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**Agribusiness and Public  
Sector Collaboration in  
Agricultural Technology  
Development and Use in  
Kenya:**

**A Study of Poultry Feed  
Processing Technology**

**November 1992**

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**AGRICULTURAL MARKETING IMPROVEMENT STRATEGIES PROJECT**

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**AGRIBUSINESS AND PUBLIC SECTOR COLLABORATION  
IN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND USE  
KENYA: A STUDY OF POULTRY FEED PROCESSING TECHNOLOGY**

**Submitted to  
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**Agricultural Marketing Improvement Strategies Project (AMIS)**

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## **GLOSSARY**

<b>ADC -</b>	<b>Agricultural Development Corporation</b>
<b>AHIT -</b>	<b>Animal Husbandry and Industry Training</b>
<b>ARF -</b>	<b>Agricultural Research Fund</b>
<b>CIDA -</b>	<b>Canadian International Development Agency</b>
<b>FAO -</b>	<b>Food and Agricultural Organization of the United Nations</b>
<b>FIPA -</b>	<b>Foreign Investment Protection Administration</b>
<b>IDRC -</b>	<b>International Development Research Centre</b>
<b>IPC -</b>	<b>Investment Promotion Centre</b>
<b>KAFI -</b>	<b>Kenyan Animal Feed Industry</b>
<b>KARI -</b>	<b>Kenya Agricultural Research Institute</b>
<b>KBI -</b>	<b>Kenya Breweries Ltd.</b>
<b>KGCCU -</b>	<b>Kenya Grain Growers Cooperative Union</b>
<b>MLD -</b>	<b>Ministry of Livestock Development</b>
<b>NAHRC -</b>	<b>National Animal Husbandry Research Centre</b>
<b>NIB -</b>	<b>National Irrigation Board</b>
<b>NORAD -</b>	<b>Norwegian Agency for International Development</b>
<b>NPBC -</b>	<b>National Plant Breeding Centre</b>
<b>NPDP -</b>	<b>National Poultry Development Programme</b>
<b>NRC -</b>	<b>National Research Centre</b>
<b>RRC -</b>	<b>Regional Research Centre</b>
<b>UoN-DAP -</b>	<b>University of Nairobi, Department of Animal Products</b>

**USDA - United States Department of Agriculture**

**VOPS - Vegetable Oil/Protein System**

**Currency Equivalent**

**Currency Unit--Kenya Shilling (KShs)**

**Rate Used--USA Dollars--USA\$1 = 30 KShs**

## **PREFACE**

This confidential study on technology development and usage in the poultry feed processing subsector in Kenya has been prepared for use by the Post Harvest Institute for Perishables (PIP) of the University of Idaho.

The information contained herein has been obtained from key sources involved in the poultry industry and in its ancillary trades (hatcheries, pharmaceutical companies, seed companies, loaning institutions, etc.); selected FAO, World Bank and Ministry of Livestock Development publications; and various other independent sources in Kenya. Any prospective investor or lender is expected to conduct their own appraisal prior to an investment decision. No representation or warranty is provided by Blake and Associates Inc. or the University of Idaho as to the accuracy or completeness of the report, although the information contained herein was derived through diligent effort and is believed to be substantially correct.

## EXECUTIVE SUMMARY

This study is one of a series of reports to (1) inventory successful cases of technology development and transfer to Sub-Saharan Africa; (2) identify successful examples of public/private sector collaboration to design a model and identify opportunities for U.S. firms to market, invest and develop technologies in Africa; and (3) develop a data base of critical information for U.S. firms to enter the technology development and transfer market in Africa. To this end, this study investigates public and private collaboration in technology use and transfer in the Kenyan poultry feed industry.

Kenya's poultry feed industry was chosen because technological issues in that industry are a major constraint to increased poultry consumption in that country. Very few countries in the world consume such a small amount of poultry meat as Kenya. Poor quality and unavailability of feed ingredients, lack of poultry management expertise, poor marketing practices, and the high cost of poultry meat are major problems that must be solved to establish a successful poultry industry in Kenya. Moreover, weak and unimaginative marketing and packaging practices have resulted in unattractive and low quality poultry products in Kenya. There is a general lack of experienced, motivated management experts to guide and train local personnel in all phases of poultry management, processing and marketing.

There is ample opportunity for investors to develop effective ways of selling poultry meat in small enough quantities to be affordable to poorer Kenyans. Past industry experience has shown that when the price of poultry meat is reduced through the introduction of modern, efficient feed and meat production practices, and when the finished product is attractively packaged, poultry consumption increases. Kenyan consumer demand for meat products is already on the rise. The demand for animal products is increasing due to rapid population growth and changes in consumer tastes and preferences. The livestock sector has to accommodate these changes in consumption. The demands for direct food production are increasing to such an extent that land for extensive grazing is becoming scarce, and therefore, livestock production systems need to undergo structural changes.

The performance of the poultry feed industry has important implications for structural change in the poultry industry. One of the structural changes required in the poultry industry is the increased use of processed feeds which can sustain or increase production through yield increases. There is, therefore, a need to produce adequate quantities of high-quality feeds for poultry to meet the nation's demand for poultry meat and eggs.

The pricing structure for the raw materials for poultry feeds has been identified as a constraint in the poultry feed industry. The price control structure needs to be reviewed for both the raw materials and the final product - the feed. In addition, alternative sources of raw materials for poultry feed manufacture are needed to reduce dependence on the feed sources whose prices continue to rise.

On-farm feed mixing is yet another option that requires further investigation. Since the raw materials are available in the rural areas, the cost of feed could be reduced by promoting rural processing. Furthermore, other sources of poultry feed require research, as is the case of soybeans and sorghum, as well as lupin and amaranth. These alternatives would ease the pressure on the processed feed industry.

The need for quality control is emphasized for both the raw materials and the manufactured feed to ensure the productivity of the poultry industry. Quality control is especially important for protein-containing raw materials.

This study assesses the poultry feed industry in Kenya, focusing on availability of raw materials for the manufacture of feeds. The factors that determine the availability and quality of poultry feeds are discussed. The performance of the feed manufacturing industry is then investigated. The study reviews the performance of the industry within the context of the quality of feeds, which is determined by availability or lack of ingredients in poultry feed formulations. Finally, the study proposes areas where further research work will be required to increase the production and availability of poultry feeds. One area investigated is the potential utilization of alternative poultry feeds, including oil seed byproducts and sorghum. Some of the key problem areas in the poultry industry which, if addressed, could minimize the cyclical nature that has characterized the industry in the past are outlined below:

- i) Unavailability of feeds;
- ii) Quality of feed;
- iii) Disorganized marketing arrangements and information;
- iv) Lack of established quality control measures;
- v) Inadequate research data, particularly at the farm level;
- vi) Lack of effective extension services at the farm level to handle poultry management problems;
- vii) Inadequate policy guidelines on the issues related to the production of raw materials and manufacture of poultry feeds;
- viii) High price of poultry feeds;
- ix) Lack of adequate credit facilities to assist poultry farmers; and,
- x) Inadequate allocation of foreign exchange with which to import breeding stock and ancillary supplies such as poultry health products and vaccines.

### **Recommendations**

The Government of Kenya could implement several reforms to improve the poultry industry and lead the way in strengthening the country's agriculture. Recommended GOK actions are:

- (1) Make firm and deliberate policy decisions to encourage poultry feed millers to produce and use raw materials that are commonly used for human consumption.

- This encouragement of increased production of feed resources should include provision of more incentives to small farmers. Improved seed varieties, application of more fertilizer, available storage facilities for poultry feed, use (rather than export) of excess maize, and price and government incentives to produce cereals for poultry feed (possibly even allocation of production hectareage) would also improve the feed situation;
- (2) Improve the timeliness of fertilizer distribution. Currently, there is insufficient infrastructure for its delivery. During the 1991/92 crop season, fertilizer was not delivered in time for planting;
  - (3) Improve extension services. Field service is an important factor in the poultry industry. Without it, there can be no viable poultry industry in Kenya. Currently, there are no veterinarians specializing in poultry, no poultry nutritionists, and no poultry management specialists;
  - (4) Support training of more poultry husbandry extension staff to strengthen the advisory service to poultry farmers;
  - (5) Assist in providing low interest loans to the growers (there are currently none available);
  - (6) Assist in providing credit to eligible poultry farmers so that they can further improve their poultry businesses;
  - (7) Provide incentives for fish farming. There is currently a shortage of fishmeal in Kenya, and meal is imported in limited amounts;
  - (8) Gradually privatize parastatal projects and companies;
  - (9) Provide incentives for experienced foreign investors to develop agricultural projects. The IPC has made considerable headway in this area, with the establishment of a "one-stop shop" for investor approval, better guarantees for repatriation of capital and profits, and promoting joint ventures. However, additional reforms could increase investment incentives, such as fewer restrictions on foreign investment and tax incentives;
  - (10) Simplify processing of import licenses and allocation of foreign exchange to facilitate regular importation of breeding stock, vaccines, poultry health products, and equipment;
  - (11) Remove import duty on breeding stock;
  - (12) Review pricing of poultry feeds for the purpose of either decontrolling the prices of raw materials or gradually relaxing final product price controls;
  - (13) Eliminate duplication of responsibilities in various government agencies;
  - (14) More measures for water conservation could be implemented. For example, automatic drinking devices would reduce waste, and water could be recycled for clean-up uses, which reduces waste water that enters the septic system;
  - (15) Safeguarding agricultural lands and preventing the destruction of the limited arable and valuable lands; and,

- (16) Improved marketing practices, such as better egg cleaning and packaging, implementation of an egg grading system, refrigeration (which is generally not available except in some supermarkets), beginning of a live broiler market, better poultry meat packaging, increased availability of cut-up chicken, better sanitary conditions in display and storage of meat, and more refrigeration of meat.

### Areas of Further Research

The following areas of further research and study are recommended to address the major problems mentioned earlier:

- (1) Evaluate the nutritional quality of locally produced poultry feedstuffs.
- (2) Test the performance of chicks, grower pullets and broilers on rations with different levels of locally grown and processed poultry feedstuffs.
- (3) Assess the economics of using a formulated cereal balance meal based on locally-processed oil cakes and fishmeal as easy-to-mix ingredients for farmers.
- (4) Undertake trials on the possible use of alternative energy sources, such as sorghum, cassava and millet, mixed with home-produced oil seed cakes from sesame, soy, sunflower, rapeseed, and cottonseed.
- (5) Undertake a detailed study of the poultry industry to obtain accurate information on:
  - a) Actual poultry feed produced and its quality
  - b) Incidence of disease
- (6) Justify the need for new hatcheries. Investigate and establish the demand for chicks versus the capacity of the hatcheries to meet this demand.
- (7) Study the marketing structure for eggs and poultry meat to obtain information on the market channels, prices, supply/demand situation, volumes, consumption habits, trends, and constraints.



## INTRODUCTION

This study is one of a series of reports to (1) inventory successful cases of technology development and transfer to Sub-Saharan Africa; (2) identify successful examples of public/private sector collaboration to design a model and identify opportunities for U.S. firms to market, invest and develop technologies in Africa; and (3) develop a data base of critical information for U.S. firms to enter the technology development and transfer market in Africa. To this end, this study investigates public and private collaboration in technology use and transfer in the Kenyan poultry feed industry. Kenya's poultry feed industry was chosen because technological issues in that industry are a major constraint to increased poultry consumption in that country. Very few countries in the world consume such a small amount of poultry meat as Kenya. Past industry experience has shown that when the price of poultry meat is reduced through the introduction of modern, efficient feed and meat production practices, and when the finished product is attractively packaged, poultry consumption increases.

Food resources are severely limited in nations that are experiencing the greatest pressure from population expansion. Protein insufficiency is widespread. Staples such as rice, corn, pulses, and cassava are so poor in protein that children cannot eat enough to supply their protein needs. Proteins of animal origin such as poultry meat and eggs provide a concentrated source of readily assimilated amino acids in suitable proportions for human needs.

A meat-eating economy generally requires an affluent society, an overabundance of grain, a well-developed, sophisticated agriculture, and strong purchasing power. Animal agriculture has certain limitations. Animals compete directly with man for his basic food supply, principally grains and high protein oil seeds. In Kenya, population growth pressures are a major concern. At greater than 4.0 percent per year, population growth severely constrains land availability, to the degree that some cattle farmers are changing to zero stock growth methods. Consequently, more demand is being placed on fodder crops and other grains.

The following study examines the current state of the poultry industry in Kenya and recommends several areas of concentration for developing this industry. Part I provides an overview of the poultry sector in Kenya, including an analysis of feed and poultry demand and supply factors; investigates existing poultry feed technology supply and demand; looks at the available research support for advancing poultry technology; describes existing Government support for the industry; describes current collaboration between public and private sectors in research and technology development and use; and, overviews the economic, business and regulatory environment for investment. Part II discusses the issues and implications of the findings presented in Part I regarding the structure of the industry and existing constraints on growth. Part III draws conclusions about the poultry industry and outlines recommendations for removing constraints to the growth and development of the industry, fostering improved technology development and use, and promoting future growth in poultry production.

## **PART I:**

### **1. OVERVIEW OF POULTRY AND POULTRY FEED PRODUCTION**

#### **1.1 Overview of Poultry Production**

Poultry is the most abundant type of livestock in Kenya. Most poultry are kept on small holdings under free range conditions. Commercial poultry farmers and farmer groups employ more intensive poultry production methods, using improved poultry breeds, specialized housing, and purchased commercial feeds. Intensive poultry producers are the principal suppliers of eggs and meat to the main urban area.

The major objective of poultry feeding is to convert feedstuffs into human food. The efficient use of feed is extremely important to poultry producers. Up to 75 percent of the total production cost of poultry meat and 60 percent of the production cost of eggs comes from feed. However, in terms of the conversion of feed calories to food calories, Kenyan poultry is highly efficient.

A wide variety of feedstuffs can be, and are, used in poultry rations. Broadly speaking, these may be classed as energy feedstuffs, protein supplements, mineral supplements, vitamin supplements, and non-nutritive additives. The poultryman must choose the feeds that are most economical for the particular demands of the bird to be fed. A high energy, high protein feed that is given to a low-producing layer or an inefficient chick is not cost effective. Conversely, a low cost, low energy feed that is fed to a potentially-high producing bird will not achieve maximum potential nor minimum cost.

A balanced and consistent quality ration, in particular, is required for hybrid chickens to express their genetic capabilities. Several grains (not used primarily for human consumption) can potentially be used to satisfy the lack of feed ingredients. The staple food of the Kenyan diet is white maize, grown on the best farm land in Kenya. This means that its use as a feedstuff is in direct competition with its use for human consumption. Sorghum can be grown on drier and less optimum lands. Fish meal and oil seed cakes can be used as a protein source.

Poultry will generally be less productive in hot climates than in temperate regions. This lower performance is caused largely by the reduced voluntary energy intake which occurs at high temperatures, resulting in a lower availability of nutrients for weight gain and egg production. Some of this production loss will be unavoidable; the rate of deterioration may be minimized by various manipulations of stock management, house design, ventilation, and nutrition.

## Exhibit 1

### Kenya Country Statistics

Area	569,000 sq km
Climate	Northeast semi-arid to arid: mountainous; southwest has mild winter and two rainy seasons, March - May and November - December
Population	24.59 million (1990 estimate), GNP per capita: US \$370 (1990)
Country Characteristics	Low-income food deficit country: regular importer and occasional exporter of grain; high potential agricultural land in the center and west and semi-arid in the north
Infrastructure	Good port (Mombasa) and extensive rail and road network, gateway to Burundi, Rwanda and Uganda
Major Foodcrops	Maize, wheat, pulses, roots and tubers
Marketing year	June/July
Estimated Cereals Consumption	120 kg per year per capita
Percent of Calories:	56 percent (coarse grains 47 percent, wheat 8 percent, rice 1 percent)
Calories per Capita:	55.5 grams (14.4 total grams of animal protein, 41.4 grams of vegetable products)

Note: The aggregate production of cereals for 1989/90 was estimated at 3.5 million tons.<sup>1</sup> This included 3.2 million tons of coarse grains, which exceeded domestic consumption requirements and left some 300,000 tons of white maize available for export.

<sup>1</sup>FAO Yearbook, 1991.

## 1.2 World Poultry Markets

Worldwide, the poultry industry is growing rapidly. Because of the short periods required for growing and marketing, the poultry industry can adjust rapidly to a variety of economic factors, such as, feed availability, numbers of birds on feed, and costs. Other livestock enterprises, notably the cattle industry, need relatively long periods to adjust to market changes because of the length of time required for the animals to mature or produce. A number of byproducts are fed to poultry including blood meal, oil cakes, molasses, fish meal, bone meal and rejected rice.

The changes in technology that have occurred in the poultry industry in the past 40 years have also been an important stimulus to the industry worldwide. Higher incomes in many parts of the world have raised consumer demand for poultry products. The technology developed for feeding, disease control, and production management can be used nearly all over the world with relatively little modification, thus the technological advances in poultry production have been quickly applied in many parts of the world. The Food and Agricultural Organization of the United Nations (FAO) estimates of egg and poultry production in various parts of the world are shown in Exhibit 2 (including broilers and layers).

### Exhibit 2

#### World Egg And Poultry Production (1990)

Region	Eggs (1000 MT)	Poultry Stock (millions)
Africa	1420	861
North and Central America	5,794	1,945
South America	2,310	933
Asia	14,274	4,447
Europe	7,175	1,271
Oceania <sup>1/</sup>	246	84
Commonwealth of Independent States	4,540	1,200
Total World	35,758	10,740

<sup>1/</sup> Includes Australia and New Zealand.

Source: FAO Production Yearbook 1990, Vol. 44, 1991.

### **1.3 Kenya's Agricultural Situation**

#### **1.3.1 Production Overview**

The finest soil in Kenya is found in the highlands and on the plateaus sloping westward from the highlands to Lake Victoria. Here, is found some of the best agricultural land in Africa. Fertile soils can also be found along the Indian Ocean coast. These soils are well drained and have a high humus content, suitable for intensive cultivation.

The better soils usually receive adequate amounts of rainfall for cultivation. However, roughly 80 percent of the country's soils are located in areas having semi-arid and arid climates. They support varying amounts of natural vegetation suitable only for extensive grazing. Somewhat better soils are found beyond the coast and in the semi-arid zone skirting the country's higher elevations. Both usually receive enough precipitation to support subsistence agriculture. Those areas have long been used by pastoralists mainly for raising livestock.

Kenya's tropical climate permits the cultivation of a variety of crops ranging from tropical to temperate. Coffee, tea, white maize, sugar cane, sorghum, and wheat occupy the majority of arable land. These crops are all cultivated under dry farming. Irrigation is used to a small extent. However, the Government of Kenya is considering developing irrigation projects in order to expand production and to increase productivity.

Approximately 20 percent of Kenya's total land area, 569,000 square km, is estimated to be of high or medium potential for crop cultivation, forestry use, or intensive livestock grazing. About 10 percent is marginal land in semi-arid areas usable for rain-fed subsistence agriculture and livestock husbandry. The remaining 70 percent is largely semi-desert used by pastoralists for extensive livestock grazing.

The indigenous fowl of Kenya is well adapted to harsh conditions. Indigenous fowl often rely on scavenging for insects, grass seed, and greens, in addition to kitchen and other leftovers provided by the owner. Although the indigenous breeds are better adapted to the existing conditions, the improved or imported strains make a valuable contribution to diets, once management has improved and proper vaccines are available. The so-called exotic hybrids or genetically-improved pure lines generally outperform the local stock.

#### **1.3.2 The Structure of Farming**

Since Kenya gained its independence, agriculture has developed into three major subsectors: (1) a subsistence sector (producing primarily for home consumption), (2) a commercially-oriented smallholder sector (producing both food and cash crops), (3) and a large farm sector. These groups are defined as follows:

- Smallholders and pastoral holders - land area from a half hectare to six hectares.

- Medium size holders - land area between 20 and 50 hectares
- Large landowners - over 50 hectares.

Smallholders produce mainly white maize and beans for subsistence, with some cash crop and livestock production. This subsector, in terms of output, land area, and employment, is dominant. Smallholders produce about 75 percent of agricultural output on 66 percent of arable land. They also provide 85 percent of total agricultural employment and produce 50 percent of marketed output.

At present, large- and medium-size farmers cultivate about 3.5 million hectares. Their main products are white maize, wheat, barley, livestock, coffee, tea, sugar cane, and sisal.

Historical land fragmentation has presented a serious problem to Kenyan farmers in the past. During the 1970s and 80s, real estate brokers bought large parcels of land, divided them up and sold them to small farmers, thus making it impossible for large farmers to operate commercial equipment such as tractors and harvesters. This practice of land parcelation is not as prevalent now.

#### **1.4 The Poultry Industry**

The poultry industry in Kenya is vastly underdeveloped, producing only 17.9 million birds in 1987 according to statistics of the Ministry of Livestock, and an estimated 25 million birds in 1990, according to FAO statistics (see Exhibit 3). Capital shortages, level of infrastructure, lack of trained technical manpower, and marketing systems have hampered the poultry industry in Kenya. The buildings are inadequate and the equipment poor, marketing practices are inefficient, supporting infrastructure is lacking most importantly in refrigeration and in bulk food storage capacity, and feed quality is generally poor. Other factors crucial to commercial poultry production include shortage of feed grains, poor quality feed, lack of appropriate breeding stock, importation bottlenecks, difficulties in securing medicines and additives, inefficient production methods, and lack of qualified technicians.

At the same time, the climate for poultry production is ideal, with the capability of producing alternative grains for feed, such as sorghum and millet, on poorer soils than those required by some of the grains used for human consumption. Whole grain rations are not fed to poultry as a general rule. The ration consists of a variety of price-controlled grain byproducts. At the present time, experiments are being conducted in the production of lupin and amaranth as a poultry feed ingredient, among other uses.

### Exhibit 3

#### Kenyan Poultry Population

Year	Number (thousands)
1978	14,500
1979	15,700
1980	15,600
1981	15,900
1982	19,700
1983	19,700
1984	15,400
1985	15,800
1986	16,800
1987	17,900
1988 *	23,000 F
1989	24,000 F
1990	25,000 F

F = estimated figures.

\* 1988 - 1990 figures from FAO Yearbook.

Source: Ministry of Livestock Development, Annual Report, 1988.

FAO Production Yearbook 1990, vol 44, FAO, Rome, 1991.

#### 1.5 Demand for Poultry

Although poultry meat is the meat of preference, its higher cost has kept consumption very low according to interviews with supermarket managers and poultry producers. Most poultry meat is consumed on holidays and special occasions. Exhibit 4 shows that there was no increase in consumption from 1983 through 1985. This has largely been due to critical shortages and unreliable supplies of poultry feed ingredients. Furthermore, more recently, day old broiler chickens with one hatchery have dominated the industry creating difficulties for importing day old chicks. Other hatcheries and poultry farms cannot obtain the necessary foreign exchange. The shortages have resulted in an increase in the price of frozen broilers and a corresponding decrease in the consumption of poultry in the lower income groups.

## Exhibit 4

### Historic Per Capita Meat Consumption In Kenya

Type of Meat (lbs/capita/year)	1985	1984	1983	1982	1981	1980
Beef/Veal	15.6	29.0	27.3	27.9	27.1	25.3
Edible Offal	4.2	7.3	6.5	6.5	6.5	6.5
Sheep/Goats/Camels	6.8	7.5	8.6	9.6	9.7	9.9
Pork	.2	.4	.6	.6	.6	.5
Poultry*	1.7	1.7	1.7	1.9	1.9	1.9
Total meats	<u>28.5</u>	<u>45.9</u>	<u>44.7</u>	<u>46.5</u>	<u>45.8</u>	<u>44.1</u>
Milk/butter	94.6	76.6	93.3	105.4	104.9	103.1
Eggs (eggs/capita/yr)	N/A	12.0	13.2	14.1	13.9	13.9

\* These figures include depleted commercial layers.

### **1.6 Chick Production**

The Kenya hatcheries import grandparent and parent stock from Europe, Israel, and the United States to produce parent stock. (Grandparent stock (GPS) reduces the need for foreign exchange, as the GPS produces first the parents, F1, and the commercial, F2.) The majority of the commercial stock is sold to farmers. However, one large hatchery is raising broiler chicks by contract with local farmers. The farmers then sell the six-week-old broilers to the hatchery, which processes the broilers through their processing plant. There is currently a critical shortage of day-old broiler chicks. The import of breeding stock is strictly controlled by the government, because of the shortage of foreign exchange. The production of day-old chicks is in the hands of a selected number of hatcheries. Exhibit 5 shows the unofficial estimates of Kenya's recent stock levels.

## Exhibit 5

### Kenya Chick Production (1987-1991)

Year	Broilers	Layers	Total
<u>Parent Stock</u>			
1987	82,599	32,129	114,688
1988	76,925	51,611	128,536
1989	n.a.	n.a.	n.a.
1990	--	34,487	34,487
1991	--	42,942	42,942
<u>Grandparent Stock<sup>2</sup></u>			
1990*	213,300	--	213,300
1991*	45,755	--	45,755

n.a. = 1989 data not available; -- = negligible.

Source: Unofficial MLD statistics, 1991 (not documented).

### 1.7 Poultry Vaccines

The Ministry of Livestock Development (MLD) produces some vaccine for poultry, but according to many of the farmers, the supply is erratic and limited, and many of the required vaccines are outdated. Several pharmaceutical companies import vaccines, but the supply is not steady. Recently there was an outbreak of disease on one of the largest farms in Kenya because the birds were not vaccinated. The inability to obtain an import license, plus shortage of foreign

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<sup>2</sup> Kenchic launched the grandparent stock program in June 1990. Chicks were imported from Arbor Acres, U.S.A. Also, in 1991, two million broiler hatching eggs were imported due to acute shortage of day old chicks.

exchange have resulted in extremely high mortality in some flocks because of a lack of proper vaccines.

## **1.8 Production Equipment**

The majority of the automatic equipment, such as feed mills, processing plants, automatic feeders and drinkers, and egg graders must be imported. However, its purchase is again limited because of the need for foreign exchange. Seventy-five to 85 percent of the feedstuffs used in the poultry feed are from local sources. The quality varies considerably because of poor storage (loss of vitamins through heat and humidity), mold growth, and rodents. Moisture content is also a factor. The two main ingredients used in commercial poultry production worldwide are maize and soybean. Maize is the main diet of Kenyans and soybean is not produced in the country.

## **1.9 Market Channels**

Retail prices of various meats and poultry products were obtained through a survey taken by the consultants in April 1992, and are shown in Exhibit 6, below. Eggs are marketed loosely in local shops or in 30-egg flats (made in Kenya). A flat of 30 eggs costs 60 to 80 KShs, the equivalent of U.S. \$ .80 per dozen. Eggs are not separated by size or quality and are poorly packaged. It appears that the majority of eggs are purchased by restaurants, hotels, bakeries and the military. Eggs are delivered from the farms to the markets in Nairobi, once or twice a week. They are not held under refrigeration at the farm. Most of the markets also do not refrigerate the eggs. A small portion of egg sales occur at the farmgates. Nairobi appears to be the "hub" of the egg market from which the eggs are shipped to Mombasa and other population areas.

### **1.9.1 Poultry Meat**

Depleted hens (those that have completed their laying cycle) are sold in the open market live and not by weight. The majority are depleted commercial layers and backyard chickens. They are in poor condition and their weight varies substantially.

### **1.9.2 Broiler Meat**

Kenya has no public, live bird market for commercially grown broilers. Cost is probably the major deterrent, since the cost of a whole chicken is much more than the average Kenyan family can afford.

## Exhibit 6

### Retail Prices For Various Meats And Other Food Items In Kenya April 1992

Type of Food	Ave KSh/unit	
1. Hens and Spent Fowl	110-150	1.2 kg.
2. Fish-		
Nile perch-fillet	75	Kg
Tilapia-whole	55	Kg
Tilapia-fillet	125	Kg
3. Chicken-		
Broiler	80	Kg
Local	70	Kg
Capon	75	Kg
4. Pork	70	Kg
5. Eggs		
Supermarkets	60-80	Flat-30 eggs
Farm	55-70	Flat-30 eggs
6. Beef		
Topside	70	Kg
Rump Steak	75	Kg
Meat with bone in	50	Kg
T-Bone	95	Kg

Source: Original market survey.

Most frozen, commercially-processed, whole broilers are distributed in small uninsulated trucks to restaurants, hotels and other institutional users. A small number of broilers are sold directly to consumers through supermarkets throughout the city. Poultry meat packing is unimaginative (usually plastic bags). Dressed broilers are quite small with poor conformation and weight between 1.0-1.2 kg. Because white maize is sometimes used in the feed ingredients, the birds are pale skinned. There is very little cut-up chicken. It is only cut up at the customers request by the butcher who uses a cleaver to produce many bone-fragmented pieces.

Freezer or cooler space in the better supermarkets is usually limited to one old chest freezer or sometimes just a cooler. Open air markets display all meats (including fish and chicken) on concrete tops or in unsanitary non-refrigerated display cases.

### **1.9.3 Manure and Poultry Offal**

Poultry manure is sold as fertilizer and as a supplement feed for cattle and swine. Disposal is no problem at this time. If the manure is for land application, it is not processed. If it is to be used for cattle and swine feed, it is sifted to separate some of the litter. Because of poor poultry management, the litter, in some cases, contains a substantial amount of poultry feed and adds considerable nutrients to the cattle and swine diet. The manure for livestock is sold for about 1 KShs per kg.

Poultry offal from the processing plant may initially be used as swine feed, but eventually when volume merits, this offal will be rendered and used as a protein source for poultry feed. If municipal sewerage is not available, lagoons can be built near the processing facility to settle the biological load before water run off.

## **1.10 Infrastructure**

The installed capacity of electricity in Kenya was 558.7 megawatts as of 1987. All the urban areas are in the electrical network. However, rural electrification is not completed, and few rural areas have access to electricity. A portion of the electrical supply comes from Uganda.

### **1.10.1 Storage of Grains**

Presently, the total storage capacity of the public and private sectors is about 1.1 million metric tons (mt). However, conventional stores are needed for smaller depots that handle bagged grain.

### **1.10.2 Rail**

The Kenya Railways Corporation operates a network consisting of 1,086 kilometers of rail from the Indian Ocean to the border of Uganda, along with 1,028 kilometers of branch lines. Rolling stock is fairly old.

### **1.10.3 Roads**

There is a well-integrated road system, totaling 150,000 kilometers. There are acceptable roads between Nairobi and other principal cities. Most secondary highways are badly in need of repair.

### **1.10.4 Air**

The airports of Nairobi and Mombasa were opened in 1977 and 1979, respectively, and are of international standard. In addition, a number of companies operate light aircraft services that link the principal cities and towns in the country. Nairobi has an excellent network of flights to European centers and good connections with other major African cities.

#### **1.10.5 Sea**

The Kenya Ports Authority, a wholly-owned government corporation, is responsible for handling cargo entering and leaving the Port of Mombasa, and for operating other minor ports along the coast. Considerable work on modernizing and enlarging Mombasa Harbor was undertaken in 1978; further work is currently in progress.

#### **1.10.6 Communications**

Interurban telephone connections are acceptable, and principal cities have telegraphic connections abroad. International telex installations are available to businesses. Postal services are reasonably well-organized; delivery is via post office box. Fax facilities are available.

#### **1.11 Current Condition of Support Services**

Although the Ministry of Livestock Development does have facilities to test feed, the equipment is not in working order. There are facilities for post-mortem and diagnostic work, but it seems there is some question about its effectiveness.

There is a severe shortage of breeder hatcheries in Kenya. Most farmers have to wait several months before getting their chicks, and then their order is reduced because of shortages. One hatchery demands a deposit well in advance of delivery. In one case, an individual deposited 1.3 million KShs in anticipation of receiving chicks as promised. Approximately 20 percent have been delivered over a one year period.

Extension services from the Ministry of Livestock Development are practically nonexistent for the poultry farmers. The main activity in the field of poultry is the Cockerel Exchange Programme in the villages of Kenya. The indigenous male is exchanged for an improved breed for the purpose of upgrading the next generation.

Commercial egg producers and broiler growers depend on feed millers, hatcheries, and in some instances, pharmaceutical companies for advisory services. They are, however, not adequate.

Vaccine supply is unreliable, and, in fact, a serious outbreak of disease occurred because of the government's reluctance to recognize the disease.

## 2. POULTRY FEED SUPPLY AND DEMAND FOR TECHNOLOGY

### 2.1 Overview of the Poultry Feed Situation

Good poultry nutrition first involves a correct feed formula for the particular type and age of chicken to be fed. Practically all the nutrients the bird receives must be incorporated in the feed it eats. Not only must the nutritional demands be met, but care must be taken to see that an excess of any ingredient or compound is not fed, not only for nutritional reasons, but to provide a diet that is economical as well.

At present, over 80 percent of the total chickens are indigenous types which are rarely fed on commercial feeds. The commercial chickens, broilers, and layers are fed on formulated feed. During the years 1978 to 1988 the requirements for poultry feeds have increased by approximately 10 percent per annum, as seen in Exhibit 7.

Exhibit 7

#### Poultry Feed Requirements

YEAR	TOTAL ANIMAL FEED IN MT	POULTRY FEEDS IN MT	POULTRY FEED AS A % OF TOTAL	PERCENT CHANGE IN POULTRY FEEDS
1978	176.4	79.4	45	
1979	172.4	65.2	46	- 18
1980	107.7	49.6	46	- 24
1981	131.5	63.9	49	+ 29
1982	112.6	61.0	54	- 4
1983	152.1	92.4	61	+ 51
1984	139.5	69.5	50	- 25
1985	136.9	74.8	55	+ 8
1986	178.2	123.8	70	+ 66
1987	197.5	130.0	66	+ 5
MEAN	14.7	81.0	55	+ 10

Source: MLD Annual Reports 1978 -1987

## 2.2 Current Feed Product Lines

The principal ingredients used in formulating poultry rations are oil cakes, sesame, cottonseed cake, sunflower, maize (when available), rejected rice, rice polishing, maize gluten meal, fish meal (local and imported), limestone cereal byproducts, wheat, and bone meal. The level of Kenya's domestic production of some of these commodities can be seen in Exhibit 8. According to the manager of one of the larger feed mills, a Malaysian company is establishing a palm oil processing plant in Kenya.

The by-products of Kenya's food production are used for animal feed, when available. The staple diet of Kenyans consists of white maize, wheat, sorghum, tubers, and roots. Only twenty percent of the Kenya's land receives sufficient rainfall for agricultural production, of which seven percent is considered to be "first class" land. The condition of Kenya's soil has become a major obstacle in the country's quest for food self sufficiency. The overall growth in output of cereal crops is low. The slow expansion of cereal production is equally attributable to low growth rates in areas cultivated and in yields. With little arable land available, cultivation is intensive and competition between crops is substantial, putting constraints on the production of poultry feed inputs. On the other hand, the dry areas are extensively being used for grazing livestock by subsistence pastoralists. Although one study found per capita calorie consumption to be above the minimum requirements, it also projected a deterioration of the food situation in Kenya in 1990s.

Following is a list of the food production and the forms of by-products which are used as animal feed:

<u>Food Product</u>	<u>Animal Feed Ingredient</u>
• Groundnut	Ground nut meal
• Sunflower seed	Sunflower seed cakes
• Maize	Gluten feed, maize gluten meal
• Rice paddy	Rice bran, broken rice
• Cassava	(Not currently used as animal feed)
• Millet	(Not currently used as animal feed)
• Barley	Brewer's yeast
• Wheat	Wheat bran, wheat middlings

There is currently much commercial interest in the poultry industry, especially in the Nairobi area. Many poultry farmers would like to produce broilers, but are hesitant because of insufficient supply of maize, the major ingredients of broiler rations, and the high cost of maize and other ingredients.

Exhibit 8

KENYA FOOD PRODUCTION  
1988 - 1990

	AREA 1000 HA			YIELD KG/HA			PRODUCTION 1000 MT		
	1988	1989	1990	1988	1989	1990	1988	1989	1990
Groundnuts	14 F	14 F	15 F	637	644	621	9 F	9 F	9 F
Sunflower Seeds	3 F	3 F	3 F	1424	1433	1441	5 F	5 F	5 F
Maize	1451	1554	1500 F	1903	1882	1800	2761	2925	2700 *
Rice Paddy	14	13	15 F	3116	4421	3933	45	58	59 F
Sorghum	144	146 *	140 F	1001	979	1036	144	143 *	145 F
Cassava	65 F	66 F	65 F	9231	9545	10000	600 F	630 F	650 F
Millet	110	96 *	100 F	650	625	620	72	60 *	62 F
Barley	12 F	13 F	14 F	1667	1538	1571	20 F	20 F	22 F
Wheat	151	154	150 F	1615	1591	1533	243	245 *	230 F
Soybeans									

### **2.2.1 Wheat**

The demand for wheat has drastically increased during the past few years. This is particularly noted in the urban area. However, limited availability of arable land prevents the expanded production of wheat. Consequently, a good portion of consumer demand is imported. In 1985/86, the production of wheat was estimated at 250,000 metric tons. In 1990, it was estimated at 230,000 mt.

### **2.2.2 Fish Meal**

Kenya's fish industry is composed of both fresh water and marine fish. Lake Victoria is the largest source of fresh water fish. This lake is one of the largest fresh water lakes in the world with an area of 4,000 square kilometers. The two main fish in Lake Victoria are Nile Perch and Tilapia, respectively. The total fish landing from this lake is estimated at 70,000 metric tons per annum.

The Fisheries Department is encouraging fish farming. Presently, over 24 fish ponds have been established in various districts in the western area near Lake Victoria. These ponds are demonstration ponds for fish farming activities. The main fish used in fish farming is Tilapia. Programs are also underway in the coastal region for the development of shrimp farming. The Food and Agricultural Organization (FAO) of the United Nations has already implemented marine shrimp (*Panaeus monodom*) farming in the Coastal region in the Malindi district.

Fish meal is a good source of protein produced that is locally. However, fish meal cannot be used for more than eight percent of a total ration and thus can contribute less than half of the desired protein. Too much fish meal can create an undesirable taste in both poultry meat and eggs and rancidity which causes a deadly vomiting condition. In most developed poultry industries, fish meal is avoided because of potential rancidity problems and difficulties with Salmonella contamination.

### **2.2.3 Barley**

Substances such as barley, cassava meal, and rice hulls are frequently used in poultry rations but must be limited to 20 percent to 40 percent maximum for a nutritionally balanced ration, and one which does not violate other constraints (such as, toxicity and digestive capability) of the laying flock or the broiler bird.

#### **2.2.4 Maize**

Among the grain crops, maize is the most important and the most universal cereal, and is grown in areas with at least 630 millimeters of well distributed rainfall per year. Maize cultivation is widespread within most of the medium to high potential areas. For the farmers, maize is not only one of the leading crops, but it was also the main cash crop long before other cash crops were introduced. Yields of maize vary from 500 kilograms to six tons per hectare, depending on the area and type of farming. It is estimated that 1989/90 yields were about 2.7 million metric tons, which would meet domestic consumer demand. Byproducts are used in poultry rations.

If seed price is low, farmers will plant maize. If the ratio of seed cost to sale of product is 2:1, it is acceptable to the farmer. If they are not satisfied with the profit, the farmer will grow another crop. The present price for maize is 4.65 KShs (Kenya Shillings) per kg. Seed cost is currently eight KShs per kg.

Kenya Seed Company buys their hybrid seed from the Agricultural Development Corporation (ADC), which researches new varieties, then does the maintenance breeding. Fifty percent of the hybrid seed production is contracted out to ADC, and the remaining 50 percent is contracted out to local farmers. Individual farmers can produce hybrid seed maize cheaper than ADC (which is a parastatal) because they are more labor efficient. In general, farmers' equipment is well maintained and will last much longer than ADC's.

#### **2.2.5 Rice**

Rice production for 1985/86 was estimated to be about 25,000 metric tons. The 1989/90 yields were estimated to be 59,000 mt. It is thought that about 16,000 additional hectares of land can be placed under rice production. Once irrigation projects are implemented, it is estimated that 50,000 metric tons of rice will be produced. In 1986, the annual consumption of rice was approximately 51,000 metric tons. Assuming a population growth of 4% and that consumption kept up with population growth, even if irrigation projects were completed in 1992, approximately 14,500 mt. of rice would still need to be imported to meet the estimated demand of 64,500 mt. Rice byproducts are used in poultry rations.

### **2.2.6 Soybeans**

Thus far, there has been little interest in soybean production, mainly because of the low yield -- 100 to 250 kg per acre, according to the production manager at Kenya Seed Company. However, Kenya Seed Company was approached by the Ministry of Livestock Development and Kenchick (the leading hatchery in Kenya), to consider the production of soybean for oil extraction and soybean meal for use in poultry rations. The proposed project was dropped and Kenya Seed Company was left with 40 metric tons of soybean seed.

### **2.2.7 Other Oil Crops**

There are many oil crops that can be grown in Kenya, but the most important at the moment are sunflower, cotton, sesame, rapeseed, groundnut, coconuts, and castor. Production of oil crops has not enjoyed the attention and promotion accorded to food and export crops, and therefore only small quantities of oil seeds are cultivated. Inevitably, Kenya has continued to rely heavily on imported vegetable oils and fats, and they have become the single largest item in Kenya's food import bill. The national requirement for oils and fats in 1987 was an estimated 100,000 metric tons, out of which only 20,000 metric tons were produced locally.

The widespread production of oil crops in all parts of the country is a testimony to the fact that, with only a little effort and a well-formulated domestic policy, Kenya could sever itself from its excessive dependency on imported edible oil. There is no proper marketing system for most of the oil crops and where there is (such as for sunflower, sesame, rapeseed), the prices offered are so low that farmers have no incentive to grow them. Some of the oil crops being promoted have low oil content, which reduces the price and discourages farmers from growing large areas. Production has also suffered from the competition of highly-subsidized vegetable oils on the international market. Commodity aid in the form of oil, though ensuring a cheap supply of oil on the market, has also affected (to some extent) the production of local oil crops.

## **2.3 Inputs to Feed Production**

### **2.3.1 Fertilizer**

The supply and use of fertilizer for crop production in Kenya is quite limited. For example, there is no commercial fertilizer blending, bagging and distribution system, and fertilizer is currently imported into Kenya pre-blended. Although the total amount of fertilizer consumed in Kenya is about 250,000 metric tons, the demand is twice that much. But even at the existing consumption level, transportation of fertilizer to the farmers is a problem in Kenya.

The need for a commercial fertilizer business is great. Some local companies are studying how to overcome current cost inefficiencies, improve fertilizer distribution and availability to farmers, and incorporate value-added processing into Kenya's economy.

Blending, bagging, and distribution are key operations which should be considered by present distributors wanting to expand their business.

In most cases, the smallholders who produce 75 percent of Kenya's agricultural products do not receive an adequate fertilizer supply. To increase production, an effective distribution system is needed to get fertilizers to growers in a timely fashion. The shipments of fertilizer for the present crop did not arrive in time for the 1992 season. In addition to transportation problems, import licenses were difficult to obtain.

### **2.3.2 Irrigation**

In the first decade after independence, estimates of areas of irrigable land ranged from about 160,000 to 200,000 hectares, but a major study of water resources by foreign consultants, published in 1979, arrived at a figure of 540,000 hectares. This irrigable land was found mainly in the Tan River and Lake Victoria drainage basins, each having an estimated 200,000 hectare potential. The Rift Valley potential was set at 70,000 hectares, and the Eighth-Zouave basin in southeastern Kenya accounted for 40,000 hectares. The remaining 30,000 hectares was along the Ewaxo Ng'iro, which drains into an area mainly north and northeast of Mount Kenya.

The irrigation schemes carried out under the administration of the National Irrigation Board (NIB) have been costly with respect to return, employment created, production, and benefits to the farmer (who was paid based on the operation's net profit.) In the Development Plan 1979-83, the government did not make any new commitments to large-scale projects, but instead emphasized the promotion of small-scale and private projects. The Small-Scale Irrigation Unit, established in the Ministry of Agriculture in 1977, has initiated a considerable number of such projects, mainly in the upper and lower Tan Basin. Since 1979, provincial irrigation units have also been involved. Substantial foreign financial and technical assistance has been received in the program.

## **2.4 Availability of Feed and Protein Sources**

Almost as critical as the lack of maize is the poor supply of protein sources for poultry feed. Soybean meal must all be imported since very little is produced in Kenya. Given the high cost of soy, it is rarely imported. Some fish meal is produced locally, but in limited volume. As a result, poultry feeds are woefully deficient in protein. In turn, this deficiency is reflected in poultry's generally poor performance. Because of the lack of foreign exchange, pre-mixes are not readily available for the small poultry farmer.

### **2.4.1 Milling Capacity**

The majority of feed mills are underutilized. Exhibit 9 provides a list of feed mills and their capacities. Major problems exist with the condition and operational performance of Kenya's feed mills. Many mills are obsolete, while others have various mechanical deficiencies resulting in improper milling and formulation of feed. Even when ingredients and formulas are appropriate, the finished ration is not properly milled and balanced. This results in feed waste, poor feed conversion, and significant losses in handling and distribution. The quality and content of feed is further deteriorated by the lack of adequate storage facilities. Feed in transit and storage is accessible to rodents, pests and birds who not only consume a portion of these valuable resources, but also contaminate the feed. Diseases are often transferred via the feed to the poultry.

In 1989, there was a severe shortage of poultry feeds and most farmers sold their layer flocks. Thus, the hatcheries could not sell their day old chicks and the industry experienced a slump in business. By 1990, the industry recovered and thrived. At that time, the major problems included the following:

- Feed availability had improved by 1990, but there were complaints about the quality of commercial feeds. Toward the end of the year, the feed prices were decontrolled, and naturally, the prices went up. The effect of the price decontrol on feed quality could not be immediately established.
- Demand increased for day-old chicks, especially during the last half of the year. The prices for day-old chicks were fairly stable during this period.

Exhibit 10 shows Kenya's animal feed production by type of feed.

### Exhibit 9

#### Feed Mills and Installed Capacity (Tons) 1/

Feed Mill	Capacity	Location 2/
Unga Feeds Ltd.	125,000	Nairobi, Nakuru
Milling Corporation of Kenya	77,760	Nakuru
Atta Millers	24,000	Mombasa
United Millers	36,000	Kisumu
Meru Central Co-operative Union	54,000	Meru
Rift Valley Hatcheries	1,763	Nakuru
Muus	4,800	Thika
ADC Feed Mill 3/	5,760	Kitale
Muttu Products	14,400	Thika
Arkay Industries	17,280	Kitale
Ideal Manufacturers	14,000	Nairobi
Belfast Millers	50,000	Nairobi
Sigma Feeds	14,400	Nairobi
ABC Foods	60,000	Nakuru

1/ Data extracted from Ministry of Livestock files. 2/ Addresses of these feed mills are provided in the List of Key Players, Appendix A. 3/ Produced cattle feeds for use on ADC farms.

### Exhibit 10

#### **Kenya Animal Feed Production 1987-90 (metric tons)**

Year	Cattle Feed	Poultry Feed	Pig Feed	Other Feeds	Total
1987	53,994	130,032	11,403	2,100	197,529
1988	66,825	113,126	18,825	5,691	204,477
1989	67,538	116,888	19,417	7,212	211,055
1990	50,486	122,960	21,481	8,122	203,409

Source: Extracted from Ministry of Livestock Development Data Files.

### 2.4.2 Quality of Local Feed Ingredients

There are two primary quality problems that poultry producers face. First, there is considerable difficulty maintaining high and consistent quality in poultry rations. This is probably the poultry producer's most serious problem. Problems with sampling methods prevent feed buyers from taking a representative sample of a product and analyzing it before purchase. Moreover, quality throughout a single feed shipment is frequently inconsistent.

Second, lack of availability of quality feed ingredients is another major problem that must be overcome before Kenya's poultry projects can be successful. Most maize is produced on small holdings, so maybe a ton at most is produced by any one farmer, who probably will use half of that himself. Thus, the sheer logistics of purchasing and collecting maize are staggering. Of course, locally-produced maize probably will not be dried properly, so drying equipment will be required, or else most of the locally-purchased maize will spoil before it can be used.

### 2.4.3 Import of Feed Products

Formulated poultry feeds are generally imported. In 1990, Kenya imported an estimated 2000 metric tons of soybeans (Exhibits 11 and 12). The high cost of feed has been a limiting factor in producing poultry products at a reasonable cost, and the sale of poultry products is limited to higher income groups. As a result of this scarcity of prime feed inputs, feed conversion and egg production varies greatly, according to ingredients available at the time of formulation.

#### Exhibit 11

#### Imported Protein Rich Feedstuffs (Metric tons)

Year	Soybean Meal	Meat and bone meal	Fish meal	Cottonseed cake	Total
1985	685	-	5198	112.4	5995
1986	237	-	1077	55.0	1369
1987	755	198	2057	328	3338
1988	3844	412.9	1668	1264	7189
1989	1332	202.0	817	1013	3364
1990	1050	-	600	1670	3320
1991	2212	-	2000	1400	5612

Source: Data extracted from Ministry of Livestock files.

Data on importation of vitamin pre-mix is available for 1990 and 1991. For those, the importation was 157 and 184 tons, respectively.

**Exhibit 12**

**Kenyan Imports/Exports**  
**1988 - 1990**

(metric tons)

ITEM	IMPORTS			EXPORTS		
	1988	1989	1990	1988	1989	1990
Soybean Cake	2470	1500	2000			
Oil Seed Cake	6650	4500	4600	2400	8000	700
Eggs in Shell	3	10 F	10	29	30 F	30 F
Wheat	75600	120000 *	143000 *			
Maize			6500 *	167000	110200	95000 *
Cotton Seed Cake	4171	3000 *	2600 *	1440	6800	

F = estimate, \* = unofficial

Source: FAO Imports/Exports Yearbook 1990, Rome, 1991.

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Pre-mixed poultry is usually imported by pharmaceutical companies and feed mills. The feed mills sell directly to the farmer in most cases. In the more distant areas, the feed companies have distribution agencies. Many feed companies sell only the pre-mixes to the farmer, who adds his own cereal grains. Vitamin supplements can also be purchased through the feed mills. Since there is no bulk feed available, feed is sold only in 20, 50, and 70 kg polypropylene bags. Some farmers buy through cooperatives.

The consensus is that maize and soybean will need to be imported if poultry production is to increase, until such time as these grains are produced in-country. Soybean meal, the major vegetable protein source in poultry feed, is not yet produced in Kenya and there is no guarantee by the government that a steady supply can be imported. Adapting strains of soybean seed for Kenyan conditions does not seem to be a priority with the MLD.

## **2.5 Financial/Economic Efficiency**

Feed costs vary from time to time and from supplier to supplier. These variations occur because of fluctuations in the costs of ingredients caused by changes in availability. Most of these changes follow the pattern of harvest yields, which may be good or bad, with severe events like droughts producing extreme situations. Availability of other products depends on fishing catches, levels of throughput in slaughter houses, and changes in world demand.

Whatever the cause, feed millers will respond to increases in prices of ingredients by either varying their formulations or making a price adjustment, or by a combination of the two. Different feed millers using the same fundamental knowledge of nutrition, formulate different feeds depending on their technical judgment and commercial assessment. It is absolutely essential in a profitable enterprise to know the basic facts about a feed, such as its energy and protein levels and the source of the mineral and vitamin supplement. The latter source will often provide formulation input as well.

Using sorghum as an example, the consultants made the following estimates of the costs of producing poultry feed ingredients, based on raising 10,000 eight-week-old chicks to market weight. One broiler will consume approximately 4.5 kg of feed to market time. Average yield of sorghum = 1000 kg per hectare (FAO Yearbook 1990). The cost of producing one hectare of sorghum is approximately 20,000 KShs (according to Kenya Seed Company). This cost does not include drying or storage. Ten thousand broilers will consume approximately 45 m.t. of feed, depending on the feed quality. Seventy-five percent feed grains = 33.75 m.t. (75 percent of ration is grain). The commercial broiler producer will have the capability to produce 50,000 broilers per year. (10,000 x 5 batches = 50,000). Based on estimates of 3.75 kg per bird of grain consumption, 168.75 m.t. of feed grains will be required to produce 50,000 eight week old broilers per year.

Although this is a rough estimate, an in-depth study should be done before considering contract growing. The yield per hectare of maize is approximately two m.t. per hectare. Production figures vary considerably among the interviewees and in the various publications. For example, Kenya Seed Company considered 4.5 m.t. of maize per hectare as average. FAO's 1990 Yearbook estimate was two m.t. per hectare. This discrepancy could be attributed

to the difference between commercial production and smallholder production, and the rate of fertilizer application. Studies should also be carried out on the economics of oil seed production (on contract) for inclusion in poultry rations.

## **2.6 Economic and Environmental Impact**

With the very current low level of fertilizer consumption in Kenya, there is no widespread danger of environmental pollution. However, the potential implications of fertilizer use should be determined, since consumption is increasing rapidly and since there are some areas where fertilizer is already being used extensively. A study of the environmental impact of intensive fertilizer use in countries with very high levels of consumption concluded that when fertilizers are properly applied, their contribution to the loading of surface and groundwater with nitrogen, phosphorus and potassium is smaller than that from other sources.<sup>3</sup>

Pesticides also present contamination hazards. Those used in Kenya still include certain chemicals that have been partially or completely banned for environmental reasons in some industrialized countries, but for which effective and cheap substitutes have yet to be developed. Livestock deaths from feed contaminated by insecticides have been reported. The direct and indirect contamination of water by pesticides may kill fish, reduce fish productivity, and give rise to high concentrations of undesirable chemicals in edible fish tissues. In east Africa, the pesticide contamination of inland fishery resources has recently been reported from Burundi, Kenya, Sudan, Tanzania and Zambia.

<sup>3</sup>FAO/SIDA, "Effects of Interim Fertilizer Use on Human Environment," FAO Soils Bulletin No. 16 (Rome 1972).

### 3. RESEARCH SUPPORT FOR POULTRY FEED TECHNOLOGY

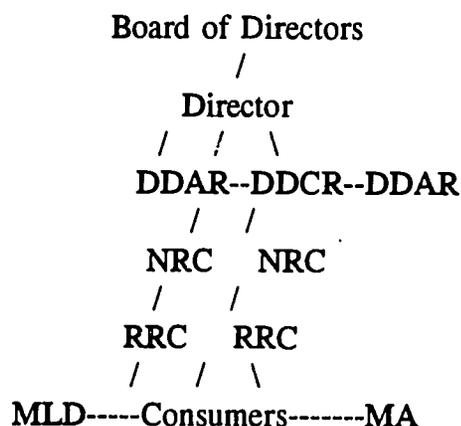
#### 3.1 Local Research -- Public Institutions

The main public institutions involved in commodity and technology research are the Kenya Agricultural Research Institute (KARI), University of Nairobi, Department of Animal Production (UoN-DAP) and Egerton University (EU). KARI was established in 1980 through an Act of Parliament and mandated to do research based on fifty-three recommendations. These recommendations include dairy, beef, small stock, maize, and oil crops.

KARI consists of National Research Centres, Regional Research Centres, and the headquarters. Exhibit 13 shows the organization of KARI. As the name implies, the NRCs' research programs are aimed at solving problems of national nature. RRCs, on the other hand, test technologies developed at NRCs for adoption in the region in which the RRC is located. The National Animal Husbandry Research Centre (NAHRC) at Naivasha is the one mandated to do poultry research.

#### Exhibit 13

##### Organization of KARI



DDAR	Deputy Director, Animal Research
DDCR	Deputy Director, Crop Research
NRCs	National Research Centres
RRCs	Regional Research Centres
MLD	Ministry of Livestock Development
MA	Ministry of Agriculture

There are no regional research centers for poultry research. Poultry research at NAHRC started in 1977, under the Ministry of Agriculture and Livestock Development. A joint program between the National Poultry Development Programme (NPDP) and the Government of Kenya and the Netherlands was started in 1977. Funded by the governments of Kenya and the

Netherlands, the major objective of this program was to upgrade poultry production in the rural areas and to improve the income and nutrition of the rural households. Poultry research provided data, information, and technologies needed by NPDP's extension activities.<sup>4</sup>

In 1989, poultry research was brought under KARI's research system. Since 1990, KARI's poultry research has been funded by the Netherlands, under a different agreement from the NPDP. The current poultry research at this center is focusing on two main areas, production characteristics and nutritional requirements of the indigenous chicken. Indigenous chickens are widely distributed in rural households and account for 87 percent of the total poultry population.<sup>5</sup> The major purpose of this research activity is to increase egg and meat production, thereby improving the nutrition and income of rural households. There has been a lot of interest shown both, locally and internationally in the indigenous chicken.

### **3.1.1 Evaluation of Sorghum as a Poultry Feed**

There are two types of sorghum, brown and white. The white sorghum has no tannin, while brown sorghum does. Presence of tannin protects sorghum from bird attacks.

Tannin affects the nutritional value of sorghum. Research work at the NPDP research center is, therefore, aimed at assessing the effect of tannin on metabolizable energy (energy that can be used by the bird) content of sorghum. This study is expected to determine the optimal level of maize that can be replaced by sorghum.

Poultry research has been going on at the University of Nairobi, Department of Animal Production, since the 1960s. The most important research activity dates back to 1977 when a project was funded by the International Development Research Centre (IDRC). The objectives of this project were:

- To identify alternative ingredients that had little or no competition by demand for human consumption. To facilitate this objective, cocoyam (*Colocassia esculenta*), and millet were evaluated as energy sources to replace maize.
- To identify potential protein sources. Protein sources have been in short supply. Toward this end, pigeon peas (*Cajans cajans*) and white Lupin (*Lupin albus*) were tested.
- To evaluate the potential of the ingredients for production in Kenya. This project ended in 1982.

<sup>4</sup>P.N Mbugua, "Poultry Production in Kenya," Proceeding of the CTA International seminar on Small Holder Rural Poultry Production in Africa. October 1990, Thessaloniki, Greece.

<sup>5</sup>KARI, Annual Report 1990.

### **3.1.2 Other Feed Research Efforts**

Research on poultry and poultry feeds in the Department of Animal Production has continued since 1984 with the hiring of a Kenyan Ph.D. poultry specialist. Most of the research activity has continued along the same lines as that conducted under the IDRC funded project. Trials involving evaluation of feedstuffs include the following:

- Evaluation of dried poultry waste as an ingredient in broiler feeds. The hypothesis being tested in this trial was that dried poultry waste was a potential source of protein and inorganic elements for broiler diets. The extent to which dried poultry manure could replace conventional feedstuffs was therefore assessed.
- Evaluation of cottonseed cake as a protein source for broilers. There is a high potential for cottonseed cake production in Kenya.<sup>6</sup> However, use of cottonseed cake is limited to high gossypol content. The output of this trial was to assess to what extent cottonseed cake could replace soybean meal.
- Evaluation of sunflower and sesame cakes as protein sources. High fiber limits use of sunflower seed cake. The quality of the cake is also influenced by the processing method. Little work has been done on sesame seed, although Ufuta, a subsidiary of Unga Feeds Ltd., has been promoting this oil crop during the last eight years. The efficiency of sesame seed in promoting poultry growth and egg production needed to be determined. This work is still in progress.
- Evaluation of sorghum as an energy source. The purpose of this study is to determine the optimal level to which maize can be replaced with sorghum and to assess dietary factors such as protein level and amino acids which influence the nutritive value of sorghum. Physical processing methods to reduce tannin content and improve the nutritive value of sorghum have been attempted. This is a long-term project with donor funding. Some experiments have been concluded while others are in progress.
- Evaluation of the nutritive value of grain amaranth. Grain amaranth has a high potential for growth in Kenya. Its yields are comparable to those of maize. Because of its deep rooting, it will grow in dry areas where maize does not do very well. It is rich in energy, protein and essential amino acids.<sup>7</sup> The use of grain amaranth is, however, limited by the presence of antinutritive factors. This study, therefore, aims at identifying suitable processing methods such as extrusion that may influence the quality of the material. The major output of the study will

<sup>6</sup>G. Kaheri, M.Sc. Thesis, University of Nairobi.

<sup>7</sup>L.W. Kabuge, "Evaluation of grain amaranth as an ingredient for poultry," Ph.D research proposal, University of Nairobi, Department of Animal Production, 1991

be to determine the optimal level to which grain amaranth can replace maize and soybean meal.

- Evaluation of byproducts of beer production for poultry feeds. This study has been funded by Kenya Breweries Limited, the only beer producing company in Kenya. Incidental to beer production are a range of raw materials, such as dried brewers yeast, malt culms, malt chaff, and barley dust, that have potential in poultry feed production. The company has also indicated the desire to diversify its activities to include animal feed production. This study is in progress and is scheduled to end in May 1992.
- Evaluation of processing methods suitable for producing cassava meal. Cyanide is a limiting factor in the use of cassava in animal feeds. Also, if cassava is not properly dried, it is attacked by a toxin-producing fungus. This study is on the drawing board.

Two other trials have been completed, namely the evaluation of broiler feeding systems and biotin requirements in broilers. In the feeding system trial, the effect of diet on carcass quality was assessed. The affluent urban consumer is becoming more discriminating about the quality of food products, particularly concerning fat content in broiler carcass. The justification of the biotin trial was based on the fact that the availability of biotin varies from feedstuff to feedstuff. Biotin in maize is readily available, while that in wheat is not. Therefore, it was necessary to determine the effects of changing from maize to wheat byproducts and other materials on biotin requirement.

The most important research activity being carried out at Egerton University is on the vegetable oil/protein system (VOPS). This project is funded by IDRC. In 1987, a survey was carried out to assess (a) the economics of production and processing of edible oil and protein cake in Kenya; (b) oil crop production in Kenya; (c) fats and oils industry and consumption in Kenya; (d) Kenya's animal feed industry; (e) milk production, consumption, and utilization of vegetable oil cakes by dairy cattle; (f) the poultry and pig industries in relation to oilseed cake utilization in Kenya; (g) Kenya's vegetable oil/protein system; (h) rural oilseed processing in Kenya.

The VOPS study is two pronged. On the one hand, its aim is to increase vegetable oil production for human consumption and on the other to increase production of oilseed cakes for use in animal feeds. The current research programs are aimed at both of these.

### **3.2 Private Institutions**

The private institutions have not been involved in research for a number of reasons. It is a widely held belief in Kenya that research funding and the actual research should be the responsibility of the government. For example, maize has been a scheduled crop, marketed by the government through the National Cereals and Produce Board. The movement of maize from one point to the other is controlled, although this is now changing. In such a set-up, then, it would not be prudent for a private company to be involved in research on a crop where it has

no control.

Kenya Seed Company<sup>8</sup> is the major company involved in breeding and seed production. Kenya Seed Company was established in 1958 and is responsible for producing seed maize, grass, potato, and wheat seed. In its seed production activities, Kenya Seed Company collaborates with various research centers of the KARI research system who do the basic breeding and agronomy research. The most significant output of Kenya Seed Company is the production of a hybrid maize suitable for various ecological zones.

Another important company involved in research is Kenya Breweries Ltd. This company has been involved in barley research for a considerable period of time. The company also contracts barley growing with farmers. The reasons for mentioning this company are twofold. First, this company has developed a "culture of research," an important trait for future research funding by the private sector. Second, there is a spillover of excess barley or rejected barley for use in animal feeds (rejected barley refers to that grain which is unsuitable for beer brewing or malting).

Ufuta Ltd., a subsidiary of Unga Feeds Ltd., is involved in promoting sesame seed production in Coast Province of Kenya and other areas. This has helped to broaden the protein resource base for poultry feeds.

Tamfeeds Ltd. produced 30 percent of the fish meal currently available in Kenya (both for poultry and non-poultry feeds.) Tamfeeds funds its research from its own savings. It has been involved in fabricating suitable fish meal processing methods. It also carries out quality testing of its fish meal. The company also produces protein concentrates (cereal balance) and regularly tests the efficacy of these products.

### **3.3 Local Supply -- Public Institutions**

The major research institutions involved in poultry and feed research are KARI, the University of Nairobi's Department of Animal Production and Egerton University. KARI has a board of directors that formulates research policy and a director in charge of day to day operations. The director is assisted by three deputy directors, one in charge of animal research, another in crop research, and the third is responsible for administration. Two of the deputy directors are responsible for the national and regional research centers.

For the purposes of this study, the important NRCs are the National Animal Husbandry Research Center (NAHRC), where poultry research is conducted. There is no regional research center for poultry. Maize research is carried out at the National Agricultural Research Centre (NARC) at Kitale. NARC is involved in maize breeding, agronomy, soil research, and maintenance of breeding material. The output of this research center has had a dramatic impact on the agricultural activity in Kenya. Since 1963, the center has developed maize hybrids suitable for various ecological regions. In addition, it has developed packages on planting time,

<sup>8</sup>Kenya Seed Company is a commercial parastatal.

spacing, and fertilizer use. NARC has RRCs at Emou and Oljororok. NARC works closely with the Kenya Seed Company in its maize breeding program. The National Plant Breeding Centre (NPBC) at Njoro is involved in wheat and oil crop research.

KARI Agricultural Research System has no direct contact with the farmer or the consumer of its products. Research outputs therefore get to the farmer through:

- Seed companies
- The extension divisions of the Ministries of Agriculture and Livestock Development
- Scientific conferences
- Seminars and field days
- Publications

KARI is an offshoot of the Scientific and Research Division of the ministries of Agriculture and Livestock Development and the defunct East African Community. These research divisions did not have extension wings.

The two departments worth mentioning in the University of Nairobi are the Department of Animal Production and the Department of Pathology and Microbiology. The former is involved in poultry and feed research, while the latter is involved in poultry health. Both of these departments have among them seven scientists working on poultry-related issues. Information from these departments is disseminated in a similar way as that described for KARI.

Egerton University has a Department of Animal Science and also a Research and Extension Division. It is the Research and Extension Division that is involved in Vegetable/Oil Protein Systems (VOPS) mentioned earlier.

### **3.4 Supply of Products -- Private Enterprises**

As noted earlier, the private enterprises are not involved in research to any large extent. Therefore, the supply of technology products depends entirely on what these companies can import, such as, vaccines.

## 4. STEWARDSHIP<sup>9</sup>

### 4.1 Information

Technologies developed through KARI and the universities are made available to the users through scientific publications, seminars, field days, and agricultural shows. The Ministry of Agriculture also runs an information center where research data is translated into language easily understood by the layman.

Still, there are gaps in the information disseminated from the researchers to the users. This gap is even greater between the researcher and the private company. Companies such as UNGA Feeds Ltd. (through Elianto Ltd. and Ufuta Ltd.) are able to provide research information to their client farmers.

### 4.2 Financing

At KARI, research is financed through the Government of Kenya or through donors. For example, USAID is funding a sorghum breeding program. Similarly, the Netherlands is financing dairy and poultry research at NAHRC, Naivasha. Not all research programs are donor funded, thus, more donor funding should be sought. In the long term, research funding should be the responsibility of the Kenya Government. Even in those areas where there is donor funding, government funding should be increased.

Research at the universities is funded by donors and the Government of Kenya. However, when donor funding is not available, research activity is low. Organizations such as the National Research Council in the United States, the European Economic Commission, and the joint German-Israeli international research team are potential sources of funds. However, many scientists are not aware of the funding and selections procedures of these organizations. Grants from these institutions are highly competitive and the ability to write solid research proposals is a prerequisite to obtaining funds.

No evidence is available that private institutions have access to research funds through the government or donors. However, KARI, through USAID, has established the Agricultural Research Fund (ARF). Funds from ARF are available to non-KARI scientists, whether they are in the private sector or not. The second cycle of ARF is starting and it is likely that through it, the private sector will get research funds.

Many Kenyan banking institutions can provide companies with financing for production technology. Funding agencies such as Industrial Development Bank, Development Finance Company of Kenya, Industrial Commercial Development Corporation (ICDC), and Kenya

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<sup>9</sup> Stewardship concerns supporting services that promote and distribute technology products to users. Stewardship includes extension, information, training, financing, and distribution efforts.

Industrial Estate (KIE) provide long-term financing. In addition, the Small Enterprise Finance Company (SEFCO) has thus far financed ten small-scale animal feed manufacturing companies. In 1991, SEFCO also started funding poultry production. At any one time, SEFCO can fund an individual enterprise as much as U.S. \$100,000.

The other important agricultural funding agency is the Agricultural Finance Corporation (AFC). AFC has not seen fit to fund poultry production because of the risks involved. Whether a company is able to get funds from these institutions or not depends on many factors. The major concern of most companies is getting funds from development finance companies or similar institutions which are funded by overseas banks in hard currency. If, for example, the loan is denominated in U.S. dollars, a Kenyan company is unwilling to accept the funds due to the high depreciation rate of the Kenyan shilling.

#### **4.3 Extension/Training**

Training in poultry-related issues takes place at several post-secondary institutions. These include the Animal Husbandry and Industry Training (AHIT) at Kasete, Nyaharuru, and Ndomba. This is a two-year course and covers a wide spectrum of the animal industry. There is no specialized poultry course at these institutions. The graduates are recruited to provide extension services at the farm level.

The next level of training takes place at the diploma colleges, which include Egerton University and Jomo Kenyatta of Agriculture and Technology. These institutes provide a three-year course program. Again, poultry production is not offered as a specialized course. The graduates work in research stations or join the extension service of the Ministry of Livestock and are posted at divisional levels. Exhibit 14 shows the structure of the extension services.

The third level of training is at the University. Currently, the University of Nairobi trains about 150 B.Sc. in agriculture and 100 veterinary students, in four- and five-year degree programs. These graduates work in various areas of agriculture. Within the extension system, they are posted at the province, district, and division levels. Egerton University which offers an M.Sc in animal science, trains about 100 graduates. The University structure related to poultry research is shown in Exhibit 15.

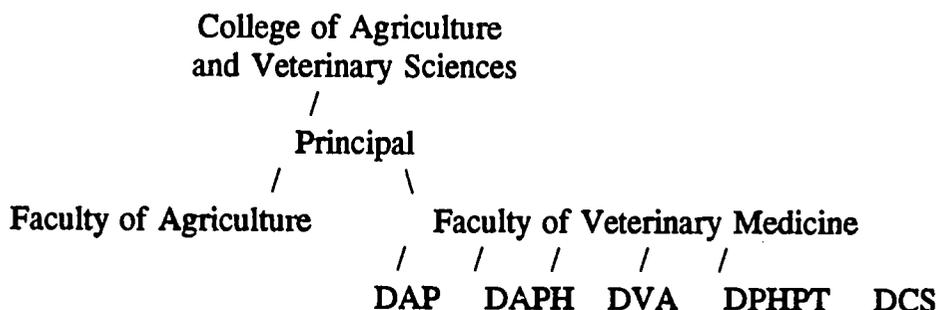
## Exhibit 14

### Provision of Extension Services

Kenya----Directors, Animal Production (AP) & Veterinary Services (VET)  
/  
Province----Provincial Directors AP and VET  
/  
District----Provincial Directors AP and VET  
/  
Division----Divisional Officers  
/  
Location----Locational Officers  
/  
Farmer

## Exhibit 15

### Departments Involved in Poultry Research University of Nairobi



1. Each faculty is headed by a dean.
2. DAP    Department of Animal Production
3. DAPHL    Department of Animal Physiology
4. DVA    Department of Veterinary Anatomy
5. DPHPT    Department of Public Health Pharmacology and Toxicology
6. DCS    Department of Clinical Studies
7. Each department is headed by a chairman.

The Department of Animal Production has been offering courses on alternate years. So far, the department has trained seven students at the M.Sc level, specializing in poultry nutrition. The department has also trained one Ph.D. student and is currently training two more. Besides the training offered in Kenya's institutions, other training facilities are available through donor-funded projects. The National Poultry Development Programme (NPDP) has trained about ten officers either at Benerveld College in the Netherlands or in overseas universities. KARI has a training program funded by CIDA of Canada. Through this program, KARI hopes to train enough research officers to fill gaps which are currently limiting its performance. It should be emphasized that NPDP organizes a one-month refresher course for the officers involved in poultry extension. Currently most of the districts have poultry officers who have been either trained through the refresher course or overseas training. The private sector also trains its personnel through on-the-job training and attachments to overseas companies (UNGA and Kenchick for example).

#### **4.4 Distribution**

The feed companies visited have an efficient distribution system for their products: (a) they sell feed at wholesale and retail at the mill; (b) they arrange, for a fee, for transportation of the feed to those farmers who buy in large quantities; (c) they also have appointed dealers at different urban centers; (d) most of them sell their products through the Kenya Grain Growers Cooperative Union (KGGCU), which has distribution outlets throughout Kenya; and (e) they sell through the farmers cooperative unions. These unions buy the feed as part of inputs they supply to their cooperators. Eggs and poultry meat are not sold through cooperatives. Those farmers who grow broilers on contract with Kenchick Limited obtain specially formulated feeds, and the company facilitates acquisition of the feed. These farmers also obtain day-old chicks through the company.

It must be emphasized that farmers near the hatcheries have no problem in getting chicks from the hatchery. They can drive and obtain the chicks. However, for those farmers hundreds of miles from the hatcheries, such as in Western Kenya, it is difficult to obtain the day-old chicks. Another important issue is that of vaccines. Most of the vaccines have to be refrigerated and are difficult to transport unless refrigeration facilities are available. Yet another contentious issue concerns the packaging of the doses. Marek's vaccine is imported and in most cases comes in packages of 1,000 doses or more. This is expensive for a farmer raising fewer than 1,000 birds at a time.

## 5. COLLABORATION BETWEEN PUBLIC AND PRIVATE SECTORS

### 5.1 Collaboration in Conducting/Financing Research

Collaboration between public and private sectors is not widespread in Kenya. Historically, research has been assumed to be the sole responsibility of the Government of Kenya. However, certain companies have been cooperating with public institutions in product development and promotion of their products. The following six examples illustrate the current situation in Kenya.

- **Kenya Breweries, Limited (KBL) and barley research.** At the initial stages of research in barley, KBL collaborated with the plant breeding station at Njoro, mainly in the form of funding. As the program developed, KBL hired its own scientists who continued to work with the public institutions. Currently, KBL is wholly responsible for barley research with no inputs from the public sector other than the Kenya Seed Company, which is responsible for bulking the barley seed.
- **Kenya Breweries, Ltd and animal feed research.** In the recent past KBL has been attempting to diversify its product lines. One of the possible new product lines is animal feed production. KBL produces a wide range of raw materials such as dried brewers yeast, malt culmi, malt claff, and barley dust. KBL has been keen to find out if these materials can be used in animal feeds. Toward this end, KBL has funded a series of trials at the University of Nairobi in 1991 and 1992.
- **Hoffman-La Roche.** This company has funded two M.Sc. research projects at the University of Nairobi, one to evaluate biotin requirements for broilers and the other to evaluate the need for B-carotene in dairy cattle. As part of the company's funding, Hoffman-La Roche has provided the active ingredients (biotin and carotene and also biotin-free pre-mix) to the project. They have also provided analysis of experimental samples, as well as technical advice.
- **Unga Feeds Ltd.** This company has not funded research directly, but has made ingredients needed for experiments available.
- **Kenyan Animal Feed Industry (KAFI).** Once established, KAFI aims to identify research needs and finance such needs through its members.
- **The Agricultural Research Fund administered by KARI.** This program, which is open to the private sector, has already been mentioned.

### 5.2 Joint Ventures

In the survey, the question about the possibility of forming joint ventures was not adequately answered. First, some of those interviewed, particularly the farmers, did not

visualize how this could be feasible. Second, some of the businesses are family businesses and the owners would like to keep it that way. Third, the problems that feed manufacturers face are related to availability of raw materials and price control. Joint ventures will not solve these problems. One feed manufacturer, however, did indicate the need to enhance the technology of feed manufacturing. It was also pointed out that there is a need to increase local fish meal production. To set up a plant to produce fish meal will require a minimum of U.S. \$660,000.00. This is an area where a joint venture would be welcome. Indeed, according to Tamfeeds, Ltd., there have been serious requests for fishmeal by Israel, and South Africa, but the output of Tamfeeds is too small.

It should be emphasized that in other sectors such as vegetable seeds, flowers, and horticulture in general, joint ventures have been set up with Dutch, U.S., and Belgian companies. In the long term, there is no reason why such ventures cannot flourish in the poultry feed sector. Kenchick Ltd. and Unga Foods, Ltd. are joint ventures in the poultry sector.

### **5.3 Contracts**

Two types of contracts were noted in this study:

- Contracts between Kenya Seed Company and farmers to produce seed maize. This has been going on for over 20 years.
- Contracts between Kenchick and the broiler growers. Kenchick has been very successful in raising broilers under contract. The farmer has to have a house that will hold a minimum of 1,000 broilers at a time. The farmer buys the day-old chicks, as well as feed, at a discount. The farmer is then expected to sell the broilers to Kenchick. Kenchick provides, at cost, extension services and agrichemicals that the farmers may need.

No contracts exist for the production of maize or raw materials used in animal feeds. However, Kenya Breweries Ltd. has been able to grow all the barley it requires through contract.

## 6. ECONOMIC, BUSINESS AND REGULATORY ENVIRONMENT

After independence, Kenya promoted rapid economic growth through public investment, encouragement of smallholder agricultural production, and incentives for private (often foreign) industrial investment. Total gross domestic product (GDP) grew at an annual average of 6.6 percent in volume from 1963 to 1973. Agricultural production grew by 4.7 percent annually during the same period, stimulated by redistribution of estates to smallholders, rapid diffusion of new crop strains, and opening of new areas to cultivation.

Economic growth has declined since 1973, and real GDP has grown only about 2.75 percent for the 1980-1986 period. Agricultural production, accounting for more than one-third of GDP and almost two-thirds of non-petroleum exports, has averaged growth of less than three percent per year since 1972. This has been partly due to climatic conditions and decreased international demand, but inconsistencies in domestic pricing policy and credit availability, as well as inadequate marketing, have been even more important factors.<sup>10</sup>

During the years from 1985 to 1987, Kenya managed three consecutive years of positive growth in per capita income, the first since the 1970s. Total wage employment grew by 3.5 percent in 1987, but this was insufficient to keep pace with new entrants who are increasing by about 4.5 percent annually. The overall balance of payments showed a US \$100 million dollar deficit. Most of the factors responsible for 1987's slowdown in economic performance have persisted during 1988, leading to a stagnation in growth and a return to chronic fiscal and external payment difficulties.

Kenya has also faced a slowdown in foreign exchange earnings due to a fall in demand for two of the country's major exports, coffee and tea. World demand for coffee remains below supply, so Kenya cannot capitalize on its considerable comparative advantage in coffee production. It still must maintain large coffee stocks, equivalent now to about nine months of production. Pakistan, Kenya's largest market for tea, combined with an oversupply on the world market, has driven prices at the Mombasa auction down to their lowest levels since 1983.

### 6.1 Financial Markets

Sources of finance include the following:

Industrial Development Bank (IDB)  
Managing Director, Industrial Development Bank  
National Bank Building, 18th Floor, Harambee Ave.  
P.O. Box 44036  
Nairobi, Kenya

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<sup>10</sup>Kenya, A Country Study, Federal Research Division, Library of Congress, 1986.

**Industrial and Commercial Development Corporation (ICDC)**  
Executive Director, ICDC  
Ichumi House  
P.O. Box 45519, Nairobi, Kenya

**Development Finance Company of Kenya (DFCK)**  
The General Manager  
P.O. Box 30483

**Small Enterprise Finance Company of Kenya (SEFCO)**  
The General Manager  
P.O. Box 30483  
Nairobi, Kenya

**East African Development Bank (EADB)**  
Resident Manager  
P.O. Box 47685  
Nairobi, Kenya

**Kenya Industrial Estates, Ltd. (KIE)**  
Managing director  
P.O. Box 78029  
Nairobi, Kenya.

**Kenya Equity Management Ltd. (KEM)**  
Managing Director  
P.O. Box 62360  
Nairobi, Kenya

**The Africa Growth Fund (AGF)**  
The General Manager  
SEFCO P.O. Box 34045  
Nairobi, Kenya

**International Finance Corporation (IFC)**  
Resident Representative IFC,  
P.O. Box 30577  
Nairobi, Kenya

**African Project Development Facility (APDF)**  
General Manager  
International House  
P.O. Box 46534  
Nairobi, Kenya

Industrial Promotion Services Ltd. (IPS)  
Managing Director  
IPS Building  
P.O. Box 30500  
Nairobi, Kenya

Economic Development for Equatorial  
and Southern Africa (EDESA)  
General Manager  
P.O. Box 56038  
Nairobi, Kenya

## **6.2 Investment Climate**

This is clearly not the best time to consider investment considerations in the Republic of Kenya. Presently, the country is in a "down hill mode." USAID funds have been reduced by 75 percent. Several other donor countries have also reduced funding and are urging the government to allow private enterprise to take over the parastatals, which are extremely inefficient.

Elections are expected to change the investment climate. However, there is no set time for these elections to take place. Kenya's foreign exchange situation is also critical at this time, due in part to oversupply of Kenya's primary export crops.

Kenya began a new \$225 million three-year IMF adjustment program in early 1988 to help cover a period of chronic balance of payments deficit, and in June 1991 received approval for a major World Bank Industrial Sector Adjustment Loan.

Although there are many restraints on investment imposed by government policy, there have been some changes for the better. The Investment Promotion Centre was established to promote investment and render support to investors in the country. The center operates a "one-stop" approval system where project applications are processed and relevant approvals obtained on behalf of the investor. This ensures that a project is approved in less than four weeks.

In addition to this service, which is rendered free of charge to investors, the center provides information on investment opportunities in the country and all the relevant facts for successful investment in Kenya. For approved projects, the center offers assistance in acquiring industrial plots.

For inquiries regarding investment, contact:  
The Managing Director Telephone: (254) (2) 221401-4  
Investment Promotion Centre Telex: 25460 Biashara  
National Bank Building Fax: (254) (2) 336663  
Harambee Avenue  
P.O. Box 55704  
Nairobi, Kenya

### **6.3 Investment Approval Process**

Prior to initiating business operations in Kenya, a prospective investor should obtain a number of approvals and registrations, some general and others relevant only to specific sectors or activities. The Investment Promotion Centre's (IPC) one-stop office obtains all approvals for investors within four weeks. IPC helps investors complete an Investment Proposal Form that consolidates all the necessary information and identifies approvals required by the investment.

#### **6.3.1 Company Registration**

The initial step in forming a company in Kenya is to obtain a reservation for a company name from the Registrar of Companies. Next, the company must draft a memorandum and articles of association and file the memorandum with the Registrar of Companies who will issue a certificate of registration.

#### **6.3.2 Approvals and Licensing**

No person in Kenya may conduct any business except under, and in accordance with, the terms of the license. The term "business" does not mean business generally, but is defined as operating in the areas of:

- Regulated trade
- Importing or exporting goods
- Functioning as commissioned or independent agent
- Acting as manufacturer's representative

A centralized place for payment of licenses is needed to eliminate the present situation whereby investors have to pay for licenses scattered among many ministries and government agencies. Moreover, approval of agribusiness investment is not without problems. Careful consideration should be given to declines in the production of goods for domestic consumption and also inefficiencies in the agricultural sector -- erratic supplies, insufficient credit, and transportation and shipping bottlenecks.

### **6.4 Investment Restrictions**

Prior approval of the Central Bank is required before any investment can be made by a nonresident company in a new or existing resident company, whether foreign controlled or not. Central Bank approval is required for the capitalization of reserves by a resident company that has nonresident shareholders. Consent is also required for the appointment of nonresident directors. Approval of directors normally will be given, but with a statement from the Central Bank that there is no understanding that fees will be remittable. Any payment of fees to nonresident directors requires special approval.

#### **6.4.1 Registration of Foreign Capital**

Foreign capital is acknowledged through the issuance of a Certificate of Approved Enterprise. Application for the certificate should be made to the Treasury. If the investment is in a company, the certificate will state the amount invested in equity and, if applicable, loan capital. It will also denominate the currency of any loan capital and the allowable rate of interest.

#### **6.4.2 Foreign investment and Repatriation of Profits**

Most foreign investment is governed by the Foreign Investment Protection Act, 1964 (FIPA). Investors can obtain a certificate of Approved Enterprise that allows for the repatriation of capital and the remittance of noncapital profits or interest. One businessman said that it can take up to three years for foreign business to repatriate their profits, due to bureaucratic requirements.

#### **6.4.3 Exchange Control Authority**

The Central Bank of Kenya is responsible for exchange controls which it administers through its Exchange Control Department in accordance with the provisions of the Exchange Control Act and related administrative notices issued by the Central Bank. Very few powers are granted to local banks. Central Bank approval is required by Kenyan residents for the purchase of foreign exchange for payments to nonresidents. This is an important consideration for foreigners when leasing their intellectual property.

### **6.5 Taxation**

Locally registered and incorporated companies, both foreign and local, pay corporate tax at a rate of 37.5 percent of taxable income. Branches of foreign companies pay taxes at the rate of 45 percent. Local authorities may levy property taxes and service charges.

### **6.6 Investment Incentives**

#### **6.6.1 Export Rebate**

Although there are few incentive schemes available to Kenyan industry, exporters can receive a rebate on export goods. Effective June 1984, the general rate of export compensation was set at 15 percent of the F.O.B. value of the goods, with a further 10 percent depending on any increase in the value of exported goods over the previous financial year.

#### **6.6.2 Investment Tax Deduction**

The investment tax deduction is primarily intended as an incentive to investment in certain categories of expenditure. Eligible expenditures include the construction of an industrial building and the purchase and installation of new equipment for processing. Twenty percent of the capital expenditure can be deducted from the taxable income for the first year in which the

facility is brought into use.

## **6.7 Pollution Control**

There is no antipollution act in Kenya, but the responsibility for maintaining environmental quality belongs to the National Environmental Secretariat in the office of the President.

## **6.8 Location of Industry**

Industry in Kenya is concentrated in the large centers of population. The New Project Committee views more favorably locations for proposed industry outside of the Nairobi or Mombasa areas. Factories outside these areas qualify for an investment allowance.

## **6.9 Intellectual Property Rights**

### **6.9.1 Patents**

Patents are regulated by the Industrial Property Act and administered by the Kenya Industrial Property Office. Under the Industrial Property Act, it is no longer necessary to first register patents in the United Kingdom before registration can have effect in Kenya.

### **6.9.2 Trademarks**

Trademarks in Kenya are regulated by the Trademark Act (CAP 506, Laws of Kenya) and are administered by the Registration of Trademarks in the Office of the Attorney General. The duration of trademarks is seven years from the date of filing and 14 years on renewal. Foreigners leasing intellectual property rights should remember that Central Bank approval is required by Kenyan residents for the purchase of foreign exchange for payments to nonresidents.

## **PART II: ISSUES AND IMPLICATIONS**

### **7. IMPLICATIONS OF THE CURRENT STATE OF THE KENYAN POULTRY AND FEED INDUSTRY**

#### **7.1 World Market Potential**

There is a potential market for poultry and eggs in the Middle East. Saudi Arabia imports thousands of tons of poultry meat each year from Brazil. If a steady supply of poultry feed can be assured and at a reasonable cost, if vaccines and poultry health products are readily available, and if quality support service is assured, the Middle East could be a lucrative market for Kenya-raised poultry products.

#### **7.2 Local Demand Potential**

Mature chickens are sold in the marketplace for very high prices. Statistics on supply and demand for agricultural products are very scarce. FAO and supermarket personnel interviewed agreed almost unanimously that potential demand for poultry products is unsatisfied and would increase further if prices were reduced and quality improved. If quality poultry rations were available at reasonable prices, poultry consumption could easily double within the next three to four years.

#### **7.3 Input Distribution Networks**

According to information from several interviewees, the demand for day-old chickens far exceeds the supply, which seems to be controlled by one hatchery. To ensure the growth of the poultry industry in Kenya, more hatcheries should be allowed to import breeding stock. Oversupply of poultry products can eventually become a problem in a developing poultry market if too many producers enter the marketplace, thus dropping the price of the product dramatically. When this occurs, the best managed and best financed groups will survive. However, it is not likely that oversupply will occur for several years, and then only if the recommended reforms come about.

The primary limiting factor for establishing a viable poultry industry in Kenya is the lack of supply and expense of basic poultry feed ingredients. Before an investment in a major poultry production project is feasible, a guaranteed supply of good quality feed grains must be available. Only Kenyan government officials can guarantee adequate supplies of feed additives for a Kenyan poultry industry, since many items must be imported. Periodic shortages of cereal grains, pre-mixes, concentrates, and the near total absence of soybean meal make consistent quality of poultry feeds impossible. The performance of laying hens is very poor as a result. Feed conversion of broilers is also poor.

The Kenyan government should be acutely aware of these feed needs -- not just Ministry of Livestock Development personnel, but other government officials as well. Particularly important are officials who make decisions regarding allocation of foreign exchange availability.

Unless these officials make pre-mixes, soybean, and other imports top priority items for importation, the poultry industry in Kenya will struggle along until local production of these products is sufficient to meet the need.

Soybean meal is not imported to Kenya, although soybeans are. Worldwide, soybean meal is the single most important ingredient in a poultry ration. The amino acid balance in soybean meal is nearly perfect for the nutritional needs of poultry. Without it, a blend of at least six to eight other protein meals is required to produce a nutritionally-balanced ration. It is recommended that government officials in Kenya encourage production of soybeans in Kenya, but until such time as locally-produced supplies are available, soybean meal should be imported regularly.

Regarding other imports, it would appear that diplomatic relations between Kenya and the Republic of South Africa (RSA) will soon be normalized. Equipment, pre-mix and poultry health products would then be accessible at more reasonable prices from the RSA. Most construction materials can be purchased locally, even though the materials going into these items may be imported (such as, steel that is imported and made into trusses locally).

Feed inventory and formulation programs should be established for use by the entire poultry sector of Kenya. These programs should result in optimum use of local ingredients and formulation of better-balanced poultry rations at the lowest possible development cost to those in the poultry sector.

In-country capabilities for poultry disease diagnosis and feed ingredient/ration analysis are also essential for effective disease control and feed optimization. These programs would significantly reduce, or completely eliminate, the purchase, receipt, and use of feed ingredients that do not meet specifications and/or poultry nutritional requirements. Currently, inspection and quality control of ingredients, imported vaccines and pharmaceuticals are extremely limited.

#### **7.4 Marketing System**

The present Kenyan system of marketing chickens, as described earlier, is typical of many similar countries in Africa and around the world. The various marketing techniques used to develop these markets are also proven and well known. Once modern production capabilities are established, chicken products can be marketed in volumes previously considered impossible, because chicken meat is one of the best and least expensive ways to provide protein for consumers.

The hotel, restaurant and supermarket potential in Kenya is considerable and the early local producers of broiler meat will be able to exploit these potential markets. All restaurants seem to offer chicken on the menu, and even some street vendors offer dishes such as chicken kabobs and grilled chicken quarters. Restaurants and hotels will purchase chicken in bulk as whole birds to provide flexibility in what they prepare for chicken dishes. Some hotels and bars might even purchase livers or wing joints for use as party hors d'oeuvres once they know about these products and supplies are readily available.

Important requirements for success in the markets are to have good, consistent quality and reliable supply. For supermarkets, attractive packaging and quality are important considerations. These institutions have refrigeration and can display poultry products effectively. Expatriates and Kenyan citizens who are accustomed to seeing poultry products attractively displayed will pay premium prices for this quality. Moreover, the amounts packaged have a significant affect on marketability. As mentioned earlier, chickens are available only as whole birds or as live chickens. Only a few "supermarkets" now exist and these are largely patronized by expatriates and government officials. Once volume increases, the price of chicken will be within the reach of the middle to lower income person.

## **7.5 Infrastructure**

### **7.5.1 Storage**

Currently, the total storage capacity of the public and private sectors is about 1.1 million mt. Yet, conventional stores are still needed for smaller depots that handle bagged grain. Presently, the majority of storage facilities are used for cereal grains for human consumption.

### **7.5.2 Technical Support**

The production of poultry meat and eggs is an extremely complex operation. It requires professionally-trained experts in the fields of poultry economics, genetics, nutrition, environmental control, poultry husbandry, pathology, food technology, disease control, laboratory technology, and marketing. This kind of specialized support system does not currently exist.

The development of the poultry industry in Kenya is likely to be constrained by these factors, therefore, specialized training in modern commercial poultry production should be implemented immediately. Specialized training would have to be sought outside the country. Poultry management courses (six months to one year) should be offered in-country or in other countries where climatic conditions, and, therefore, husbandry methods would be similar.

## **7.6 Feed Supply and Processing**

While there is a significant shortfall in the quantities of feed rations available to the poultry sector, the poultry sector faces some major problems, which can easily be corrected immediately. These problems include the waste of available ingredients, as well as necessary controls in quality, handling, and distribution. These problems cannot be solved simply by increasing the quantity of feed and feed ingredients in Kenya. They must be solved through a coordinated national program that will first utilize available ingredients and resources, and then optimize productivity by using them efficiently. Fish meal is one possible protein supplement that is produced in Kenya and should definitely be used, but with full awareness of potential problems. Unfortunately, supplies of fish meal are limited.

The performance of chickens can be affected significantly by changes (even small ones) in the composition of feed rations in such a way that feed composition can be the sole reason

for chickens not reaching their full potential. When specific items are not available for inclusion in the feed ration, often substitutes can be used. The feed mill assumes great responsibility in making feed by guaranteeing that all components of the required feed ration are available at all times or, if not, that supplies can be obtained from an alternate source.

There is an almost total lack of quality control beginning with individual ingredients supplied by the poultry producers themselves. Appropriate technologies are simply not being used throughout the industry. As a result, feed conversion is generally lower than what it should be, and productivity in the poultry sector is also lower to what it could be through the application of available and known technology.

### **7.7 Use of Animal Byproducts**

The capability for a byproducts utilization/rendering plant does not presently exist in Kenya to any measurable degree. Yet, the offal and other byproducts from poultry production are valuable assets in poultry operations in developed countries.

Manure comes in large volumes but is probably the easiest waste to discard. Its primary value comes from its use as fertilizer. Manure can be given or sold to farmers because it is high in nitrogen and because manure from broiler rearing houses is mixed with wood shavings or other organic materials - just what is needed for lands intensively farmed. Care must be taken to avoid spreading manure within four to five kilometers of the farm because of disease risks. Temporary odor problems can also be a concern in the spreading of manure, but agricultural areas usually do not view odor to be a problem.

Poultry litter and manure also contain considerable feed components lost from feeders or passed through the chickens undigested. Thus, poultry manure may be fed to other livestock - principally cattle and swine. Manure from cage layer operations may be in liquid form and must be removed in tank trailers or dried before removal. There are procedures to "digest" liquid manure to make a tasteless, odorless, powdered substance that can be mixed with cattle feed.

### **7.8 Feed Milling**

The major shortcoming of feed mills in developing countries is the lack of technical quality control. A basic requirement that should be implemented is that each incoming batch of feed ingredients be sampled to determine its nutritional value and that each bag of milled feed be properly marked with contents and dated. As the poultry farmers of Kenya become more experienced, it will be important for the feed mill to provide exact details of feed composition, and to guarantee their accuracy.

### **7.9 Economic and Environmental Impact**

Dead birds can be incinerated, but care should be taken to avoid smoke. Thus, the incinerator should always be placed on the downwind side of the farm. Hatchery waste can also be incinerated.

Processing waste (feathers and offal) is more difficult because of its high moisture content -- it must be dried before incineration. Feathers can be dried and used in pillows. Processed waste can be rendered, dried, and used as a poultry feed ingredient high in protein. Another process is available that can bioferment both manure and processing wastes into a product that can be fed to cattle. Of course all of these products can be fed directly to swine in unprocessed form, but the risk of disease is high and must be carefully controlled.

Water removal from the processing plant is a tough problem. High fat content in this water quickly clogs leaching fields and high biologic content (mostly blood) is difficult to break down efficiently. If space permits, a water lagoon can be used to allow natural aerobic action to occur, or a water treatment plant can be constructed.

#### **7.10 Local Research -- Public Institutions**

Issues that need to be addressed for future local poultry research in public institutions include: (a) qualified manpower needs, b) funding, c) comprehensiveness of research or lack of it, and d) availability of infrastructure.

Manpower issues have long been a major concern of the KARI research system.<sup>11</sup> In a study carried out in the early 1980s, it was noted that KARI's research system was not adequately staffed by qualified personnel. High turnover and attrition rates were also reported. Although time has remedied this situation, there are still far too few scientists involved in poultry research at the National Animal Husbandry Research Centre (NAHRC). Currently, there are two Kenyan B.Sc. Dutch expatriates. The other two Kenyan scientists are pursuing their masters degrees in Europe and the United States. With so few scientists, it is most unlikely that NAHRC will make a serious impact in poultry research in the near future. The same situation is seen at Egerton University.

The Department of Animal Production at the University of Nairobi is in a slightly better position. There is a Kenyan Ph.D. poultry specialist and one Ph.D. swine specialist. There are also two M.Sc. scientists. Since 1976, the Department has been conducting an M.Sc. course in Animal Science. The Department also has a Ph.D. program. The graduate students form an important pool of manpower and have carried out most of the research activities mentioned earlier with the supervision of the two Ph.D. scientists.

Lack of research funds in all institutions is a major issue. Poultry research at NAHRC has largely been funded through a bilateral agreement between Kenya and the Netherlands. The research activity going on at Egerton University is funded by IDRC. IDRC and the Norwegian Agency for International Development (NORAD) have funded research in the Department of Animal Production. Although funding by these agencies is greatly appreciated, it is important that the government of Kenya increase its research funding, so that it is self-sustainable if donor funds are not available.

<sup>11</sup>C. Zulbertic and J. Lugogo, 1989.

KARI has attempted to rationalize its research activities by prioritizing the commodities it is mandated to work on.<sup>12</sup> KARI has a mandate to work on 53 commodities, including dairy, beef, maize, oil crops, poultry, and tuber crops. The factors considered in ranking these commodities are: (a) value of product, (b) foreign exchange earning or saving, (c) technology adoption rate, (d) probability of research success, (e) contribution to food security, (f) domestic and external trade potential (g) potential future area/production expansion, (h) equity, and (i) employment potential.

In this ranking, very few factors were considered. Also, this ranking is not static and is expected to change with changes in circumstances and possibilities. Nonetheless, the attention a given commodity receives is justified by its ranking. Poultry is ranked 10th out of 53 commodities.

The specific research areas that KARI has recommended for poultry are:

- Evaluation of commercial feeds available in the market (feed testing)
- Formulation of feeds using locally available ingredients to reduce feeding costs
- Formulation of feeds with maize alternatives to reduce competition between humans and livestock
- Development of feeding systems to improve nutrition of indigenous chickens
- Housing systems
- Effect of temperature and humidity on feed intake

It is noteworthy that these specific research areas are related to nutrition and management. Nothing is mentioned concerning poultry health, marketing of eggs, and development of new products.

Egerton University has also developed very comprehensive research modalities for VOPS. The Department of Animal Production, University of Nairobi, has concentrated its efforts on identifying alternative protein and energy sources. Since KARI, Egerton University, the Department of Animal Production at the University of Nairobi are dealing with similar problems, they should collaborate.

The research organizations described earlier have functioned in this form for a long time. It has been argued that the research outputs have not been delivered to the users in an efficient manner, and suggestions are being made to add an extension wing to these research institutions. The Ministries of Agriculture and Livestock Development have well-established extension wings.

<sup>12</sup>KARI, Kenya's Agricultural Research Priorities to the Year 2000, 1992.

Research findings can therefore be communicated to the farmers by ensuring a strong link between the research institutions and the extension wings of the relevant ministries. There is, however, little extension work between these institutions and the private sector (for example, feed manufacturers). This is an area that needs attention.

### **7.11 Training**

In most cases, the courses offered by various institutions are general courses in animal production. Therefore, more in-depth courses are needed in specialized areas such as poultry disease, hatchery operations, management of breeding stock, engineering aspects of house design, and design of equipment.

The following courses have been recommended by the University of Nairobi and Egerton University, with possible assistance from USAID:

- Refresher courses in poultry, feed, etc. for graduates of the various institutes
- Refresher courses in poultry health and disease diagnosis
- Training in feed production for feed company personnel
- Management training for feed producers
- Training in other specialized areas, such as poultry housing, poultry equipment, and processing of poultry products.

### **7.12 Conducting Financial Research**

Collaboration between the public and private sectors should be encouraged to enhance the use of research findings and to ensure that researchers aim at solving "known" problems. Since most of the companies do not set aside money for research, some seed money needs to be established (as KARI has done) to set this collaboration in motion.

## **PART III: CONCLUSIONS AND RECOMMENDATIONS**

### **8. CONCLUSIONS**

Commercial poultry production will never be successful in Kenya until a steady supply of quality maize, soybeans, fishmeal, and pre-mix are guaranteed. Kenyan government officials must establish priorities for use of foreign exchange and feed ingredients must be near the top of the list. Alternatively, programs must be initiated to encourage local production of fish meal, soybeans and maize by offering tax and other incentives. Further research is needed to investigate indigenous feed products not consumed by humans that can be used for poultry feed.

The consultants are of the opinion that through improvements in quality control, ingredient testing and analysis, and variety of the feed and poultry production activities, supported by a minimal amount of equipment and an optimal amount of technical assistance and training, existing feed resources can be improved. Included in the program would be a feed ingredient inventory control and tracking system and identification and optimal use of indigenous ingredients.

To meet the demand of the country, agricultural inputs such as seeds, fertilizers, and insecticides should be easily accessible to growers, particularly to smallholders, who are responsible for more than 75 percent of Kenya's total agricultural production and over 50 percent of marketed production. The development of soybeans for Kenyan conditions and further research on sorghum and lupin strains should be encouraged. The allocation of production hectareage for maize (for poultry feed) should be considered by the government.

As the price of poultry feeds remain the same, whatever the quality, and feed costs account for approximately 70 to 75 percent of total egg and broiler production costs regardless of the quality of the feed ingredients used. This affects the overall performance (poor feed conversion, higher mortality, smaller eggs and lower egg production) and results in financial losses to the poultry producer. Consequently, the dramatic effects on productivity are the only signal to producers that feed quality has changed. A particularly damaging aspect of this situation for intensive egg producers and broiler growers is that these dramatic fluctuations in feed quality can occur without producers' prior knowledge. Sometimes a balance is struck between potential performance and cost of feeding. The view may be taken that substantial reduction in feed cost may be worth fewer eggs or slightly longer growing period. Any decision of this nature should be based on very careful costing of the two alternatives.

Kenya must embark on an accelerated program of research and improved management of all ingredients that are, or can be, utilized in animal feeds. Since many of those ingredients are also used for human nutrition, the comprehensive management program should start with an improved cropping plan and patterns, then improve allocation of ingredients to the sectors which will produce the greatest benefit for the economy and for Kenya's population. Ingredients not now used in Kenya could be substituted for the primary protein in poultry rations. However, soybean meal is the best source of vegetable protein in poultry feeds. Without soybean meal, six to eight other ingredients may be necessary to be included in a ration to bring up the amino

acid requirement for the bird.

The companies which breed laying and broiler stock publish data indicating their expected genetic potential (usually measured under the prevailing conditions of their country of origin). This potential may or may not be attainable under conditions in the country of purchase. However, it will have an effect on production distinct from the maintenance requirements of the stock. Egg production, feed conversion, and rate of gain must all be evaluated and realistic targets established for the area in which the birds are purchased.

Very few qualified poultry technicians exist in Kenya at present. There are few poultry courses offered in Kenyan universities and, as a poultry industry develops, there will be heavy competition for any existing, trained personnel.

## **9. RECOMMENDATIONS**

### **9.1 Poultry Stock Improvements**

At the present time, one hatchery monopolizes the chick industry, supplying 75 to 80 percent of all the day-old chicks in the country. More hatcheries should be allowed to import breeding stock into Kenya. The Government currently limits the imports of day-old chicks due to a shortage of foreign exchange. Consequently, even large producers who receive the imported chicks suffer from lack of stock. U.S. poultry breeding companies should investigate the potential of expanding the poultry industry in Kenya, notably in increasing private importation or production of day-old chicks.

### **9.2 Training**

The development of the poultry industry in Kenya is likely to be constrained by these factors, therefore, specialized training in modern commercial poultry production should be implemented immediately. Specialized training would have to be sought outside the country. Poultry management courses (six months to one year) should be offered in-country or in other countries where climatic conditions, and, therefore, husbandry methods would be similar.

A multi-level training program should be developed which would include the following steps:

- Structured on-the-job-training of semi-skilled and skilled workers;
- Several months of formal classroom training (possibly at an existing institution) for production and processing supervisors, followed by field experience. The use of pilot programs and a gradual increase in project scale will provide a context for increased experience. These supervisors may also ultimately train growers; and,
- Senior managers will require formal training for supervisors plus a long term intern program.

Training for staff professionals may best be achieved by recruiting professionals with the appropriate credentials and providing a combination of advisors, special training, and local on-the-job experience. Equipment and food processing manufacturers will sometimes offer training programs abroad.

There are no veterinarians in Kenya who are poultry specialists. Most veterinarians are generalists. USAID should consider training qualified veterinarians at a U.S. university which specializes in poultry science, such as North Carolina State or the University of Georgia. One year to 18 months working in a poultry pathology laboratory would enable a qualified veterinarian to recognize and treat the more common poultry diseases.

If the poultry industry is to develop on a sound basis, there must be an adequate supply of quality vaccines and the farmer must be knowledgeable on how to use these vaccines. As the poultry population increases, diseases not common to Kenya will inevitably develop. To combat

these diseases will require not only a greater volume of present vaccines, but many new types as well. Consideration should be given to increasing the import of vaccines presently required and producing in-country vaccines that will be required in the future.

### **9.3 Feed Input Supply Improvements**

In order to improve the quality of poultry feed and therefore improve poultry production and supply, an adequate quantity and quality of feed ingredients are necessary. In particular, there is a need to develop a variety of soybean that can be adapted to Kenya's production conditions. Without soybean meal, six to eight other ingredients must be added to a ration in order to include all the necessary amino acids required in poultry rations. A.I.D. could play an important role in providing technical assistance and funding for such a research project, working in conjunction with Kenyan research institutes and private producers.

Local fishmeal for feed ingredients is also in short supply, yet there is ample fish available both from the sea as well as fresh water fish from Lake Victoria. The establishment of a modern fish meal plant could be a project in which U.S. private agribusiness would like to invest.

### **9.4 Feed Milling**

All feed produced by the mill should be tagged with a dated and batch numbered label listing the basic ingredients and the amounts contained in the ration. Minimum items that need to be shown include:

% Crude Protein	- Not less than
% Crude Fat	- Not less than
% Crude Fiber	- Not more than
% Calcium	- Not more than
% Phosphorus	- Not less than
% Salt	- Not less than
% Salt	- Not more than

Imported feed ingredients should be bought on a guaranteed basis.

Because of the importance of feed quality, the Ministry of Livestock Development (MLD) should organize to perform periodic inspection and feed quality testing at its own laboratories to supplement the testing done by the mill at its laboratories. Testing facilities should also be available for any imported feed. A unified program for good milling practices should be adopted. The major shortcoming of feed mills in developing countries is the lack of technical quality control. A basic requirement is that each incoming batch of feed ingredients be sampled to determine its nutritional value. As the poultry farmers of Kenya become more experienced, it will be important for the feed mill to provide exact details of feed composition, and to guarantee their accuracy.

Further improvement to animal feed quality could result from the upgrading of a quality

control laboratory for animal feed. This is potentially a cooperative venture for both the public and private sectors. At this time, the existing facilities for animal feed quality control are not operable.

### **9.5 Local Research Collaboration**

Since KARI, Egerton University, the Department of Animal Production at the University of Nairobi are dealing with similar problems, they should collaborate in order to use the infrastructure that is available more efficiently. In both the University of Nairobi and Egerton, there are departments of Agricultural Engineering. These departments should be encouraged to work on poultry house design, building materials, etc. Similarly, the Departments of Food Science should be involved in development of poultry products. Also, the Department of Agricultural Economics should carry out marketing studies. The Department of Pathology and Microbiology should carry out diagnostic work as well as poultry health research. Collaboration between departments, however, cannot be achieved unless research priorities are ranked.

The recommendations for increasing collaboration among research institutions are:

- Research priorities should be ranked within each institution and department;
- A policy of collaboration between KARI and the universities should be instituted (currently, most research is independent);
- Increase collaboration between departments within universities and increase research funding (again, these are currently independent); and,
- Ensure an adequate supply of qualified personnel.

### **9.6 Information Dissemination**

Dissemination of information about technologies needs to be strengthened by:

- Improving the information center of the Ministry of Livestock Development;
- Collecting information from research institutes, universities, and the private sector. (Perhaps the information center could do this);
- Making contacts with institutions outside Kenya that can provide such information. Kenya Association of Feed Industry (KAFI) aims to do this;
- Writing a "handbook," for the poultry feed industry, on composition of raw materials used in compounding poultry feed; and,
- Compiling a directory of who is who in the commodity and technology fields.

## **9.7 Financing**

The following are recommendations for increasing funding of poultry-related activities:

- Financing institutions and programs need to become more aware of the potential for poultry production in Kenya;
- Increased research funding should be encouraged for collaborative use by both public and private institutions;
- AFC and other lending agencies should be encouraged to fund poultry-related activities; and,
- A stabilizing fund should be established for loans denominated in hard currencies, to guard against depreciation of the Kenyan shilling.

## **9.8 Distribution**

One or two hatcheries in Western Kenya are needed to supply day-old chicks to this area.

Government offices or veterinary research laboratories, or better still, farmer cooperatives, should be encouraged to purchase and store, under refrigeration, vaccines commonly used in their areas.

A directory of sources for vaccines and poultry health products should be established for farmers. Also, the government should liberalize the importation of vaccines not produced in Kenya, such as the infectious Bursal disease vaccine.

## **9.9 Joint Ventures**

Joint ventures and other investment possibilities (according to government officials, USAID, and the University of Nairobi) should be encouraged in the following areas:

- Vaccine production facilities or, alternatively, technical assistance in the management of such facilities. Quality is a serious problem with vaccine production;
- Technical assistance, such as in feed mills and feed formulation. Possible joint venture opportunities exist in expanding fish meal production plants for freshwater as well as ocean fish;
- Hatchery and breeder farms. As mentioned, one hatchery in Kenya controls 75 percent of chick production;
- Agricultural pesticides and herbicides;
- Oil seed crushing; and,

- Poultry management services.

### **9.10 Recommended Government Action**

The Government of Kenya could implement several reforms to improve the poultry industry and lead the way in strengthening the country's agriculture. Recommended GOK actions are:

- (1) Make firm and deliberate policy decisions to encourage poultry feed millers to produce and use raw materials that are commonly used for human consumption. This encouragement of increased production of feed resources should include provision of more incentives to small farmers. Improved seed varieties, application of more fertilizer, available storage facilities for poultry feed, use (rather than export) of excess maize, and price and government incentives to produce cereals for poultry feed (possibly even allocation of production hectare) would also improve the feed situation;
- (2) Improve the timeliness of fertilizer distribution. Currently, there is insufficient infrastructure for its delivery. During the 1991/92 crop season, fertilizer was not delivered in time for planting;
- (3) Improve extension services. Field service is an important factor in the poultry industry. Without it, there can be no viable poultry industry in Kenya. Currently, there are no veterinarians specializing in poultry, no poultry nutritionists, and no poultry management specialists;
- (4) Support training of more poultry husbandry extension staff to strengthen the advisory service to poultry farmers;
- (5) Assist in providing low interest loans to the growers (there are currently none available);
- (6) Assist in providing credit to eligible poultry farmers so that they can further improve their poultry businesses;
- (7) Provide incentives for fish farming. There is currently a shortage of fishmeal in Kenya, and meal is imported in limited amounts;
- (8) Gradually privatize parastatal projects and companies;
- (9) Provide incentives for experienced foreign investors to develop agricultural projects. The IPC has made considerable headway in this area, with the establishment of a "one-stop shop" for investor approval, better guarantees for repatriation of capital and profits, and promoting joint ventures. However, additional reforms could increase investment incentives, such as fewer restrictions on foreign investment and tax incentives;
- (10) Simplify processing of import licenses and allocation of foreign exchange to facilitate regular importation of breeding stock, vaccines, poultry health products, and equipment;
- (11) Remove import duty on breeding stock;
- (12) Review pricing of poultry feeds for the purpose of either decontrolling the prices of raw materials or gradually relaxing final product price controls;
- (13) Eliminate duplication of responsibilities in various government agencies;

- (14) More measures for water conservation could be implemented. For example, automatic drinking devices would reduce waste, and water could be recycled for clean-up uses, which reduces waste water that enters the septic system;
- (15) Safeguarding agricultural lands and preventing the destruction of the limited arable and valuable lands; and,
- (16) Improved marketing practices, such as better egg cleaning and packaging, implementation of an egg grading system, refrigeration (which is generally not available except in some supermarkets), beginning of a live broiler market, better poultry meat packaging, increased availability of cut-up chicken, better sanitary conditions in display and storage of meat, and more refrigeration of meat.

### **9.11 Areas for Further Research**

The following areas of further research and study are recommended to address the major problems mentioned earlier:

- (1) Evaluate the nutritional quality of locally produced poultry feedstuffs.
- (2) Test the performance of chicks, grower pullets and broilers on rations with different levels of locally grown and processed poultry feedstuffs.
- (3) Assess the economics of using a formulated cereal balance meal based on locally-processed oil cakes and fishmeal as easy-to-mix ingredients for farmers.
- (4) Undertake trials on the possible use of alternative energy sources, such as sorghum, cassava and millet, mixed with home-produced oil seed cakes from sesame, soy, sunflower, rapeseed, and cottonseed.
- (5) Undertake a detailed study of the poultry industry to obtain accurate information on: (a) actual poultry feed produced and its quality; and, (b) incidence of disease;
- (6) Justify the need for new hatcheries. Investigate and establish the demand for chicks versus the capacity of the hatcheries to meet this demand.
- (7) Study the marketing structure for eggs and poultry meat to obtain information on the market channels, prices, supply/demand situation, volumes, consumption habits, trends, and constraints.

Poultry is presently one of the most expensive meats in Kenya. This is not the case in most of the world where poultry meat is one of the least expensive meats available. If the major problems discussed earlier could be solved by providing U.S. technical and marketing expertise in a joint effort with Kenyan partners and government officials, then the cost of poultry meat could be reduced and still provide very attractive returns to project investors. If poultry meat were less expensive, consumption of poultry would increase and lead to better nutrition.

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## APPENDIX A

### KENYA POULTRY FEED: LIST OF KEY PLAYERS

#### a) Feed Millers

Company	Contact	Location	P.O. Box	Telephone
Unga Feeds Ltd.	D.H. Farthing	Nairobi	41788	541887
Atta (1974) Ltd.	S.G. Nayer	Mombasa	83272	490864/ 490865
Kisumu Walla Oil Industries	B.M. Patel	Mombasa	98102	491939/ 491600
Muus Kenya Ltd.	Dr. Bala	Thika	625	21271
Ideal Manufacturing Company	Mr. Shah	Nairobi	18443	557170/ 557933
Sigma Feeds Ltd.	Mr. Shah	Nairobi	181838	891498/ 891572
United Millers Ltd. Milling Corporation of Kenya	S.N. Shah	Kisumu	620	41227
	J.K.A. Ngetich	Nakuru	7353	211800/ 1/2/3
ABC Foods Ltd.	Mr. Dash	Nakuru	7465	2693
Rodar Nutrivet	Mr. Miller	Nairobi	42240	562011/ 560938
Kapsoit Miller Cosmos Ltd.	G. Muli Managing Director	Kericho	15	-
		Nairobi	41433	541254/ 540855
Karatina Feeds Factory	Mr. Omor	Karatina	1237	-
Meru Central Farmers Coop. Society Feed Mill	Mr. Keremi	Meru	6	016420496
Golden Feeds Ltd.	C. Chibole	Nairobi	49855	558672/7
Moore Industries Ltd.	Mr. Kipngoro	Nairobi	66937	-
Merchant Manufacturers	Mr. Maseki	Nairobi	18181	557839/ 554708
Arkey Industries Ltd.	Mr. Sanjey	Eldoret	679	2835
Kitale Industries Ltd.	Managing			

Muttu Products	Director Mr. Kairu	Kitale Thika	616 1032	20356 -
Belfast Millers	K. Shah	Nairobi	18453	558488
Miritini Oil Industries	Dr. Kikiu	Nairobi	20644	33341

b) Hatchery operators

Company	Contact	Location	P.O. Box	Telephone —
Kenchic Ltd. Rift Valley Hatcheries	B.A. Stark Feed Manager	Nairobi Nakuru	20052 2690	444809 44211/2
Muguku Poultry Farm Washanga Hatcheries	Manager Managing Director	Kikuyu Mombasa	70 85795	015432072 485665
Sigma Feeds Ltd.	Mr. Shah	Nairobi	181838	891498/ 891572

c) Vaccine (Biological)

Kenya Veterinary Vaccine Production Institute Cooper Kenya Ltd.	J. Onjwong Dr. J. Njau	Nairobi Nairobi	40596	632031/2
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d) Antibiotics, Coccidiostats (Agrochemicals)

Cooper Kenya Ltd. Cosmos Ltd.	Dr. J. Njau Managing Director	Nairobi Nairobi	40596 41433	632031/2 541254/ 540855
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Company	Contact	Location	P.O. Box	Telephone
<b>e) Pre-Mix Suppliers</b>				
Cosmos Ltd.	Managing Director	Nairobi	41332	541254
Tamfeed Ltd.	E. Karstad or J. Njuguna	Nairobi	24371	882375
Hoffman La Roche	S. Shishoka	Nairobi		
<b>f) Universities and Research Institutions</b>				
University of Nairobi Dept. of Animal Prod.	Chairman	Nairobi	29053	632211
Egerton University Dept. of Animal Sci.	Chairman	Njoro	536	40861
Kenya Agricultural Research Inst.	Dr. A Abate	Nairobi	57811	332336
Kenya Seed Company	Managing Director	Kitale	553	20941
<b>g) Extension and Marketing</b>				
Ministry of Livestock Development	Permanent Secretary	Nairobi	34188	728370
Kenya Grain Growers Cooperative Union	Managing Director	Nakuru	35	41111
<b>h) Regulation/Licensing</b>				
Investment Promotion Centre	J.G. Mwangeka	Nairobi	55704	221401
Kenya National Chamber of Commerce and Industry	Manager	Nairobi	47024	20866
Ministry of Commerce	Permanent Secretary	Nairobi	30430	340010
Ministry of Livestock Development	Permanent Secretary	Nairobi	34188	728370

## APPENDIX B

### LIST OF PEOPLE/INSTITUTIONS/COMPANIES VISITED

1. Tamfeeds Ltd--Pre-mix supplier  
    --Fishmeal producer     }Langata  
    --Protein concentrate    }Nairobi
2. Sigma Feeds Ltd--Feed production    }Langata  
    --Hatchery                }Nairobi
3. Belfas Millers--Feed producer-Nairobi
4. Milling Corporation--Feed producer-Nakuru of Kenya
5. Golden Feeds Ltd.--Feed producer-Nairobi
6. Kimken Feeds Ltd.--Feed producer-Ngong
7. Ideal feed manufacturing--Feed producer-Nairobi
8. MUUS Products--Feed producer-Thika
9. ABC Foods--Feed producer-Nakuru
10. Hoffman-LaRoche--Agrichemical-Nairobi
11. Cooper Kenya Ltd.--Agrichemical-Nairobi
12. Kenya, Veterinary  
    Vaccine production }Agrichemical-Nairobi  
    Institute
13. Nutrivet--Agrichemical-Nairobi
14. Department of Animal Production     }Training and Research  
    University of Nairobi Institute, Nairobi
15. Kenya Agriculture                 }Research Institute  
    Research Institute (KARI)
16. Kenchick Ltd. } Broiler Production-self and contract, broiler processing, hatchery, broiler  
    parent stock, broiler parent stock, broiler and layer parent stock--Nairobi
17. Muguku Poultry Farm: hatchery, broiler and layer parent stock
18. Muus Kenya Ltd.--feed producer-Thika
19. Kenya Grain Growers--service co-op-Nakuru Cooperative Union
20. W. Shisoka--Organizing Secretary, Kenya Association of Animal feed industry Nairobi
21. Kenya Seed Company--Maize, potato, soybean, wheat, pasture seed  
    production-Kitale
22. Small enterprise finance company--Financier of small-scale  
    animal feed production, and poultry production
23. H. Norton--Head FAO Office, Nairobi
24. Deputy Permanent Secretary--Ministry of Livestock Development, Nairobi
25. J. O. Ochuonyo--Head Animal Feeds Section
26. J. Mwangeke--Investment Promotion Centre
27. Chairman Department of Pathology   }Diagnostic Lab Training  
    and Microbiology, University and Research in Poultry  
    Nairobi among others

28. Francis K. Kaigua--Poultry farmer (Layers)-Limmur
29. Mrs. Morris Njirir--Poultry farmer (Layers)-Limmur
30. Stephen N. Njenga--Poultry farmer (Layers) Limmur
31. Paul Hato--Large Poultry Farmer (Layers)=Thika
32. Komo Munyu--Self-Help poultry enterprise-Thika
33. David Ngigi--Broiler poultry farmer (Broilers) Thika
34. Munyaka Poultry Farm--Large poultry enterprise-Thika
35. Mrs. Kio Wando--Poultry farmer (large)-Kikuyu
36. Kenya National Chamber of Commercial Industry-Nairobi
37. Kenya Bureau of Standards
38. There were other people, about 15 of whom were visited but refused to participate - in particular, Unga Feeds, Ltd., the largest feed concern in Kenya. There were also the oil millers (suppliers) of oil cakes/meals. These people operate as a cartel, and it is difficult to penetrate their organization. A similar situation was noted in 1987 when the University was conducting the vegetable oil/protein system (VOPS) study. From April 12 to April 25, Phase 1 and Phase 2 were combined.

**Appendix C**

**Oil Crop Estimated Hectarage and Production**

**1983 - 1987**

	AREA 1000 HA			YIELD KG/HA			PRODUCTION 1000 MT		
	1988	1989	1990	1988	1989	1990	1988	1989	1990
Sunflower Seeds	3 F	3 F	3 F	1424	1433	1441	5 F	5 F	5 F
Coconut	73 F	74 F	75 F	12 F	13 F	13 F			
Sesame Seed	20 F	20 F	21 F	386	392	398	8 F	8 F	8 F
Goundnut (in shell)	14 F	14 F	15 F	637	644	621	9 F	9 F	9 F
Castor	13 F	13 F	13 F	323	326	328	4 F	4 F	4 F

Source: FAO Production Yearbook 1990, Vol. 44. FAO, Rome, 1991

F = Estimated