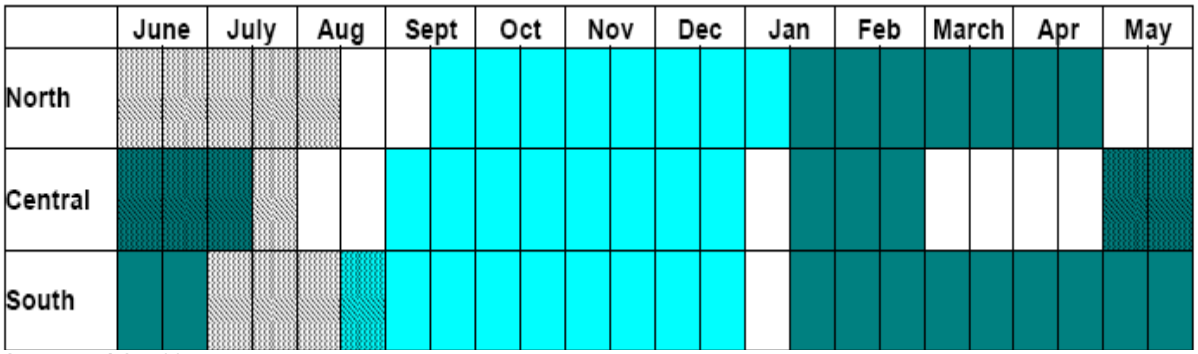
Before independence in 1975, Angola was characterized by important agricultural and commercial activities. Extensive agriculture, (based on maize cultivation intercropped with beans, cassava, and sweet potato) was the main activity. While agricultural inputs were limited and soils poor, livestock provided the necessary transport and traction and a good commercial network provided generally good living conditions for the rural population. After independence, major livelihoods did not change but the degradation of the road network and the impact of the war with resulting displacement, seriously affected rural livelihoods. Currently, 95% of households are subsistence farmers, with very little access to agricultural inputs besides low-tech equipment. The redistribution of population during the war - forced to settle in large numbers in small areas - has

resulted in accelerated degradation of vegetation and soil. Deforestation continues due to the high population pressure. (WFP, 2005)

There are three main agro-ecological zones corresponding to the main climatic and geographical features of the country: the north, with a humid climate; the semi-arid south; and the central highlands, Planalto Central, with a sub-humid climate, which is the transition zone between the humid north and the dry south. The cropping pattern is varied. In the north (Uige, Kuanza Norte, Zaire, Malange) and the northeast (Lundas area), there is a predominance of cassava, maize, beans and groundnuts. Maize and beans predominate in the Planalto Central area. In the south maize and livestock predominate, moving towards areas in which maize is replaced by cassava, sorghum, millet and cowpeas, while pastoral systems dominate in the
province of Cunene. According to MINADER's Serviço Nacional de Veterinaria, most of the livestock is reared in an extensive system in Cunene, where a large proportion of the country's livestock is to be found (500 000 head out of a total of 3 500 000). (WFP, 2005)

Agriculture in Angola is predominately a family-labor activity for millions of smallholder self-subsistence peasants who plant an average of 1.4 ha per family on two or more plots; the area planted increases slightly every year. Agricultural production is based on a rained main growing season from September to April (planting from September to February). This season accounts for about 95 percent of the total production of cereals and pulses, which are also the major food crops: cereals (maize, sorghum, millet and rice), beans, groundnuts, cassava, sweet potatoes and Irish potatoes. The second growing season is carried out mainly in low-lying wetland areas and is planted from June to August. This season accounts for about 5 percent of the production of cereals and pulses. Vegetable and sweet potato production is also very important in these areas. The most important vegetables are cabbage, tomatoes, lettuce, onions, peppers, carrots and pumpkin. (FAO, 2004)

Fig.4.Crop harvest calendar in Angola



Source: FAO, 2006

1st Harvest
2nd Harvest
Wetland Harvest

- North: Zaire, Uige, Malanje, Kuanza Norte, Bengo, Lunda Norte, Lunda Sul & Cabinda.
- Centre: Benguela, Bie, Huambo, Moxico & Kuanza Sul.
- South: Huila, Cunene, Kuando Kubango & Namibe.
- In most regions cropping is carried out three times a year consisting of 1st, 2nd and Wetland seasons. The corresponding harvest is depicted in the chart.
- Harvest periods generally follow each other. However, in Central, the 1st and 2nd harvests overlap for two-and-half months (May, June and first half of July).
- Periods during which there are no harvest in the three regions:

  North: two moths (1 month in May; 1 month August/September)

  Centre: 3-½ months (1 month in August; ½ month in first half of January and 2 months in March and April)

  South: ½ month (first half of January). (FAO, 2006)

5.5.1. Impacts of civil war on agriculture

Agriculture has been the sector most ravaged by the conflict. Except in the coastal area where irrigation is practiced by commercial farmers, and to some extent the tuber-producing Northern provinces, Angolan agriculture has fallen to a subsistence level, with little or no marketable surplus. Plantations of coffee, sisal, cotton and sugar cane have reverted to bush, while production of bananas, palm oil and tobacco has withered during 25 years of warfare. The acute deprivation of the farming community and the

lack of credit facilities from financial institutions make the use of purchased inputs and mechanization possible only on a few commercial farms.

The main problems after civil war in agriculture are mined areas and destroyed communications. During the twenty seven years of war, most people lost the knowledge of cropping and keeping livestock. Although de-mining is progressing, with an estimated 20,000 km per square of land cleared between 1999 and 2003, it is estimated that there may still be between five million and ten million landmines in Angolan soil. (ICBL, 2004) For this moment, in Angola many non – governmental organizations and governmental organizations are working for agricultural reconstruction after civil war.

Rural areas were the most affected and, consequently the livestock sector with population and animals moving in search of more stable places. The owners abandoned the physical structures and animals; there was a series of animal diseases transmission and incapacity to control the livestock effective and diseases.

The insecurity in the rural areas and particularly the presence of land mines led to the decline of the agricultural sector and a production drop of over 80%, which implied a dramatic increase in the consumption of imported food.
(FAO, 2005)

5.5.2. Area planted

The total area planted to all crops in Angola is estimated at 2 941 000 ha, which represents an increase of 15 percent over last year is planting. There are nine major food crops in Angola, namely: maize, sorghum, millet, rice, beans, groundnuts, cassava, sweet potato and potato. It is estimated that about 96 percent of the total area planted (2 833 000 ha) was devoted to these nine crops, of which cereals and pulses (including groundnuts) accounted for 64 percent of the total (1 890 000 ha). (FAO, 2004)

The area planted to cereals, pulses and groundnuts increased by about 10 percent compared with the last cropping season; cereal area grew by 9.3 percent, and maize represented 8.5 percent of this. One important factor contributing to the increase in the area planted was the distribution of agricultural inputs (seeds and hand tools) to about

600 000 families, among whom 336 000 were assisted through partners coordinated by the FAO.

Other main food crops in Angola include cassava, sweet potatoes and Irish potatoes (roots and tubers). Cassava is the second main food crop in terms of area planted and is the main staple in the northern region. Sweet potatoes are widespread throughout the country, and Irish potatoes are concentrated mainly in the centre. The area planted to these three food crops grew by about 12 percent; of which cassava grew 7.8 percent, sweet potatoes 19 percent and Irish potatoes 39 percent. One of the major constraints to farming area expansion still remains the presence of land mines in the fields. Angola is one of the most heavily mined countries in the world. (FAO, 2006)
Tables with area planted and yield provided by FAO from previous years are in Annex I and II.

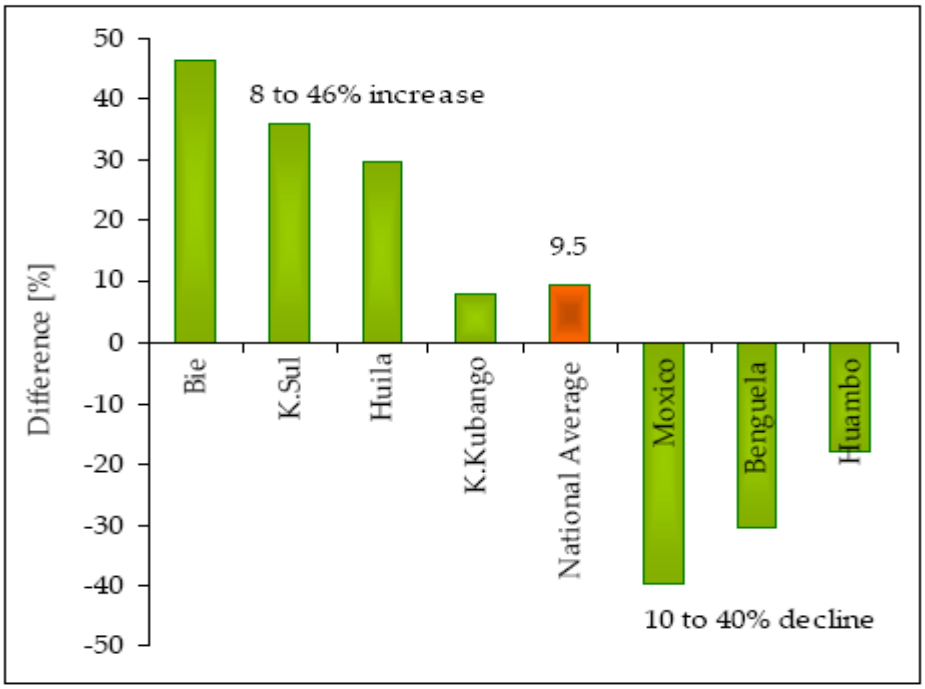
5.5.3. Crop production

Food crop production in Angola can be summarized as follows: good performance of crops in the Northern provinces, normal performance in the central provinces and poor performance in the southern provinces. Aggregate cereal production (maize, sorghum, millet and rice) in 2003/04 is estimated at 721 000 tones, 9.5 percent, out of which maize production is estimated at 577 000 tones, 5.8 percent above last year. The central region is the main cereal producing area in the country, with 56 percent of the total production, followed by the southern region with 38 percent. The total output of beans is estimated at 76 000 tones, about 15 percent higher than last year, while production of groundnuts is estimated at 55 000 tones, representing a reduction of 9 percent compared with last year, because of low yields in the centre and south. The production of cassava is forecast at 6 638 000 tones. The northern region is the main cassava producing area, with 84 percent of the total.

Angola's total production of cereals, pulses and groundnuts for 2005/06 is estimated at 912 000 tones. Of this, cereals (milled basis) alone account for approximately 742 000 tones compared with 878 000 tones in 2004/05, a reduction of 15.5 percent. The most substantial reduction in cereal production occurred in the central zone where a difference of 111 000 tones between this year and last represents a drop of almost 22

percent. Significantly, for this year of poor rainfall distribution, sorghum and millet production showed a small increase on last year. Angola is a potentially rich country agriculturally. In the north, there is a surplus of cassava that, in its processed form, could, if road conditions were improved, serve as a food-security buffer for other parts of the country in years of poor rainfall. The estimate of potential cassava production of 8.8 million tones in fresh weight or about 2.8 million tones in cereal equivalent seems too high. (FAO, 2006)

Fig. 5. ***Percentage difference in crop production (2003 and 2004)***



Source: CFSAM estimates

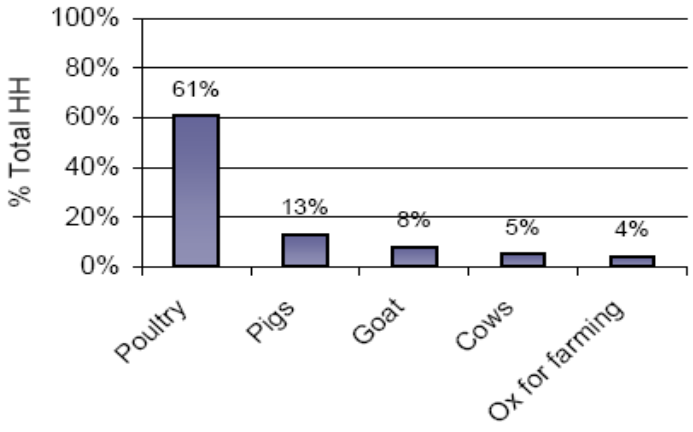
5.5.4. Livestock

In the south of the country, in areas where transhumance (seasonal migration of herders and livestock for grazing) is practiced, the process started earlier than usual as a result of the poor rains at the beginning of the season. For instance, in Namibe Province where the rains were especially poor in October and November, cattle began moving to Huila Province in search of pasture as early as December. However, the heavy rains in much of the south in March and April, though often detrimental to field crops, were very beneficial for pasture. Livestock condition in the south is currently very good, as are the pastures and the availability of water.

Large numbers of cattle are brought north from the southern provinces for sale in the centre of the country at markets such as Cuala in Huambo Province. There is now an increasing demand for cattle and draught oxen as farmers attempt to build up their herds again after the losses sustained during the years of conflict. Cattle prices normally fluctuate during the year, with prices dipping in January and February in response to uncertainty about the length of the dry spell and the expected quality of pasture. (FAO, 2006)

Livestock numbers are increasing rapidly. In 2004 MINADER registered 3.7 million head of cattle, 4.4 million goats, 0.3 million sheep, 2.5 million pigs and 15.9 million chickens. Cattle production is concentrated in the dry south; in wetter areas cattle production is limited by the presence of tsetse flies. Newcastle Disease is the main constraint for chicken production. In the central highlands, over 85 percent of the households own chickens, 20 – 50 percent own
goats or pigs and less than 20 percent own cattle. (WFP, 2005)

Fig.6. ***Livestock ownership in developing countries***



Source: WFP, 2005

The majority of the country's cattle are in Huila and Cunene Provinces. In 2005, livestock products entering the market amounted to 8 000 tones of beef, 13 000 tones of pork, 5 400 tones of mutton and goat meat, 630 tones of poultry, 121 000 eggs and 800 000 liters of milk2. There is obviously a very real opportunity for expansion in the poultry industry as is indicated by the importation of more than US$34 million worth of chicken meat from the United States in 2005. (FAO, 2006)

5.5.4.1 Poultry in Angola

Poultry play an important role in the production system of Angolan small-holders. The peasants are mainly crop-producers, but many keep cattle or pigs, and almost all households keep poultry, mostly chicken. After Angolan independence, commercial poultry production was given special attention. The central body of the Ministry of Agriculture practiced it in big State-owned institutions that were supervised until the start of privatization in 1988. The last structure, which coordinated and orientated poultry production, was a National Program of Poultry. Its actions were essentially to support commercial poultry activity as well as to stimulate and encourage small-scale family poultry production with the introduction of improved rustic breeds. (FAO, 1992)

Poultry production in Angola is a traditional domestic activity practiced mainly by women and children. It is very important and can be divided into the commercial poultry sector (modern semi industrial and industrial) on the periphery of the big towns, and the traditional or family sector.

The main constraints to traditional poultry production are instability in the rural areas, shortage of feed and diseases especially Newcastle disease (ND) which kills about 50–80% of chickens each year in the villages. Consequently, ND is a serious problem in areas where appropriate hygiene and prophylaxis are lacking. ND is a contagious viral disease, which can quickly spread through flocks. It appears with higher frequency during the dry weather between June and August. (N'salambi 1999)

The Angolan poultry production sectors have been viewed differently, especially for commercial (semi-industrial and industrial) poultry production on the one hand, and for traditional poultry production on the other. Traditional poultry production has been given relatively little attention because of lack of coherent policies. Therefore, Angolan poultry production has suffered severe shortages, especially of maize, a basic component of rations, in these last years, generally because of organizational and economic constraints. The persistent instability in the rural areas also contributed to decreased development of poultry production. (N'salambi 1999)

The existence of markets for poultry products and a poultry production tradition are two fundamental factors which might drive poultry production once the organizational problems and other problems have been solved, especially the lack of livestock extension and spread of available technology. (Kama, 2000)

Factors influence traditional poultry production:

• The poor conditions of hygiene and non-existent application of appropriate preventive health measures.

• Lack of accurate knowledge of animal species distribution at the national level because no national livestock census has been undertaken. Animal species distribution was not a part of the survey of nine provinces mentioned previously.

• Political instability led to an interruption of diagnostic and research activities within the Veterinary Research Institute. Vaccine production ceased, equipment and materials were destroyed or stolen and the human resource base was diminished. Consequently, ND monitoring and control activities ceased.

• Low priority for traditional poultry production because of indefinite or ill-defined development policies. Only immediate research priorities are addressed.(Kama, 2005)

5.5.5. Agricultural markets in Angola

Although agriculture accounts only for about 8 percent of Angola's GDP, it is the main source of employment in the country. Prior to independence (1975), food production was high and the country was a major exporter of maize and coffee. During the years of conflict, agriculture fell to an almost subsistence level in many areas, with little or no marketable surpluses and very limited trade activity. Consequently, the country has relied on food imports (commercial imports of wheat and rice) and food aid for many years, mostly in the form of maize and beans. In particular, commercial imports of wheat and rice have constantly increased since independence, reaching in 2005 the record levels of about 460 000 tones and 200 000 tones respectively. With the cease-fire in April 2002 and an improved mobility of people and products throughout the country, local markets have started to resume their activities despite the appalling condition of the road network. (FAO, 2006)

Although the marketing and market situation in rural Angola has improved over the last four years since the war ended, there are still serious infrastructural impediments to its proper functioning, chiefly the condition of the roads and transportation. For example, it is possible to obtain good yields of potatoes on the Planalto Central, but the incentive to do so is limited by the fact that, by the time the produce has been brought to Luanda, it cannot compete in terms of price with potatoes imported from Brazil. The estimated imports of wheat, rice and maize into Angola in 2005/06 have been placed at about 400 000, 200 000 and 42 000 tones, respectively. Most of these imports, except for about 30 000 tones of maize which came in as food aid, were on commercial basis. Generally speaking, over time wheat and rice imports have been increasing while those of maize are on the decline due to improvements in domestic maize production. (FAO, 2006)

5.6. Province Bié and Kuito

Bié province is situated in the centre of Angola and the provinces of Malange, Lunda Sul, Moxico, Kuando Kubango, Huila, Huambo and Kwanza Sul surround it. The main food crop is maize; others are sorghum, beans, groundnuts, cassava, potatoes and sweet potatoes, with lesser quantities of rice. The average farm size is about 1.40 ha.

Farmers using animal traction for tillage and some fertilization obtained good maize yields in the same area. In the province of Bié maize yields are generally good, because of the good quality of the soils. This is one of the provinces of the Angolan central high plain with highest agricultural potential. A vast plain with fertile soils and a network of the tributaries of the main rivers of Angola have created fertile valleys in the interior.

The total area planted to the main food crops is estimated at 301 000 ha (8 percent higher than last season); cereals represent 64 percent of the total area plated. Resident farmers had sufficient tools and seeds; IDPs received seeds and tools from FAO and other partners for their first and/or second planting. No major shortages of agricultural inputs are reported. Total production of cereals is expected to reach 97 000 tones, about 47 percent higher than last season (2003) as a result of the increase in area planted and good yields. About 9 000 tones of beans, 4 000 tones of groundnuts and 124 000 tones of fresh cassava are expected.
(FAO, 2004)

Kuito is the capital of Bie province and is situated on the planalto in the centre of Angola. Because of its strategic importance, in terms of high potential in agriculture and diamond wealth, and the proximity to the UNITA hinterland, Kuito city and province Bié has often endured the most of military action in Angola long war.

In 1996, Kuito had estimated population of 220 000 persons, including a population displaced from previous conflicts. The permanent resident population is estimated to be approximately 80 – 85 000. (WFP, 2000)

6. Results and Discussion

6.1. Quantitative research of crops suitable for poultry feeding

Crops on agricultural markets suitable for poultry feeding, province Bié

The first step of survey was to identify crops suitable for poultry feeding available on agricultural markets in Bié province. It was done in the capital city of province Bié Kuito, where is located the largest agricultural market in the whole province.

Table 1. *Crops suitable on agricultural markets*

Crops	Chissindo	Catemo	Pedro
Maize	✓	✓	✓
Millet			
Rice	✓	✓	✓
Manioc	✓	✓	✓
Batatas	✓	✓	✓
Beans	✓	✓	✓
Soya beans	✓	✓	✓
Peanuts	✓	✓	✓

Crops mentioned in table 2 are selected as suitable for poultry feeding. All crops specified as a suitable for poultry feeding were available during the dry season 2007 on all monitored agricultural markets in Kuito. Millet was intended also as a crop suitable for poultry feeding but was not available on any agricultural markets in Kuito.

According to the field survey, millet is unknown crop in province Bié. In spite of large possibility of millet agriculture utilization as a feeding for livestock or feedstuff, small holders in province Bié are not used to use this crop. Millet was selected by project team of the Centre of Agricultural Education in Bié province (CEAB) as a new crop suitable for growing at school farm because of its low growing demand and its high level of utilization.

Production of millet at school farm in 2007 was high and millet was utilized as one of components in establishing of feed ration for poultry at the demonstration poultry rising of CEAB. Millet can be proposed as a new crop for establish of feed ration and consequential for improvement of food security in Bié province. Based on the survey

was done a qualitative analysis of millet and results are inducted and described in last part of Thesis (qualitative analysis of selected crops).

Prices of crops on agricultural markets

The second step in the survey was to compare prices of agricultural crops on market places. Based on field survey are worked out three tables of current prices of agricultural commodities especially crops suitable for poultry feed. The resultant values are presented in Angola's currency (Kwanza) and for better overview are also re-counted to US Dollars and Czech *koruna*. In this part of result is used only table (Table 4) from the market Chissindo because this market represents the main place of trade with agricultural commodities. The data of prices provided from other market are available in the ANNEX III.

For comparison analysis was used the survey provided by FAO in 2006 (Table 2) and survey from 2004-2005 provided by non-governmental organization CARE (Table from this survey is available in ANNEX IV.) in province Bié. Data from FAO survey were collected from all areas in Angola. Data used in table of the thesis survey were collected only in Kuito.

Table 2. ***Prices of crops provided by FAO in 2006 (Exchange rate in 2006 was 80 kwanza for 1 US $)***

Crops	Price in Kz	Price in US $	Price in CZK	Quantity
Maize	25	0,3	6,3	Kg
Peanuts	80-100	1- 1,25	21 – 26,25	Kg
Beans	75-80	0,9 – 1	18,9 – 21	Kg
Manioc	30-35	0,3 – 0,4	6,3 – 8,4	Kg

Source: FAO 2006

***Table 3.** Prices of crops in July and September 2007 (exchange rate in 2007 was 75 kwanza for 1 US $)*

Crops	Price in Kz	Price in US $	Price in CZK	Quantity
Maize	25	0,3	6,3	Kg
Millet	xxx	xxx	Xxx	Xxx
Peanuts	100	1,3	27,3	Kg
Rice	3100	41,3	867,3	50Kg
	70	0,93	19,53	Kg
Beans	90-100	1,2-1,3	25,2- 27,3	Kg
Batatas	3500	46,6	978,6	150Kg
	100	1,3	27,3	Sack
Manioc	20/30/40/50	0,26 – 0,6	5,4 – 12,6	Ks
Soya beans	100	1,3	27,3	Kg

According to the survey conducted by CARE (CARE, 2005) the price of one kilo of maize was 25.00-30.00 kz. According to the survey conducted by FAO in 2006, the price of one kilo of maize was 25.00 kz. The thesis survey found out the selling price of one kilo of maize was 25.00 kz. Prices of maize from referenced surveys are on the same level over a period of several years. Maize is crop with the biggest planted area. In 2006 was planted area of this cereal 200 000 ha (FAO, 2006). The second position in planted are have beans with 53 000 ha (FAO, 2006). There is evident difference and maize is definitely dominant cereal crop in province Bié. Tables of yield and planted area provided by FAO in 2006 are available in ANNEX I. and II.

According to the survey of CARE the selling price of beans was 80.00 kz. It was on the same level as the survey provided by FAO. The Thesis survey found out the selling price of beans was 90.00-100.00 kz of one kilo. This finding is in conflict to what FAO and CARE said. There is perceptible rise in price and bean demand can progressively decrease.

In the survey provided by CARE are not referenced selling prices of manioc and peanuts. Selling price of peanuts according to FAO research was 80.00 kz per kilo (2006). The Thesis survey found out that the current price of one kilo of peanuts was 100.00 kz. Prices of manioc are practically on the same level in both researches. From available materials and surveys was not able to find prices of batatas and soya bean for compare of prices.

Analysis of trade and trend of prices in Angola is very difficult activity because of high influence of non-market economy and insufficient time of the survey.

Factors influencing costs of agricultural commodities:

- ✓ Transaction costs: high prices for inputs (e.g. fertilizers) and low prices for outputs (e.g. crops). (According to CARE survey prices of fertilizers are about 1200 – 2000 Kwanza)
- ✓ Poor conditions of the roads and non-functioning of the railway.

  In province Bié (Central Angola) originate a high number of rivers. Bridges had a strategic position in civil war and according to that, they were completely destroyed. Railway was downfallen as well because of its strategic role.
- ✓ Long distance to the market.

  According to the field survey appears that more than half of small holders has to overrule distance longer distance than 6 km to get to the market place.
- ✓ Low density of agricultural markets.

  According to the field survey, the most important market with agricultural commodities in province Bié is Chissindo in Kuito. Other important agricultural markets are in different provinces.

Practical example: *Average income and profit of smallholder in Kuito from one crop season of maize*

From available materials and data is possible to figure out approximated average profit of smallholder in one crop season. According to the survey provided by FAO was average area of one small holder 1, 4 ha and yield of maize from the year 2006 in province Bié was 0, 7 t/ha. According to field survey price of seeds was 3000 kwanza for 100 kg. Moreover, based on the survey provided by CARE price of fertilizers was 2000 kwanza in the year 2005.

Area of small holder	1, 4 ha (FAO, 2006)
Yield of maize	0, 7 t/ha (FAO, 2006)
Price of seed	3000 kwanza/ 100 kg (Field survey 2007)
Price of fertilizers	2000 kwanza (CARE, 2005)

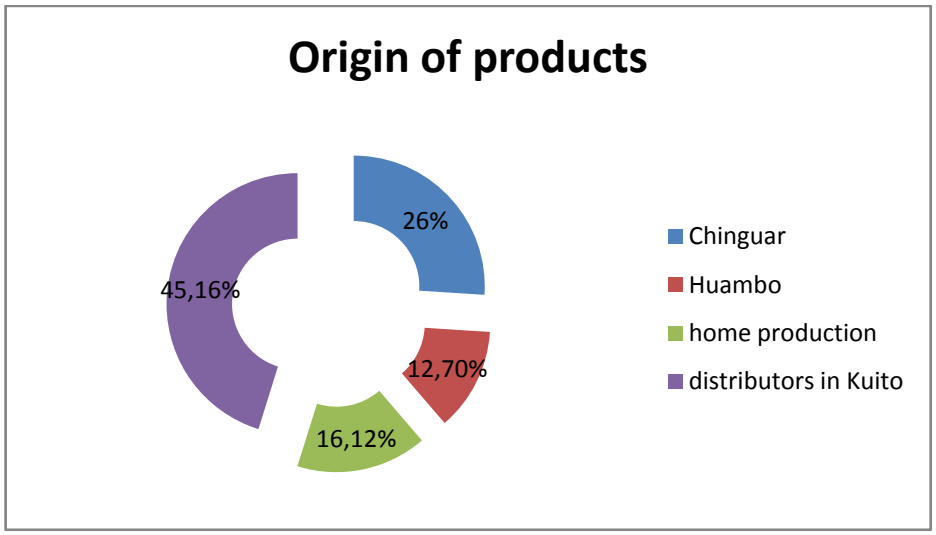
→ Average salary from one crop season for smallholder is **19 500 kwanza = 260 $**

Note: In this calculation are not included any factors as an annual rainfall, quality of seeds, transaction costs etc. Collected data are not from the same year and are not based on the same survey.
Exchange rate used for this calculation was 75kz per 1 US $

Conditions and processing of crop production for poultry feeding

This part is the third step of the agricultural market survey and is aimed at smallholder's crop production on the market places and processing activities that are connecting. Small holders from agricultural markets were asked about the origin of their products. The results are summarized in the graph 1.

Graph 1. Origin of the products available on agricultural markets in Kuito(2007)



Small percentage of farmers with own production on agricultural markets reference to poor crop production. Though geographical and climate conditions are on very good level, situation of crop production is not adequate. Production of local small holders ensures only food security. Land tenure in province Bié is low. Average area is 1, 4 ha per farmer (FAO, 2006)

In Angola is also high number of export crop commodities. The estimated imports of rice into Angola have been placed about 200 000 tones in 2005 (FAO, 2006). Angola's production of rice in the same year was 11 000 tones (FAO, 2006). Angola's crop production of some commodities is still on low level and importation is necessary for ensuring food security in the country. Other problem is constant high number of mined land.

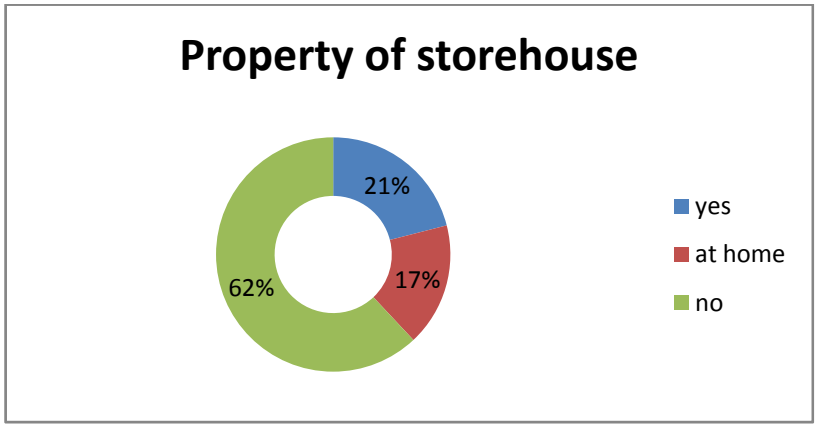
Based on screening and personal experiences and confirmation by NGO project coordinators working in the area of agriculture crop production is high cost activity for small holders. The main constraints in crop production are:

- ✓ Lack of quality seeds
- ✓ Lack of fertilizers
- ✓ High cost of fertilizers (1200 – 2000 kwanza according to CARE survey)
- ✓ Destroyed infrastructure
- ✓ Mined land
- ✓ Lack of knowledge etc.

The second question to small holders was if they have own storehouse.

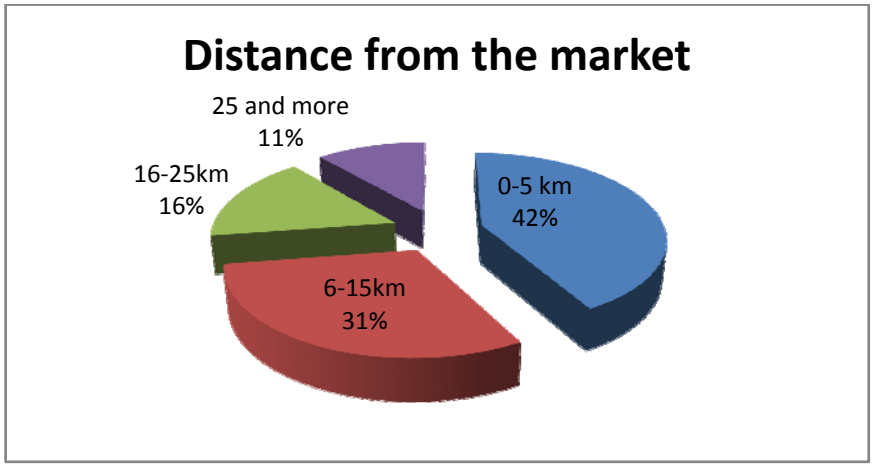
For well crop production in all aspects, storage is one of the most important fractions. Storehouse supports protection against moisture during the wet season, against pests and diseases. Storage conditions in developing countries are on low level. Number of storage areas in province Bié is deficient. Low storage conditions have influence on quality and use of crop production. Development and improvement of storage conditions is one of the aspects for ensuring of food security and as well as poultry production. Storehouses to all intend and purposes in communities of small holders do not exist. The results are in graph 2.

Graph 2. ***Property of storehouse of small holders in Bié, Kuito (2007)***



The next aspect of availability of agricultural production at the market places is a distance of production places to the markets. The small holders were asked what the distance from their home to the market is.

Graph 3. ***Distance from the market of smallholder in Kuito (2007)***



High percentage (58%) of small holders which have to overrule longer distance than 6 km to market places advert to low density of agricultural markets. Low density of agricultural markets and long distance to the market places are one of the aspects that influence relative high costs of agricultural commodities.

More than half of respondents live in relative high distance from the market places. For these respondents was last question from the questionnaire, what kind of transport do they usually use.

Most respondents living in 6-15 km from market were use to go by food or use to transport bike or mototaxi. Respondents living in longer distance, it means 15 km and more were used to use local transport *candongeiro* (small bus used in all areas of Angola, price is about 10 kwanza per 1 km). In some cases is not exception that the poorest small holders from long-distance communities are use to go by food to get to the market places. The use of transport also depends on climatic conditions and current economic situation of smallholder.

Subjective analysis of quality provided by students

Results from this part of survey are based on subjective evaluation provided by students from CEAB. Students evaluated size, color, aroma and spoil of selected grains. Results are elaborate in the table 4. Provide a qualitative analysis only by screening is impractical. For findings of factual quality, it is necessary to provide nutrition analysis of selected grains.

On the other hand, students evaluated grains of soya bean like the grains of poorest quality and qualitative analysis confirmed the validity of this presumption. As well, quality of maize set by students was affirmed by nutritional analysis.

Table 4. ***Quality of crops based on subjective evaluation provided by students of CEAB***

Crop	A (high quality)	B (middle quality)	C (poor quality)
Maize	✓		
Rice		✓	
Batatas		✓	
Manioc	✓		
Bean		✓	
Soya bean			✓
Peanut	✓		

6.2. Qualitative analysis of crops suitable for poultry feeding

The last part of the thesis survey is qualitative analysis of grains selected samples from Angola. Results are presented in following graphs. For comparison analysis were used data of nutrition values from Catalogue of feed provided by The Research Institute of Alimentation of Livestock in Pohořelec (1995). These data are included in graphs as a reference. Nutrition values provided by Research Institute of Alimentation are recommended for establishing of feed ration in intensive poultry production.

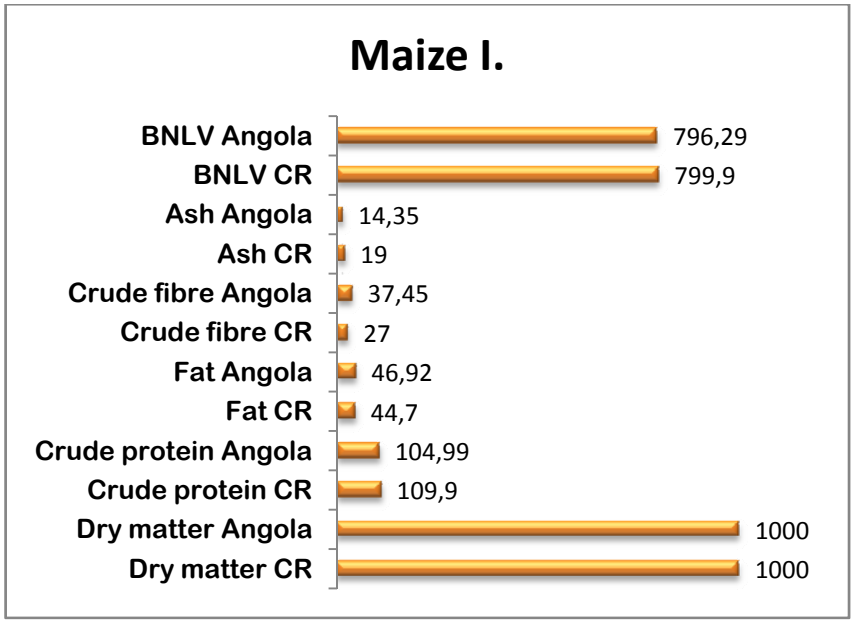
Table 5. ***Origin of samples (Angola, 2007)***

Sample	Origin
Maize I.	Production of small holder in Kuito
Maize II.	Production of small holder in Kuito
Millet	Production from school farm of CEAB
Bean	Production of small holder in Kuito
Soya bean	Imported from the other province of Angola (Chinguar)

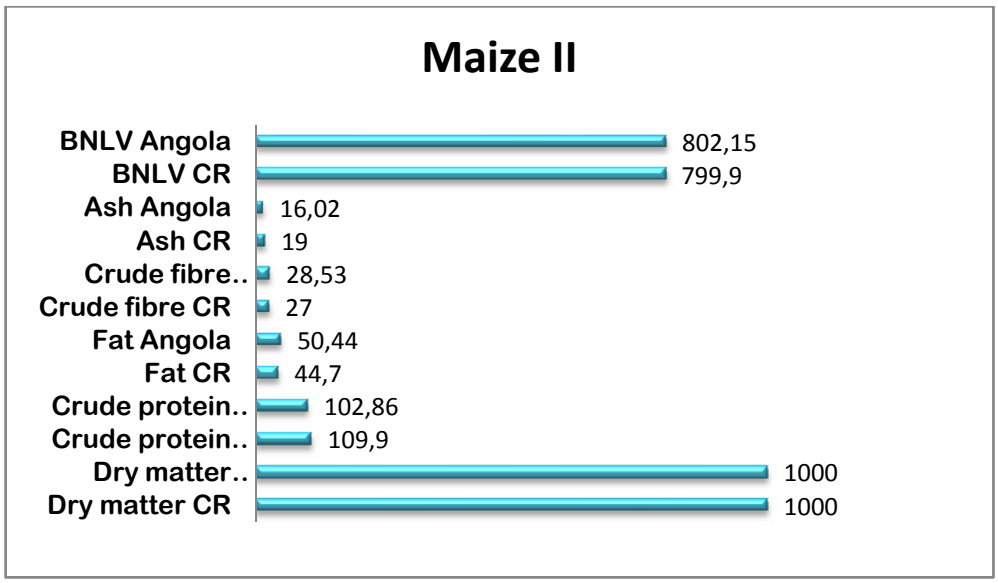
Samples of maize

From the graphs is evident that quality of both samples is on high level. Sample of Maize I. has higher content of trude fibre. Trude fibre is indigestible part of food and high content in feed ration can induce to poultry problems with digestion. Other nutrition values of both samples are comparable with nutrition values from Catalogue of feed. These samples are on high level of quality and can be recommended as a suitable for poultry feeding.

Graph 4. *Maize I. - qualitative analysis (g/kg of matter)*



Graph5. *Maize II. -qualitative analysis (g/kg of matter)*

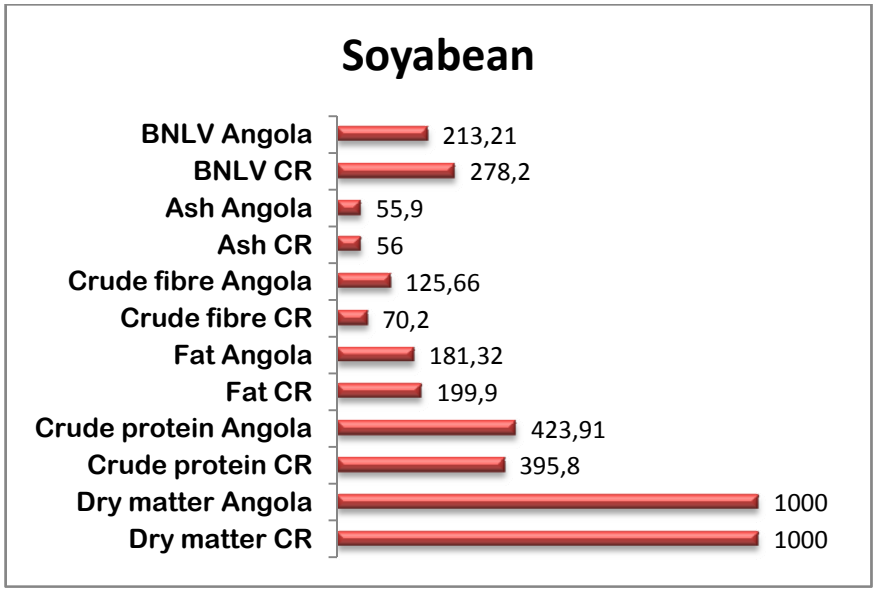


Sample of Soya bean

Qualitative analysis of grains of Soya bean referred to low quality of this sample. The most problematic issue was high content of trude fibre which is two times higher than recommended value. Also high content of trude protein referred to low quality.

Soya bean was imported to province Bié from other provinces of Angola. For well establish of feed ration for poultry is necessary to find new substitute or new source of soya bean with higher nutrition quality.

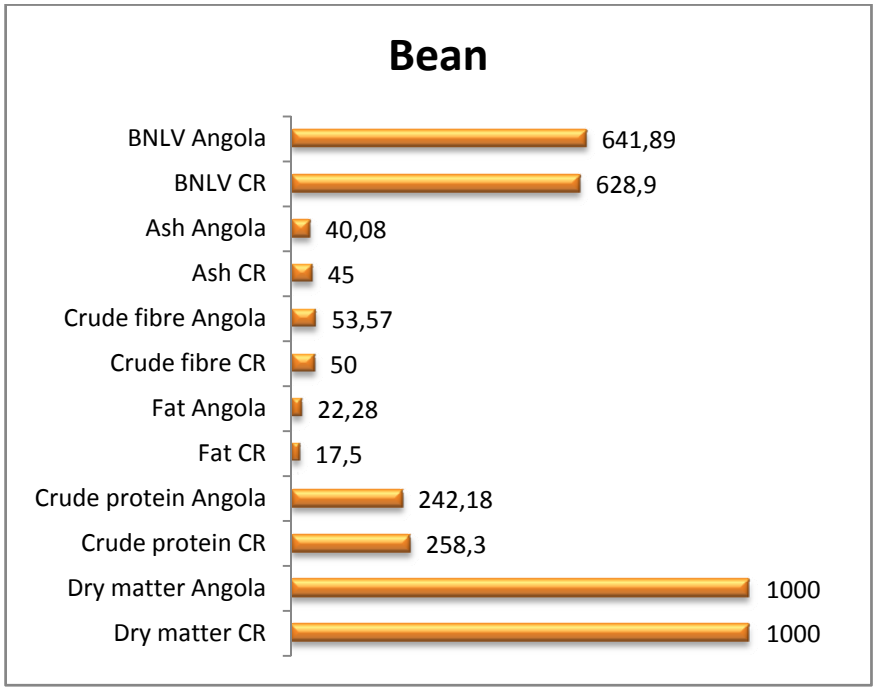
Graph 6. *Soya bean- qualitative analysis (g/kg of matter)*



Sample of bean

Nutrition values of bean are almost on the same level in comparison with nutrition values from Catalogue of feed. Grains of bean can be recommended as a suitable for poultry feeding.

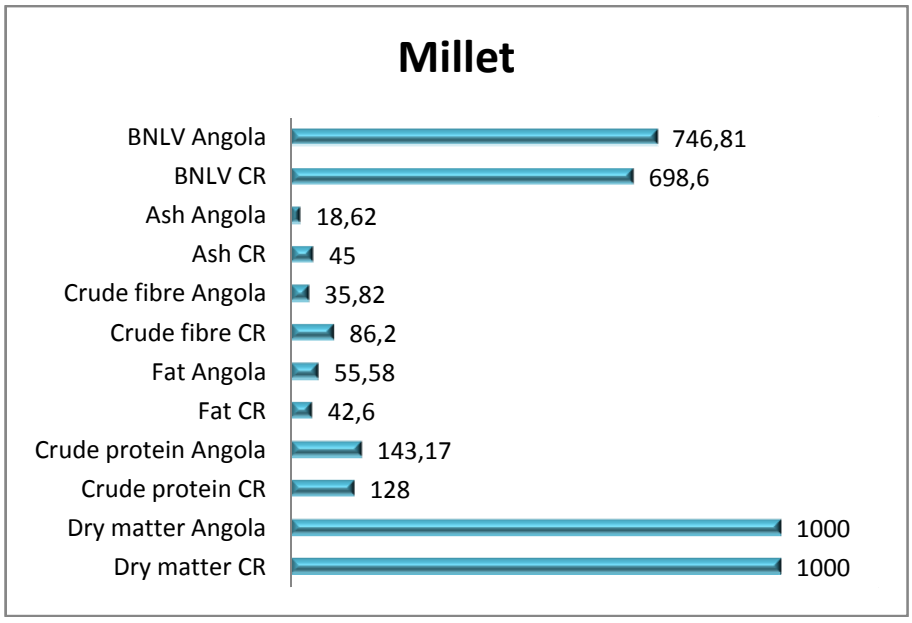
Graph 7. Bean- qualitative analysis (g/kg of matter)



Sample of Millet

Origin of millet grains is on school farm in Kunje realized by development project CEAB. In 2006-2007 was the first growing season of this crop. Nutrition values of this sample are on acceptable level. Millet can be recommended as a quality component of feed ration.

Graph 8. Millet- qualitative analysis (g/kg of matter)



Based on the thesis qualitative survey is possible to destroy a presumption that quality of agricultural crops suitable for poultry feeding on agricultural markets is low and can unfavorably affect poultry production. Quality of selected samples is relative high and not affects poultry production. Quality of feed ration is not the main factor unfavorably influencing development and improvement of poultry production.

7. Conclusions and Recommendations

Poultry production is one of the most important components in ensuring food security in developing countries. Angola was thirty years hagridden by civil war and now is in the phase of reconstruction. Improvement and development of poultry production can effectively help with improvement of agricultural sector and with improvement of economical situation of small holders. Poultry production has extension utilization in agriculture. At first, it is the essential source of animal protein and the second advantage is the financial income from sale with poultry eggs and meal for small holders living in rural areas. Although poultry production has many advantages, development and improvement of this sector face up many constrictions, whose elimination is long-term activity.

Small holders from province Bié are not able to provide feed resources for poultry from their own crop production. They are compelled to buy feed for poultry on agricultural markets. High number of mined land and high cost of inputs cause low crop production of small holders. In province Bié, there is still lack of suitable land for cropping, lack of agricultural knowledge and lack of available fertilizers for improvement of crop production.

One of the objectives of field survey was to describe and characterized markets with agricultural crop production suitable for poultry feeding. According to the field survey, appear that availability of agricultural products suitable for poultry feeding is sufficient. Crops, buyable whole year on agricultural markets and suitable for poultry feeding are maize, rice, manioc, potatoes, soya bean and bean. From results, appearing that availability of quality feed and reasonable price are important factors that can affect approach of smallholder to poultry production.

Prices of some agricultural crops are without any changes over a period of several years. The most popular and cheaper cereal on agricultural markets is maize. Price of one kilo of maize is during four years at the same level (25.00 kz). Beans became the most expensive commodity on agricultural market. Price for one kilo of bean was in 2007 100.00 kz. In 2006, price of peanuts was 100.00 kz and peanuts were more expensive than beans. In the present time, prices of both crops are at the same level. Prices of

crops suitable for poultry feeding in comparison with development world are at low level but in comparison with economic situation of smallholders in Angola, poultry production is still high cost activity. From the field survey, several problems appear involving development of poultry production.

One part of field survey was oriented to find out the information about density large of agricultural markets in province Bié. Following findings referred to low density of agricultural markets and long distance that small holders have to overrule to get there. These problems are related with destroyed infrastructure and non-functional railway after civil war. Province Bié has approximately same area as whole Czech Republic. In spite of large surface of a region, it is possible to find only one biggest and most important agricultural market in Kuito (capital city of Bié). High transaction costs, low density of markets and long distance from the market isolate some communities in opportunity to do trade with poultry products. Reconstruction of infrastructure should be one of the most important aims of Angolans government.

The other part of survey provides qualitative analysis of selected samples. Quality of grains is impacted by storing conditions. Storage conditions in developing countries are usually on low level. Property of storehouses depends mainly on economical situation of smallholder. On the base of field survey, appear that more than half of small holders do not have any storage area.

It is necessary to know quality of feed for establishing of feed ration for poultry. In present time in Angola there are not providing any surveys related to quality of feed in spite of the importance of quality knowledge. According to this finding was decided to involve qualitative analysis of selected grains in to the field survey. Qualitative analysis was provided from five selected samples (2x maize, millet, bean, soya bean). Millet is unknown crop in province Bié and was chosen by project team of CEAB as an experiment crop for cropping season in 2006. Yield of millet was high and millet was including in feed ration of poultry.

Qualitative analysis approved surprising results. Quality of samples is on high level except of sample of soya bean. Soya bean contained high amount of crude fibre. Because of this high content should be better to find new substitute of this component.

The others samples can be recommended as a suitable for poultry feeding. This finding overcome presumption that quality of grains is low and can unfavorably affect poultry production. This analysis was limiting by amount of samples and by origin of samples. (All samples are only from province Bié, mainly from Kuito). According to the quality analysis of millet, appear that this crop should be recommended as new crop suitable for smallholders and can be distribute to all areas of province Bié as a crop for ensuring food security.

Angolans government does not provide sufficient support to agricultural sector. In this situation, important roles play non-governmental organizations. For improvement of poultry production should be proposed new system of screening quality of feed. Qualitative analysis should be provided more than one of year and selected samples should be collected from all areas of Angola. Improvement of storage conditions could also help in development of poultry production and consequential ensure food security in the country. To the future could also help create more agricultural schools like the Centre of Agricultural Education realized by Institute of Tropics and Subtropics across the country and create agricultural organization, manage by local producers in order to develop agricultural sector.

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Appendix

ANNEX I. Areas planted in cereals, beans and groundnuts ('000 ha) in 2005/06

	Maize	Sorghum	Rice	Beans	Groundnuts
Total (Only peasant sector)	**1110**	**369**	**13**	**370**	**181**
NORTH	**122**		**5**	**117**	**99**
Cabinda	2			4	4
Zaire	1			3	3
Uige	20		1	10	60
Bengo	8			9	4
Luanda	2			0,4	
Kwanaz Norte	16			10	5
Malange	66		0,4	40	19
Lunda Norte	3		1	2	2
Lunda Sul	4		0,1	9	3
CENTRE	**717**	**59**	**8**	**153**	**57**
Kwanza Sul	76			22	15
Benguela	64	31		11	ě
Huambo	369	21		55	15
Bié	197	7	0,1	53	12
Moxico	10	1	8	12	13
SOUTH	**271**	**310**		**100**	**25**
Namibe	5	5		1	
Huila	222	89		84	22
Cunene	10	148		3	
Cuando					
Cubango	35	68		11	3

Source: FAO, 2006

ANNEX II. Yields of cereals, beans and groundnuts (t/ha) in 2005/06

	Maize	Sorghum	Paddy Rice	Beans	Groundnut
NORTH					
Cabinda	0,5			0,3	0,3
Zaire	1			0,3	0,3
Uige	0,5		0,7	0,3	0,4
Bengo	0,5			0,3	0,3
Luanda	0,5			0,3	
Kwanza Norte	0,5			0,3	0,4
Malange	0,5		0,7	0,3	0,5
Lunda Norte	0,5		0,4	0,5	0,5
Lunda Sul	0,5		1	0,3	0,3
CENTRE					
Kwanza Sul	0,5				0,4
Benguela	0,4	0,3			0,1
Huambo	0,5	0,4			0,6
Bié	0,7				0,3
Moxico	0,4	1			0,4
SOUTH					
Namibe	0,4				
Huila	0,5				0,1
Cunene	0,3				
Cuando Cubango	0,5				0,3

Source: FAO, 2006

ANNEX III. Prices of crops in July – September 2007 on agricultural market Catemo

	Price in Kwanza	Price in US $	Price in CZK	Quantity
Maize	50	0,6	12,6	Kg
Millet	xxxx	xxxx	xxxx	xxxx
Peanuts	100 - 200	1,3 – 2,6	27,3 – 54,6	Kg
Rice	3000	40	840	50 kg
	70	0,9	18,9	Kg
Beans	50 - 90	0,6 – 1,2	12,6 – 25,2	Kg
Batatas	3500	46,6	978,6	150 Kg
	50 - 100	0,6 – 1,3	12,6 – 27,3	sack
Manioc	10 - 60	0,13 – 0,8	2,73 – 16,8	ks
Soya bean	100	1,3	27,3	Kg

ANNEX IV. Questionnaire for small holders on agricultural markets

1. Nome do mercado :
2. Quais produtos podemos comprar no mercado? (produção vegetal)

   ……..
   ……..

3. Quel é o preço de milho? (Custo/ Quantidade)
4. Quel é o preço de masanga? (Custo/ Quantidade)
5. Quel é o preço de amendoi? (Custo/ Quantidade)
6. Quel é o preço de arroz? (Custo/ Quantidade)
7. Quel é o preço de feijao? (Custo/ Quantidade)
8. Quel é o preço de batatas? (Custo/ Quantidade)
9. Quel é o preço de mandioca? (Custo/ Quantidade)
10. Quel é o preço de soja ? (Custo/ Quantidade)

11. Qual é o origem de vossos produtos :

    a) a produção própria

    b) Outro produtor …….

    c) outros fontes

12. Tem os armazéms para as sementes ? sim não

    Que sim : Onde? ……..

13. Quando eram colheitado os produtos e qualidade dos produtus?

Qulidade (A - o melhor, B, C – mal)

Milho: .....

Masanga: .....

Amendoi: .....

Arroz: .....

Feijao: .....

Batatas: .....

Mandioca: .....

Soja: .....

14. Qual é a distância do mercado à casa? (km, horas, minutas)

……..

15. Qual é o tipo do transporte que vosses usam para ir no mercado?

……..

16. Quem é o majoria dos compradores?

……..

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