

**FACTORS INFLUENCING THE SUPPLY OF HOGS
IN KENYA**

BY

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Economics, University of Nairobi, in partial
fulfilment of the requirements for the Degree
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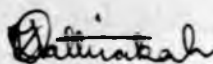
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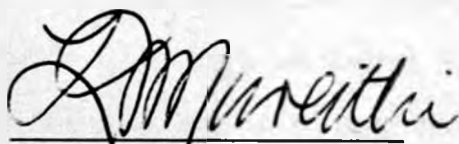
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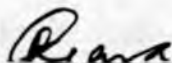
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ABSTRACT

This study was carried out from January to June 1988 with an objective of determining the nature of influence that expected (futures), producer and feed prices, seasonality, time and the number of sows available for breeding have on the supply of hogs.

Hog supply has not been meeting demand. As a result, Kenya has changed from a net exporter of hog products to an importer of hogs to satisfy the demand. Farmers realise less income when they supply fewer hogs.

According to the findings, futures and producer price variables have the largest influence on the number of hogs supplied. The producer prices of hogs have not been meeting farmers' expectations and that partly explains the declining trend in production.

The domestic production and marketing environments have not been encouraging supply of hogs either. Input costs and unreliability of some marketing channels have pushed several farmers out of the industry.

To rectify the situation, it is necessary to restructure the pricing and payment system. Higher producer prices based on liveweight of the hog should be given to the farmers. In this regard, the farmers should come together and form co-operatives so that they can be in a better bargaining position for better prices.

Policy makers should give due consideration to the livestock industry while reviewing producer prices for

cereals if the hog industry is to stabilize. Cereals are important inputs in hog farming.

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CHAPTER 1

INTRODUCTION

1.1 Brief History of the Hog Industry in Kenya.

The hog industry is one of the oldest industries in Kenya. Prior to the arrival of the Europeans in the 19th Century the indigenous people used to keep the white-spotted black hogs still common in Western Province to date. Later, varieties such as the hampshire, landrace and large white were introduced. These together with their crosses comprise a large number of hogs presently found in Kenya.

The introduction of these varieties marked the beginning of large scale hog farming on commercial basis, making the opening of a processing factory worthwhile. In 1921, Uplands Bacon Factory (UBF) a parastatal enterprise, was opened to slaughter and process hog carcass into pork and related products. Later in 1945, the Pig Industry Board (PIB) was formed to regulate the general operations of the industry. These included the issuing of licences to hog farmers, slaughterhouses, processing firms, and fixing producer prices for live hogs. Initially, the Board was financed from a 3 per cent cess levied on pigs delivered to the factory¹. However, the cess was lifted in June 1973 as it hindered full realization of producer price effect in attracting supplies.

The products of UBF found ready market locally and in Britain. Local demand increased during the emergency period mainly due to the establishment of colonial garrisons in Kenya. To cater for this increased demand, UBF embarked on an expansion program financed by several sources which included a loan and overdraft facility from the Development Corporation of Standard Bank, a cess levied on every hog supplied to the factory, revenue collected from cash subscriptions for preference shares and transfers to reserve for new factory from the appropriation account and UBF profits from operations². After expansion, the new factory opened in 1958.

With the new factory and anticipation of demand increase, many farmers increased their herds causing overproduction of hogs. As a result, 80,000 hogs were off-loaded onto the London market at a loss between 1958 and 1961. After this crisis, many farmers got discouraged and reduced hog production. To stimulate production, UBF established contracts with farmers to enable it predict output of the individual farmer well in advance. At the same time, the farmer himself would know his selling price six months ahead of delivery. This arrangement considerably curtailed overproduction of hogs. This measure assured farmers of a ready market but not the highest price. In fact, the producer price under contract farming was the lowest³. Contract arrangements with UBF operated upto 1986 when the factory closed down due to financial and management

problems. However, the arrangements were revived by Farmer's Choice, one of the important companies in Kenya's hog industry. Although firms such as Kenya Bacon and Kenya Cold Storage slaughter hogs, they do not operate such arrangements.

Commercial hog farming was mainly practiced on large scale farms upto the late 1960s. In 1960, out of the 83,504 hogs supplied to the PIB for slaughter, only 401 came from small farms⁴. However, hog farming has always co-existed with other activities such as dairy, poultry and crop farming. In some cases, it has been a subsidiary activity in mixed farming systems. A licence costing Kshs. 5/- is issued by the Veterinary Department to farmers who can show that their piggeries will not lead to the spread of East Coast Swine Fever as a result of contact between wild and domestic hogs. With time, the industry's emphasis has shifted from large-scale to smallholding. Research stations and slaughter firms, Farmers Training Centres, welfare groups, schools and the Agricultural Development Corporation (ADC) are also important in this respect. Smallholders accounted for 75 per cent of the total Kenyan hog production in 1983⁵.

Large scale farmers are, however, much more efficient than smallholders given that they have financial and other resources to hire labour and store enough feeds in case of shortages. They are also in a better position to generate surplus foods especially maize, potatoes and vegetables with which they feed the hogs. Mostly they

are also the target group in extension services and their piggeries are better.

Well constructed piggeries make the distribution of food and removal of waste easy and reduces the risk of clumsy mother hog sleeping on the piglets. But they are costly. Performance of the animals in terms of weight gain is, however, better in such piggeries. Extension service avails invaluable information on better farming and management methods.

Availability and cost of feeds has been a major factor influencing the performance and indeed the survival of the hog industry. In the mid 1970s, the feeds industry was dominated by Unga Feeds. But following a feeds shortage at around the same time, several other feeds manufacturers entered the market although Unga Feeds continued to hold a large share of the market. Major competitors include Belfast Millers, Ideal Manufacturers, Marchant Manufacturers, Ridge Animal Products (dormant at the moment), Nova Industrial Products, Sigma Feeds and Maida all based in Nairobi; Mbwaji Muus, High Hill, Muhuka, Wananchi Millers and Birdan Feeds in Central Province; the Mombasa based Atta (1974), Milling Corporation, ABC Foods (1974), Kitale Industries, Malisho Meals and Feeds in the Rift Valley; and United Millers in Kisumu, among others.

Although animal feeds are price controlled under the General Order Legal Notice No. 249 of 1983, the Price Controller's office lacks adequate personnel to monitor

the prices of such feeds. The Kenya Bureau of Standards (KBS) also suffers from the same problem and is therefore unable to satisfactorily monitor the standard and quality of all the feeds sold in the market. This partly explains the numerous cases reported at Kabete Veterinary Laboratories by farmers complaining of poor quality feeds that have even led to death of livestock. As such, the feeds factor remains a major factor influencing the growth of the hog industry.

1.2 Significance of Hog Products to Kenya

Hog products such as pork, bacon, ham and sausages are a good source of protein, B-Vitamins and trace elements. Lard is used in cooking. In particular, sausages have become a popular breakfast food item in many upper- and middle-income Kenyan homes and as snacks in fast-food restaurants. Other major consumers include tourist hotels, hospitals, schools and other educational institutions. In some cultures pork consumption is believed to have some medicinal effect.

Hogs take around six months to fully mature and are thus better placed in meat production as compared to, say, sheep and cattle. Researchers have shown that due to decreasing availability of grazing land in Kenya, beef production will decline in future⁶. The resulting gap could be filled by increasing production of pork. Hog products can not only be an alternative to red meat, but can also replace mutton and beef in the Kenyan market and thus facilitate increased exports of the two especially

to Middle East.

Besides their food value, hogs and hog products are a source of income to farmers and the country as a whole. In 1986 alone, hog farmers earned over Kshs.25 million from the sale of some 28,479 hogs⁷. Since the establishment of the industry, Kenya had maintained her position as a net exporter of hog products until 1985 when the country began experiencing hog shortages. From late 1950s through 1960s, Britain was the main export outlet for Kenyan hog products. Since 1970, however, the export market expanded to include Ethiopia, Mauritius, Seychelles, Somalia, Sudan, Tanzania, Uganda, Zambia, Arabian Gulf States, Hong Kong and India. In spite of this expansion, the domestic market earned the industry much more than the export market.

Unfortunately, the industry's output declined considerably in the late 1970s and early 1980s reducing Kenya into a net importer of hogs. In 1987, for instance, Farmer's Choice imported one thousand hogs from Tanzania. Some of the factors that explain why the country changed from a net exporter to an importer include variations in the demand and supply of hogs. Variables that have influenced demand have included population, the relative prices of beef and mutton (these are close substitutes to pork), profits made by the hog buyers, consumer tastes and preferences. Overall, however, supply factors would appear to largely account for the shortage. As an example,

supply of hogs to UBF maintained a steady decline after 1973 and only picked up in the early 1980s. As a result, domestic and export sales also declined considerably. While they were worth over Kshs. 3.4 million in 1972, the sales declined to just over Ksh. 38,000 in 1978 (See Table 1.10). Since 1984, farmers have been supplying fewer hogs than required by the various abattoirs⁸.

Table 1.10 Pork Sales by Uplands Bacon Factory (Kshs).

Country of Sales	1972	1973	1978	1979	1980
Kenya	2,359,017	2,361,595	30,912	31,924	1,438,411
Uganda	246,433	120,845	-	-	-
Tanzania	54,347	89,038	-	-	-
Outside E.A.*	769,676	440,532	7,043	7,018	100,353
Totals	3,429,490	3,012,010	37,955	38,942	1,591,007

Source: Republic of Kenya, Ministry of Agriculture
Economic Review Agriculture. (Various issues,
mimeo).

* Includes Mauritius, Seychelles, Zaire, Zambia,
Arabian Gulf States, India and others.

1.3 The Research Problem

In the recent past, supply of hogs in Kenya has fallen far short of demand. This phenomenon has been attributed largely to supply factors. For instance the exit of many farmers from the industry in 1986 and 1987 as a result of failure by Uplands Bacon Factory to pay for hogs delivered led to a serious shortage of hogs and hog products. Fluctuating feed prices combined with occasional shortages have also influenced supply of hogs. Due to various milk price reviews, many farmers have found dairy farming more profitable and therefore abandoned hog rearing. Although there has been various non-price producer incentives, these have not been sufficient to make the farmers increase the production of hogs substantially.

To determine the validity and importance of these factors in explaining the movement in the supply of hogs in Kenya, some econometric analysis is necessary. However, no researcher has done that. This study intends to provide necessary background material and an attempt of such analysis.

1.4 Importance of the Study

The shortage of hogs has caused great concern to the slaughter firms and the government. To rectify the situation, Farmer's Choice for instance introduced, in 1986 several measures to woo back disillusioned farmers. These measures included on-spot payments, delivering feeds,

extension service from field officers and giving cash bonuses for hogs transported to the factory and special transport to smaller farmers who could not afford to do so. These measures still hold today. In anticipation of increased hog supply, the company opened a new plant. On their part, the farmers with the help of the government and Danish International Aid Agency (DANIDA), plan to form a Kenya National Pig Union to take over the crisis-ridden Uplands Factory⁹.

Despite these efforts, Kenya still faces a general shortage of hogs. A proper analysis of the above mentioned factors will shed light on where to concentrate the efforts to improve the situation. Besides providing such an analysis, this paper will highlight recent developments in Kenyan hog industry.

1.5 Objectives of the Study

The objectives of this study are to:

- i) Analyse the impact of the various supply factors on the amounts of hog supplied.
- ii) Estimate various response elasticities.
- iii) Analyse the strategies adopted by Uplands Bacon Factory's competitors as a result of the factory's closure.
- iv) Facilitate formulation of policies which can improve hog industry.

1.6 Organization of the Remainder of the Paper

While chapter one deals with the background of the study, the research problem, importance and objectives of the study, chapter two discusses various factors that have been identified in theoretical and empirical studies as influencing the supply of hogs. A brief discussion of how these factors have been put to econometric use and the findings obtained is also given in the chapter. At the end, the chapter presents the merits and demerits of using the various econometric procedures in analysing the influence of the identified factors on hog supply.

Chapter three gives a picture of the domestic production and marketing of pigs with a view to showing whether the industry has been growing.

Chapter four highlights the development of the method and model to be used in the study while chapter five reports basic data used in the estimation of the model and presents the results obtained.

Chapter six concludes the paper by giving a brief summary and the suggested policy measures.

ENDNOTES

1. See United Nations Development Program, Food and Agriculture Organisation. East African Livestock Survey. Regional - Kenya, Tanzania, Uganda. Development Plans. Volume II, United Nations, Rome, 1967 p. 222.
2. See Pig Industry Board, Annual Report. 1952 (Mimeo).
3. See Republic of Kenya, Ministry of Livestock Development. Various Districts, Annual Report(s). (various issues).
4. See Republic of Kenya, Central Bureau of Statistics, Statistical Abstract. Nairobi, Government Printer. 1961.
5. See D. Stotz, Production Techniques and Economics of Smallholder Livestock Production Systems in Kenya. Nairobi, Ministry of Livestock Development. 1983 p. 110.
6. Same as footnote 1 above, p.47-112.

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CHAPTER 2

LITERATURE REVIEW

To a large extent, farmer's responsiveness to the various economic changes to some extent determine the output and scope for expansion of the agricultural sector. In hog farming, price, weather, marketing channels and other such factors, singly or in combination cause fluctuations in output and income of the hog industry. When output declines, farmers' incomes fall causing hardships not only to the farmers but also to the country since hogs or hog products may have to be imported. The fluctuations, otherwise described as the hog cycle, harmonic motion or the cobweb cycle have a distabilizing effect on the industry. It is therefore important to analyse the responses to facilitate formulation of agricultural sector planning policies.

A considerable number of studies have been undertaken on hog supply response in order to assess how output can be stablilized (See Breimyer |2|, Griffith |8|, Leuthold |10| , Lin |12|, Mclements |14|, and Robertson |19|). Other researchers have focused on how the incomes could be stabilized (See Dawson |14|, Robertson |19|, and Meilke |19|)¹. Despite the attention given to hog supply response by researchers in many countries, similar analysis has not been done in Kenya.

To fill that gap, it is prudent to review other researchers' studies in order to delienate areas of similarity and deviation of this study, from the past ones. Attention will be paid to issues of variables considered, their expression, problems encountered, merits and demerits of the various methodologies used.

2.1 Determinants, Lags, Futures Price and Risk in Response Analysis

The major determinants of hog supply response usually identified in the literature include feeds price, producer expectations of hog price, hog price in the previous period, profitability of competing enterprises, seasons, level of technology, government intervention in pricing and marketing through established institutions, the number of marketing outlets, total imports of hogs (or pork), hog-corn price ratio and risk among others. Quarterly and yearly time series data for a region (or across regions) on the above variables forms the data set for most of hog response estimates.

A survey of theoretical and empirical studies done reveals various models and estimation procedures that have been used to estimate hog supply response. Most models have applied lagged and expectation values in their response expressions.

The geometric lag is preferred by many researchers because of the way the values decay in a continuous pattern though it is criticized for assuming asymptotically diminishing weights of past prices. The critics of this method argue that the restriction imbedded in its assumption is overcome in the polynomial lag, which is relatively more flexible. However, this flexibility arises from an arbitrary choice of the co-efficients of the lag and this makes the expected variable look biased and dependent on the subjective judgement of the researcher. Pascal's lag is hard to justify and hence its limited use. Gardner [6] argues that Nerlove's geometric progression is acceptable although it induces serial correlation even when the supply equation errors are serially uncorrelated.

Lagging procedure aside, Griffith and Anderson [9] contend that if lagged endogenous variables are included in a supply relationship using time series data, the estimates will be subject to a marked bias because of the presence of serial correlation in time series data. In such a case, the use of Durbin - Watson statistics would be invalid. Suggestions on how to get out of such a problem have been given by Griffith et al [9]. They proposed the use of two stage least squares (2SLS) instead of ordinary least squares (OLS). In that case, the relationship to be estimated has to be expressed in a simultaneous equation framework. Nevertheless, the authors did not overlook the problem that would be posed by

multicollinearity in such a model. Breimyer | 2 | on this issue noted that lagged dependent variables in distributed lag models are likely to introduce correlation between the disturbance term and the lagged dependent variable. Estimates in such models would have an upward bias in the coefficients of the lagged dependent variable. However, she noted that by including a time trend variable, T, in the model, the adjusted R coefficient would be raised and therefore reduce the least squares bias.

The unfavourable impact of autocorrelation would also be lowered. As such, it is very important to include T in supply response analysis. Griffith and Anderson | 9 | argue that the use of Maximum Likelihood Estimates (MLE) in estimating parameters in adaptive expectation models will remove the bias and inconsistency found in OLS estimates. The standard errors found using MLE method are, however, not suitable in testing hypotheses. The two, nevertheless, point out that OLS can be used in simple expectation models.

Supply response researchers agree that lagged values can be used since production responds with a lag to changes in variables. But how far back to lag or what estimation and lagging method to use are still controversial issues.

It has been postulated that futures price (also referred to as anticipated or expected price) is the most relevant price in the current production plans and

supply decisions. Futures price is that price the farmer expects to get when he puts his produce on the market. As such it is not directly observable and has to be approximated. There are several proposals on how this should be done but none is universally accepted. The most naive expectation is that the expected price is simply the current price as put forward by Tryfos [22]. More advanced forms of simple expectations are such as those given by Nevlove (1958)² and Koyck (1954)³, Almon (1965)⁴ and Solow (1960)⁵. Their methods give different expectations⁶. Myers and Navlicek (1976)⁷ had an expectations model that is different from the others. It is as follows:

$$P_{j+1,K}^* = P_{JK} + \theta_j(s) + a_j(c)$$

Where,

$P_{j+1,K}^*$ is the expected price of live slaughter hogs during the next j^{th} month of the K^{th} year.

P_{jk} is the ruling live slaughter price during j^{th} month of the K^{th} year.

S is a measure of seasonal fluctuations.

C is a measure of relative position in the production cycle.

θ_j are coefficients of expectations which reflect the effects that seasonal production patterns have on price expectations.

a_j are coefficients of expectation which reflect the effects that cyclical production patterns

have on price expectations.

This method is in a way ad hoc since the specifications of S and C are arbitrary and the expected signs of θ_j and β_j depend on those specifications. The choice of any one of these methods is an individual decision.

Farming activities are subject to the vagaries of climate and weather. They are also surrounded by uncertainties about future market and prices making some of the supply response researchers feel that a risk factor should explicitly be introduced in the model (see Chin and Paddock | 3 | and Lin | 12 |). Risk variable, expressed as the variance or squared deviation of the actual and expected price, is said to make the supply response "stronger" and more responsive to stabilization plans. However, the variable can be superfluous in a model having expected price as a variable. In addition, Gardner | 6 | found risk aversion as an element in producer decision-making to be statistically insignificant.

2.2 Problems of Fluctuations, Data and Formulations

Past studies of hog supply response have found that the fluctuations characteristic of the hog industry do not promote the expansion of hog farming.

According to Dawson | 4 |, if the Canadian hog farmer's income were stabilized in addition to an incentive of cash bonus, output would rise tremendously. Robertson | 19 | shares the same view when he argues that the fluctuations

in hog production cause great hardships to the farmers.

The hog industry is found to utilize resources inefficiently due to such fluctuations. Dyck | 5 | further pointed out that the variability in commercial marketing of hogs and the profitability of hog enterprise as expressed by the hog/barley ratio need to be stabilized. Towards that end, he recommends that feed barley prices paid by hog producers, producer prices for hogs and feeds prices need to be regulated and stabilized since they are the major causes of the cycles in the industry. Such a recommendation would be of considerable relevance to Kenya when consideration is given to current shortage of hogs caused by the problems of Uplands Bacon Factory and the shortage of maize in 1984.

Hog farmers, like any other economic agents, are quite responsive to changes in economic factors. However, the response depends on the circumstances confronting the farmers. Farmers in U.S.A. and Eastern Canada were found to be more responsive to feed price changes than hog price changes which contrasts with farmers of Western Canada who were more responsive to the former. This varying response should act as a caution to the policy makers who want to stabilize the industry. The success of a specific stabilization program in one area does not necessarily imply that the program will succeed elsewhere.

The problem of data availability, especially time series data, poses a serious problem to many researchers. Many countries, Kenya included, do not have a good mechanism of storing data. In other cases, data may exist but may not be that easily accessible to the public.

Tyrfos [22] recognises this problem when he uses quantity of inspected slaughtered hogs as a proxy for quantity supplied. In Kenya where some hogs are slaughtered and consumed in the non-market rural areas, data on total slaughter can only be approximated. The problem is aggravated by slaughter firms who destroy past data. Researchers of livestock supply face serious data problems and especially when they want to utilise Tyrfos' method where the best measure of quantity of livestock supplied is not the number of animals slaughtered as in U.S. studies, but the total slaughter is kilograms plus net exports.

Concerning the debate previously mentioned, Leuthold and Hartman [11] while analysing the efficiency of hog markets in the U.S. found that expected prices are a major determinant of hogs supplied. They used an econometric model based on the cobweb model having demand and supply equations. In the supply function, a linear equation was used with sow farrowing and hog-corn price ratios as the lagged variable. Inclusion of a risk factor in the model is well discussed by Chin

and Paddock | 3|. Results of such supply relationships show producers to be risk averse.

On the issue of general formulation of supply response model, Breimyer | 2| makes a useful contribution by her argument that variables should be lagged since farm production activities, whether in crops or livestock are characterised by a lag in production response to a price change. She also attribute the cycles in livestock production to changes in marketing and price. She finds production levels to have some influence on the changes in marketing and price. Many supply response models omit current price as a variable. But the static economic theory of Marshal and Cournot argue that supply increases with price.

While this can be true for industrial commodities, in agricultural supply response, current prices play a small role in determining current supply. Tweeten and Quance | 23| are of this view. They also stress the need to incorporate the impact of operating inputs in the single equation supply functions in order to remove the downward bias in the elasticity estimates. When technology variable is included in the model, it has an effect of reducing the standard error by lowering the least squares bias and the unfavourable impact of autocorrelation.

On this issues of general formulation of supply relationships, Nerlove | 17| points out that estimating

supply response from aggregated time series data, is an approach that fails to capture the response from technological improvements, public investments in infrastructure and the development of markets. However, the weakness can be overcome by having a time trend variable as many studies have done. Nerlove pointed out that government is an element in the complex interrelated supply response system as it interferes with markets and prices but that cannot be wholly true for the hog industry in Kenya today. The industry is wholly in the hands of private sector.

An interesting finding has been pointed out by Tchir, Hawkins and Westra (1981)⁸. The finding is that many empirical studies of livestock supply response have resulted in negative coefficients on price variables. Reutlinger [18] attributes the perverse signs to the failure by many analysts to disaggregate slaughter into its various components. He also notes that theory does not suggest the price elasticity should have a negative, positive or zero sign.

2.3 An Overview of Methodologies Used in the Reviewed Studies

A survey on theoretical and empirical literature on hog supply shows the various models in use and areas of application. There is a wide application of the distributed lag model in the estimation of single equation supply function as in Meilke [15], Lin [12], and Leuthold [10], Nerlove's geometric lag has also been

used on a recursive quadratic programming model by Martin and Zwart [13]. The programming model was used in this study to analyse the spatial and temporal variations in hog supply. The use of flow diagrams is quite limited and that is why Dyck [5] reinforced their use by turning to regression. The multi-frequency cobweb model which is a combination of the harmonic motion and the cobweb models was developed and used by Talpaz [21] to decompose the hog cycle in U.S.A. Simultaneous equation model based on the cobweb cycles has been used by Leuthold and Hartman [11].

The application of linear and log-linear regression models to time series data is advantageous for it analyses the response to changes in economic factors like price, institutional operations, technology and seasons. The models are useful in showing the speed of response. The regression model describes what has actually occurred in the past and hence past policies and variable relationships can be used for prediction if they are stable (see Shumway and Chang [20]). Another merit of these models is that risk factor can be introduced explicitly if necessary.

In the estimation of supply functions, lagged explanatory variables are used since production responds with a lag to changes in economic variables. One drawback with this method is that there is no sure way of knowing how far back to lag the variable(s). Estimated

supply functions are dependant on among other variables, expected (futures) price. Again there is no sure way of estimating expectations variable. Nerlove (1958) suggested the use of geometrically weighted average of past prices in a distributed lag model. Martin and Zwart |13| used a polynomial distributed lag model and found empirical lag distributions associated with price variables that were not approximately geometric as Nerlove had suggested.

Linear Programming (LP) models are not very suitable in estimating supply functions. They give normative relationships. Quance and Tweeten |23| conclude that LP models are more realistic in showing regional shares of production than in showing the absolute level and elasticity of supply. The inherent behavioural assumption of profit maximization or the related dual concept of cost minimization, is an abstraction from reality because producers have various objectives other than profit maximization. LP models use time series and synthetic data and the behavioural assumption to describe what ought to have happened rather than what actually happened. Shumway and Chang |20| are of the same view. However, LP models are useful in analysing optimal output by farmers, a subject outside the scope of this paper.

Production functions can be manipulated to give expressions of supply functions. Supply functions derived that way are not very precise in predicting

output. The predicted output will be found to range from slightly below to extremely above the actual value with the latter being prevalent (see Shunway and Chang op cit) such functions are said to show firms to be highly responsive to price changes than is shown by direct estimates or actual observation⁹. The approach has the same limitation common in LP models of assuming profit maximization behaviour. However, the approach is quite useful in dealing with issues related to production where inputs and cost structure data are available.

Flow diagrams are very limited as models of supply. They only show the flow of activities while in supply relationships, the major interest is to find the effect of explanatory variable(s) on the dependent variable(s).

Several issues and debates have been highlighted in this section. The choice of a specific expectations model is an individual decision. None of these models can be said to be right or wrong. The inclusion or exclusion of a variable is again an individual decision. The merits and demerits of various procedures of analysing hog supply response have been discussed. The task that remains now is to analyse the Kenya hog supply response case having got a glimpse of various other cases. Towards the accomplishment of that goal, it is necessary to highlight Kenyan hog production and marketing scenes.

ENDNOTES

1. The numbers following an author's name are those in the bibliography.
2. See M. Nerlove, The Dynamics of Supply: Estimates of Farmers Response to Price. Baltimore, John Hopkins Press. 1958.
3. See L.M. Koyck, Distributed Lags and Investment Analysis. Amsterdam, North Holland Publishing Company. 1954.
4. See S. Almon, "The Distributed lag Between Capital Appropriations and Expenditures". Econometrica. Number 33, January 1965 p. 178-1961.
5. See R.M. Solow, "On a Family of lag Distributions". Econometrica. Number 28, 1969 p. 393-406.
6. Using the lagging producers given by Nerlove and Koyck, Almon and Solow, it is possible to have three different expectations models.
7. See L.H. Hyers, Myers, and J.J. Havlicek, "Some Theoretical Aspects of Short-Term Hog Supply". Journal of Farm Economics. Volume 49 Number 5 December 1967 p 1395-1400.
8. See J.R. Tchir, H.M. Hawkins, R. Westra, "Shrinkage Losses in Alberta Hog Deliveries". Canadian Journal of Agricultural Economics. Volume 29 Number 1, February 1981 p. 35.
9. This is due to the exaggeration of estimation and calculation errors in the course of manipulation.

CHAPTER 3

DOMESTIC HOG PRODUCTION, MARKETING AND GROWTH OF THE INDUSTRY

3.1 Domestic Production Scene

Hog farming activities can take any of the following forms:

- (1) Keeping sows for breeding purpose and selling piglets immediately after weaning i.e when the piglets are about eight weeks old and have attained a weight of eighteen kilograms.
- (2) Keeping the sows as well as retaining the weaner for fattening to porkers or baconers.
- (3) Buying weaners for fattening. The method of breeding sows and fattening the weaners was found to be the popular way among the farmers visited. They argued that the method realises relatively higher profits. The method of buying weaners for fattening was described as risky since it is possible to buy poor breed or fail to get weaners when market conditions encourage the fathering of weaners.

About 70 per cent of all the hogs marketed in Kenya are reared in the Rift Valley, and Central Province (See Table 3.10). The table also shows that the number of hogs reared fluctuate over time and space (regions). Note that there are no hogs in North Eastern Province. Central Province takes the lead in hog production, with

Kiambu being the leading district (See Table 3.20).

Hog production in North Eastern, Coast and Eastern Province is not popular due to religious (moslem) and other traditional beliefs. Lack of ready market, and the frequency of droughts have literary pushed hog production into oblivion as reported in the respective provincial and district Annual Reports.

Since 1983, Kiambu District has been accounting for over 50 per cent and 20 per cent of the total hog population in the province and the country at large, respectively. Nyandarua District does not engage much in hog production due to the lucrative dairy and crop farming activities that thrive in the area¹.

Hog production in the country has been declining since 1984 as shown on Table 3.10. The decline in 1984 can be attributed to the poor weather conditions prevailing at the time which induced farmers to increase their hog sales to overcome the feeds shortage.

But even as the weather improved in 1985, the trend still persisted due to the marketing problems arising from the crisis that hit Uplands Factory, the major hog buyer at that time. Other factors underlying this trend were periodic shortage of feeds, relatively high feed prices, lack of capital and short term credit facilities, relatively high capital investment requirements, absence of attractive rural pork markets and management shortcomings².

Table 3.10 Hog Population by Province 1980 - 1986

Year	1980	1981	1982	1983	1984	1985	1986
Province							
Rift Valley	15,287	18,200	21,050	23,630	14,732	9,980	8,500
Central	41,799	34,900	47,000	49,400	49,667	49,138	42,070
Eastern	5,109	9,700	9,160	19,020	6,949	2,700	3,240
Western	6,400	7,200	8,300	6,500	6,947	8,650	8,090
Nyanza	600	700	1,000	1,200	2,140	2,960	2,420
Coast	581	800	600	930	814	920	8,500
Nairobi	4,300	3,300	4,280	4,000	3,847	7,130	5,500
Total	74,076	74,800	91,390	94,680	85,096	81,478	78,320

Source: Republic of Kenya, Ministry of Livestock Development, Animal Production Division, Annual Report, (Various issues, Mimeo).

Table 3.20 Hog Population in Central Province, 1976-1986.

District	Kiambu	Kirinyaga	Murang'a	Nyandarua	Nyeri	Total
Year						
1976	6,750	3,050	18,832	470	11,267	37,369
1977	9,572	2,793	10,530	95	11,749	34,739
1978	18,788	3,287	10,530	473	19,401	52,479
1979	9,866	5,955	8,850	300	12,429	37,400
1980	17,458	5,473	7,565	232	11,071	41,789
1981	13,052	4,883	11,597	232	5,226	34,990
1982	15,700	7,100	15,000	400	9,500	47,700
1983	20,865	3,706	6,574	400	8,749	40,294
1984	26,650	3,567	6,678	778	5,094	42,767
1985	34,179	2,992	7,153	595	4,219	49,138
1986	27,140	3,304	5,740	410	5,480	42,074

Source: Republic of Kenya, Ministry of Livestock Development, Animal Production Division, Annual Report, (Various Issues, Mimeo).

The decline in production has caused a general shortage of hogs for slaughter. Farmer's Choice require 200 hogs per day but are only able to get between 150 and 171. Kenya Baconers require 150 hogs per week but get only 100. Kenya Cold Storage which handles 100 hogs per week has had to offer relatively higher prices (upto Shs. 24 per kg. cold dressed weight) to secure the required amount.

The situation has further been aggravated by the farmer's efforts to rebuilding their stocks following continued good weather and abundance of feeds as well as the increased producer prices³.

The most crucial factor input in hog production is the feeds. It is estimated that feeds account for between 75 and 85 per cent of the total cost of production⁴, so that when the price of commercial feeds rise without a corresponding movement in the producer price, hog production becomes unattractive. It is largely due to this reason that in 1986, Nyanza hog farmers left their animals to scavenge for food and in some cases, the animals were tethered around the homestead with little supplementary feeding⁵. The common commercial compounded concentrates used are sow and weaner meal, pig creep pellets, pig finishing meal, maize bran, wheat bran, bone meal, wheat pollard, super creep pellets, barley balancer meal and pig rearer meal. Out of the thirty farmers interviewed, twenty used the first three types of feeds exclusively.

A mature hog requires from two to two and a half kilograms of sow and weaner meal on average. A piglet requires about 0.3 kg. of pig creep pellets per day until weaning. After weaning, the fatteners are fed 3.5kgs of pig finishing meal per animal per day until they are sold as either porkers or baconers. The animals require a lot of water at all stages. Non-commerical feeds include cooked Irish and sweet potatoes, vegetables, fish, bananas, cassava, posho and food waste.

Given the present cost of feeds (See Appendix 1), an aspiring hog farmer should be careful not to tie much of capital on the piggeries. Selection of a good breeding sow and sound management should also be observed. A good hog breed should perform as follows:-

At birth the piglet should have 1.3kgs ($2\frac{1}{2}$ - 3lbs).

After 21 days it should weigh 5.4kgs (11 - 12lbs).

After 8 weeks (weaning age), it should weigh 18kgs (40lbs).

Between 16 and 18 weeks (porker weight) it should weigh 54kgs (120lbs).

At about 30 weeks (Baconer weight) it should weigh 70 to 100kgs (220lbs or thereabout).

After one year, the heavy hog should weight around 300lbs. If it is a sow, it should not wean less than ten piglets.

The Danish-type of piggeries with pens on either side of a central feeding trough and dunging passages running down on both the side walls are the most common in the area visited.

The domestic production's growth is influenced to some extent by the marketing channels and the producer prices. Hence, the marketing structure of hogs should be analysed in order to understand its influences on production.

3.2 Marketing Scene.

At present, hog farmers sell their animals to either Farmer's Choice, Kenya Bacon, agents of Kenya Cold Storage or to individual butchers. Some farmers also slaughter their hogs for sale. Discussion with farmers in Kiambu showed that the first two marketing channels are the most preferred because they are more reliable. Kimble Bacon Foods closed down in 1982 due to financial problems⁶. Nairobi Airport Services (NAS) buy pork from slaughter houses but not hogs for slaughter. Flamingo Produce Limited are the distributors of Farmer's Choice products. Turi Butchery, located at Molo, also slaughter hogs. Among these firms, only Farmer's Choice currently operates contract arrangements with the farmers.

A visit to these firms (except the last) revealed that supply problems were triggered by the drought of 1984 and UBF's management and financial crisis which started around 1985. The crisis rendered the factory unable to pay farmer's dues for hogs delivered. This frustrated the farmers some of who had loans to clear especially from the Agricultural Finance Corporation (AFC) besides meeting other operational expenses. Some farmers curtailed

their activities while others went out of production.

To induce farmers to market more hogs, the slaughter firms have been providing transport for hogs from the farms since 1986. Transport problems were reported as the restraining factor in hog production in Laikipia District in 1986⁷. According to farmers and the managers of processing firms, hogs are most profitable at bacon weight i.e. in the neighbourhood of 70kg cold dressed weight or 80-90kg liveweight.

Unlike most commercial farmers such as those in coffee, tea, cotton etc., hog farmers are not organised on co-operative basis to bargain for better producer price. In the past when production used to be dominated by a few large farmers, co-operatives were not necessary since these farmers could collude and bargain for better prices. Furthermore, these farmers were more often than not board members of Uplands Factory which was the major buyer. Hog farming today is practiced by smallholder farmers who have no influence on the market.

The collapse of Uplands Factory marked the end of strict system of grading hogs. Firms currently in operation insist only on healthy clean animals and reject entire boars which have been in service because of their bad odour. The grading system could award different prices for hogs of the same weight.

The marketing arrangements have been that the farmer is paid on the basis of cold dressed weight i.e. carcass less the offals. In that case, the animal has to be slaughtered first before its price can be determined. The slaughtering is done at the concerned factory's abattoir in the absence of the farmer. Weight figures are recorded and an invoice prepared for the farmer. The author witnessed several cases where farmers complained bitterly after receiving their invoices. There is need to restructure the payment system and to consider paying the farmers on liveweight basis.

The offals are usually discarded as waste. However, they are a good source of protein in feeds if they are dried and ground.

The foregoing analysis gives an insight into the production and marketing scenes. It is essential thereafter to tackle the task of analysing the Kenyan hog supply response, a task whose initial step is the formulation of a methodology.

ENDNOTES

1. See Republic of Kenya, Ministry of Agriculture Nyandarua District Annual Report, Nairobi. (Various issues, Mimeo).
2. D. Stotz, Production Techniques and Economics of Smallholder Livestock Production Systems in Kenya, Nairobi. 1983. (Monograph).
3. See Republic of Kenya, Economic Review of Agriculture, Nairobi. 1986. (Mimeo).
4. D. Stotz, op cit.
5. See Republic of Kenya, Economic Review of Agriculture, Nairobi. 1986. (Mimeo).
6. This was revealed by the enterprise's proprietor Mr. Kibogo in an interview with the author.
7. See Republic of Kenya, Ministry of Livestock Development, Laikipia District Annual Report, Nairobi. 1986. (Mimeo).

CHAPTER 4

METHODOLOGY

4.1 Theoretical Framework

The supply of hogs at any one period is an outcome of production decisions made in the previous period. The decisions are usually based on individual farmer's perception of the profitability of the hog enterprise relative to other competing activities such as dairy farming. The farmer's goal in the production process is to a large extent profit maximization. The profit function can be expressed as the difference between total revenue from hog sales and the expenditure upon all inputs. This can be expressed thus:

$$\pi = \sum_{i=1}^s P_i q_i - \sum_{j=1}^n r_j X_j \dots\dots\dots (40)$$

$i=1, 2, 3, \dots\dots\dots, s.$

$j=1, 2, 3, \dots\dots\dots, n.$

Where,

π = profit,

P_i = hog price at weight category i ,

q_i = number of pigs sold at weight category i ,

r_j = price of input j

and x_j = amount of input j used.

However, the farmer's profit level is subject to uncertainty due to hog and input price variations over time. This is further aggravated by occasional commercial feedstuffs shortage on the market during dry seasons. During such seasons, farmers are often forced to look for alternative feeds which may be more expensive, unsuitable to the hogs' growth, or both. These factors will usually affect the profit level negatively. The profit can also be affected by changes in the technology of rearing hogs, market channels and other market forces. In recognition of these factors, it is desirable to specify the farmer's expected profit as:

$$\Pi = V \sum_{i=1}^S P_i q_i - \sum_{j=1}^n r_j x_j \quad \dots\dots\dots(4.1)$$

Where, $0 \leq V \leq 1$

V is a probability coefficient which adjusts the expected profit level. If past profit levels have been high and stable, the value of V will be close to one. Determination of profit levels and stability depends on individual farmer's experience and perception. Non-price producer incentive given to the farmers by the slaughter firms may raise the value of V. If a slaughter firm provides the farmer with inputs like feeds, extension service and transportation of mature hogs, chances are that the farmer will realize higher profits than would be the case without these inputs. The value will hence tend towards one.

The farmer's profit maximization behaviour is subject to the constraints given by the technical rules of the production function. Thus the aim is to

$$\text{Maximize } \pi = V \sum_{i=1}^S P_i q_i - \sum_{j=1}^n r_j x_j$$

subject to $q_i = q_i(x_1, \dots, x_n)$

The production function can also be implicitly stated as

$$F(q_1, \dots, q_S, x_1, \dots, x_n) = 0$$

Where,

q_n = outputs

x_n = inputs

If the profit level is not comparable to that of other competing enterprises, the farmer may decide to leave or enter the hog Industry. He may also reduce or increase the number hogs kept on the farm. Such actions will be reflected in the amounts supplied to the market.

It is thus possible to obtain a hog supply response from this optimization behaviour. This can be done by forming a lagrangean function and taking partial derivatives with respect to the inputs. We get a system of input demand functions when we equate each partial derivative to zero. Solving these functions simultaneously we get optimal input demand levels. Substituting these levels into the output function, we obtain a supply function of the nature $q = q(p, r)$. The output produced happens to be equal to output supplied (in the long run) since farmers

rarely keep hogs for their own consumption (see Livingstone |31| , p.3).

The above supply function is over simplified and involves abstractions from reality. Rather than expecting profits, farmers usually consider the futures price. The relative magnitude of that price to current price is taken to be an indicator of profitability of hog enterprise.

From various district and provincial Annual Reports of the ministry of Agriculture, it is clear that farmers also consider the profitability of dairy farming, feeds availability, marketing outlets and non-price incentives in their production decisions. These factors and technology, are variables that are bound to affect the supply of hogs at any one time and should therefore be given due consideration. In effect, a hog response relationship incorporating all these variables is more appropriate than the supply relation given by $q = q(p,r)$.

4.2 The Model

To analyse the influence of the various variables on the supply of hogs the following regression model with expected, lagged and actual explanatory variables is used.

$$S_t = \alpha + \beta_1 P_{t-1} + \beta_2 F_P + \beta_3 F_A + \beta_4 D + \beta_5 T + \beta_6 N_{t-1} + \epsilon_t \quad \dots\dots\dots(4.2)$$

where¹

S_t is the supply of hogs as given by slaughter figures (million Kgs).

P_t^* is the expected pig price (Ksh/Kg cold dressed weight)

P_{t-1} is the price of hog lagged one year (Kshs/Kg cold dresses weight).

F_p is the retail price of feedstuffs (Kshs/70kg bag).

F represents feeds availability .

D is a proxy for the profitability of dairy enterprise.

T is a time variable with 1967=2, 1968=3...1986=22

N_{t-1} is the number of sows lagged one year.

The signs under the explanatory variables are the expected partial derivatives.

It is assumed that the expected price variable, P_t^* , is related to changes in the 'expected' levels of past prices as outlined in the adaptive expectations model. The expected level of past prices is defined by a second relationship in which expectations are assumed to be altered every time period as an adjustment between the current observed value of price and the previous expected value of price, ie

$$P_t^* = \theta P_t + (1-\theta)P_{t-1}^*, \text{ where } 0 \leq \theta \leq 1$$

This relationship follows the theory of the error of adjustment hypothesis where it is assumed that the price that one expects in period T is equal to what was expected to be obtained in the future during the previous period, making an allowance for error made in the last period's forecast. However, the above relationship is not observable and hence does not allow econometric estimation. It can be rewritten by lagging the price period by period following Nerlove's Geometric lag as follows:

$$P_t^* = \theta P_t + (1-\theta) P_{t-1} + (1-\theta^2) P_{t-2} + \dots + (1-\theta)^S P_{t-S} \quad \dots\dots\dots(4.3)$$

When expressed this way, the equation gives a weighted average of past actual prices. The weights decline geometrically, implying that prices received in recent past have a greater influence on current anticipations than do prices received in more distant periods (see Pindyck and Rubinfeld [25], p. 230- 237). Since successive values become progressively smaller and insignificant, in addition to the fact that farmers do not consider or remember distant past prices,

take $S = 0, 1, 2.$

Hence,

$$P_t^* = \theta \sum_{s=0}^{\infty} (1-\theta)^s P_{t-s}$$

Using Complete Ignorance Rule, assume $\theta = 0.5.$

$$\begin{aligned}\text{Hence, } P_t^* &= 0.5 \sum_{s=0}^2 (1-0.5)^s P_{t-s} \\ &= 0.5 \sum_{s=0}^2 (0.5)^s P_{t-s}\end{aligned}$$

In order to estimate the general relationship given by (3.2) we shall make the following assumption:

- (i) The relationship between the dependent and independent variables is linear.
- (ii) The distribution of the dependent and independent variables satisfy the assumptions of the linear stochastic regression model found in any standard textbook of econometrics, and
- (iii) $S = 0, 1, 2$, to make P_t^* manageable.

The final equation can be expressed as:

$$S_t = \alpha_0 + \alpha_1 P_t^* + \alpha_2 P_{t-1} - \alpha_3 F_P + \alpha_4 F_A - \alpha_5 D + \alpha_6 T + \alpha_7 N_{t-1} + \epsilon \dots (4.4)$$

3.3 Data Collection, Type and Sources

Secondary data was collected for the eight variables. Statistics on slaughter, producer price and on the number of sows were compiled from the various issues of the Ministry of Agriculture and Livestock Development Annual Report(s) and Economic Review(s) of Agriculture. Feed prices were compiled from files available at the Price Controller's office.

Dairy profitability was calculated from the data on dairy's contribution to gross farm revenue given in Kenya Statistical Digest(s) and Statistical Abstract(s).

Seasonality data was derived from rainfall data in the Statistical Abstract(s) and Masaya (1975)².

Primary data was collected from the farmers and the slaughter firms to enhance understanding of the current hog farming situation. A sample of 30 farmers in Kiambu district was picked randomly and visited. Kiambu is Kenya's leading district in hog production at present. The population number sample (30) was considered sufficient given the funds and time limitations. A questionnaire was administered to generate the data (see Appendix 4). The data and the regression results are presented in the next chapter. Firms visited were Farmer's Choice, Kenya Bacon, Kenya Cold Storage and a few individual butchers. A questionnaire was also administered in this case.

ENDNOTES

1. The variable P_{t-1} is the producer price lagged one year since it takes approximately one year to sell bacon hogs if one starts with a sow.

The retail feed price F_p is obtained from averaging weaner, pig creep pellets and pig finishing meals at ex-Nakuru prices.

The variable F_A varies with seasons and hence a binary variable was adopted. Drought years took a zero value while good years took a value of one.

Dairy enterprise profitability was approximated by taking the percentage contribution of dairy products to gross farm revenue.

The variable T represents changes in technology infrastructure etc that have not explicitly been included in the model.

2. See R Tichaendepi Masaya, "Spectral Analysis of Rainfall Series in Kenya". Working paper No. 211, of Institute of Development Studies, University of Nairobi. 1975.

CHAPTER 5

BASIC DATA AND REGRESSION ANALYSIS

5.1 Basic Data

It was initially intended that data covering the period between 1955 and 1986 would be used. However, complete data for all the variables under consideration was only available for the period between 1967 and 1986 which limited the number of observations to twenty. Statistics on the data collected are presented in Table 5.10.

5.2 Regression Analysis

The estimated coefficients for the supply response equation (4.4) presented in Chapter 4 are:

$$\begin{aligned}
 S_t = & 1.221 + 1.730P_t^* - 1.37P_{t-1} + 0.331F_P + 0.036D \\
 & (1.459) \quad (-1.577) \quad (0.318) \quad (0.625) \\
 & 0.063T - 0.223F_A + 0.106N_{t-1} \dots\dots\dots (5.0) \\
 & (-0.653) \quad (0.450) \quad (0.336)
 \end{aligned}$$

The figures in parentheses are the t-ratios. Table 5.21 shows the means and standard deviations of regression parameters.

Table 5.10 Key Data for Analysing Hog Supply Response in Kenya^b.

	SLAUGHTERED	EXPECTED	LARGED	AVERAGE	FEEDS	TIME	DAIRY	LARGED
	000,000KGS	PRICE S/7	PRICE S/7	FEED PRICE	AVAILABILITY		PROFIT	NO OF
		Ka	Ka	S/7			ABILI	SCWS
							TY	CCO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1967	3.23	3.55	3.37	0.19	1.00	2.00	9.50	1.53
1968	3.15	4.00	4.05	0.19	1.00	3.00	10.00	1.44
1969	3.85	4.25	4.41	0.68	0.00	4.00	8.00	1.53
1970	4.55	4.04	4.04	0.68	1.00	5.00	7.80	1.51
1971	4.45	3.80	3.55	0.55	0.00	6.00	10.70	1.50
1972	5.55	3.75	3.70	0.50	1.00	7.00	10.30	1.55
1973	2.70	3.17	4.11	0.55	1.00	8.00	5.20	1.22
1974	2.52	4.12	4.25	1.03	0.00	9.00	6.80	1.28
1975	2.95	4.90	4.57	1.10	1.00	10.00	5.70	1.10
1976	2.71	5.63	6.36	0.97	0.00	11.00	4.80	1.10
1977	2.79	6.09	6.55	1.06	1.00	12.00	4.50	1.13
1978	2.51	6.47	6.84	1.04	1.00	13.00	5.90	1.25
1979	3.72	7.06	7.64	1.25	1.00	14.00	5.60	1.13
1980	3.92	7.42	7.78	1.09	0.00	15.00	4.20	1.69
1981	3.97	7.36	7.30	1.83	1.00	16.00	5.90	1.34
1982	4.46	8.23	9.10	1.73	1.00	17.00	6.40	0.83
1983	4.68	8.72	9.20	1.88	1.00	18.00	5.90	1.46
1984	3.61	8.96	9.20	2.20	0.00	19.00	3.30	1.50
1985	2.17	10.48	12.00	2.20	1.00	20.00	4.80	1.39
1986	3.27	11.74	13.00	2.31	1.00	21.00	6.30	1.36

Source: Republic of Kenya, Ministries of Agriculture and Livestock Development, Annual Report(s) Nairobi. (Various issues Mimeo);

Idem, Economic Review of Agriculture. Nairobi (various issues Mimeo);

Republic of Kenya, Central Bureau of Statistics, Kenya Statistical Digest. Government printer, Nairobi. (various issues);

Idem, Statistical Abstract. Government Printer, Nairobi, (various issues);

R. Tichaendepi "asaya, "Spectral Analysis of Rainfall series in Kenya". Working Paper No 211, Institute of Development Studies. Nairobi, 1975;

Price Controller Files.

Table 5.21 Means and Standard Deviations of
Parameter Estimates.

<u>Variable</u>	<u>Mean</u>	<u>Standard Deviation</u>
S_t	3.436	0.748
P_t^*	6.244	2.435
P_{t-1}	6.585	2.820
F_p	1.163	0.654
D	6.830	2.174
T	12.000	6.921
F_A	0.700	0.470
N_{t-1}	3.890	0.768

Standard Error of Regression = 0.768

R Squared = 0.334

F - Statistic (7,12) = 0.860

Chi - Squared (7) = 5.939

Durbin-Watson Statistic = 1.356

Estimated Autocorrelation = 0.322

The parameter estimates were tested at .01 level and only the expected and lagged price variables were found significant. However, no variable was dropped out since the concern in this study is the direction of change.

In equation (5.0), the parameters α_i shows by what amount the supply of hogs will change in response to a unit change in the respective variable when all other variables are maintained at a given level. The

constant term, which mathematically is the intercept, represents the mean effect of all the excluded variables for this particular sample on supply of hogs. The preceding signs show whether the change is an increase or a decrease.

It had been hypothesised that the effect of expected price, lagged price, time and lagged number of sows on hog supply would be positive. The hypotheses were supported by the regression equation (4.0) except in the two cases of lagged price and time. In the two exceptional cases, we have an inverse relationship.

The number of hogs supplied for slaughter has been found to be positively related to expected price. If farmers anticipate a higher price for their hogs they will supply more, all other factors remaining constant. Futures (expected) price in this model has been found to be quite significant in explaining the fluctuations in hog supply.

The number of sows at any particular year has been found to affect hog supply in the next period positively. The more the sows, the more will be the piglets born. If most of the piglets are weaned and fattened then the available stock for slaughter in the next period is bound to be high. However, this variable is weak in explaining the fluctuations in the hog supply. Piglet mortality which has been estimated at 20 percent¹ can claim a large proportion of the piglets and thereby reduce the stocks

available for slaughter in the next period. It also happens that sows can bear from two to eighteen piglets depending on the breed. Likewise, the litter to be weaned varies from one piggery to the other. Therefore a few sows giving birth to many piglets are better than many sows which bear few. That's why the number of sows is not a strong explanatory variable.

The inverse relationship between lagged price and the number of hogs supplied is contrary to what economic theory postulates. In this particular case, the implication is that the producer prices have not been meeting farmers' expectations. It has been shown that farmers will raise more stock for slaughter when they expect the producer prices to go up. Hence, the prices that farmers realise are usually lower than their expectations as increased production could depress prices. That explains why hog supply has been declining over time in Kenya. There is a negative relationship between the number of hogs supplied and time (equation (5.0)). The producer prices have been rising over time but their effectiveness has been undermined by other factors such as risk and uncertainty. It was shown in chapter three that risk factor lowers the profits that the farmer expects. The risk can be associated with the instability of the marketing channels. Uplands factory which was the major marketing outlet before 1985 had frequent management and financial problems which culminated in its closure. Kimble Bacon Foods also closed down due to financial problems. Farmer's Choice, a

subsidiary of Block Hotels, has been operating at a low capacity just enough to satisfy the various Block Hotels until 1987 when they opened another plant to cater for other markets. It also happens that producer price increases occur largely when production is at a low ebb, implying that the increases are supposed to be incentives to step up production. Since the root cause of the low production is not only low producer prices, other incentives should accompany the price increases, otherwise production will still go down.

It is shown in the equation (5.0) that when feeds shortage hits the country, farmers increase their hog sales by 22.3 percent implying that they also sell the breeding stocks. A one percent decline in the breeding stocks will bring a decline of about 1.1 percent in the number of hogs supplied in the next period ceteris paribus. As feeds become abundant, supplies for slaughter go down by more than 22 percent, since farmers try to build up stocks. These changes may also undermine the effectiveness of producer price increases.

It had also been hypothesised that the effect of feeds price and dairy profitability on the number of hogs supplied would be negative. However, empirical results indicate otherwise. Feed price increases and improvements in the profits of dairy farming coincide with periods of increased hog supply in the country. The government does not allow feed prices to increase during drought periods

as a matter of policy². During good seasons when the feed prices are allowed to rise, other feed concentrates from farms can be generated or bought cheaply. In addition, any negative effect of feed price increase is more often than not offset by producer increases as shown in Table 5.10.

Skim milk has been found to be a good protein supplement for hogs. As such, an increase in milk production will avail more skim milk for hogs. Hence dairy and hog farming move in the same direction.

The effect of a change in the availability of feeds on the number of hogs supplied could not be determined or hypothesised a priori. The effect according to the model and the author's interviews with the farmers is negative. Feeds are in abundance during good weather, the period in which farmers build stocks. Feed shortages occur during dry seasons and farmers sell out most of their stocks to avoid the consequences of a shortage explained in chapter one.

From the estimated coefficients, the various (expected) elasticities of response can be calculated as follows:

$$\frac{\partial S_t}{\partial X_i} \cdot \frac{\bar{X}_i}{\bar{S}_t}$$

where ,

$$\frac{\partial S_t}{\partial X_i}$$

is the first partial derivative or the slope of the dependent variable S_t with respect to the independent variable X_i and $\bar{S}_t$ and $\bar{X}_t$ are the respective mean values.

The elasticity at the mean of hog supply response with respect to expected price is

$$\frac{\partial S_t}{\partial P_t^*} \cdot \frac{\bar{P}_t^*}{\bar{S}_t} = 1.730 \times \frac{6.244}{3.436} = 3.144$$

and

$$\frac{\partial S_t}{\partial P_{t-1}} \cdot \frac{\bar{P}_{t-1}}{\bar{S}_t} = -1.376 \times 6.585 = -2.637$$

is the elasticity with respect to lagged producer price, calculated at the mean.

The observed elasticity estimates are given in equation (5.1) below.

5.3 Elasticity Estimates

To get various elasticities of response, the data was transformed into natural logarithm for all the variables except dummy variables (see Table 5.31). The parameter estimates as given in equation (5.1) are the respective elasticities.

The estimated equation is as follows:

$$\begin{aligned} \text{Log } S_t = & 0.569 + 2.964 \log P_t^* - 2.470 P_{t-1} + 0.216 \log D + \\ & (1.689) \quad (-1.637) \quad (0.697) \\ & + 0.147 \log F_p + 0.024 \log N_{t-1} - 0.017 \log T - 0.093 F_A \dots (5.1) \\ & (0.613) \quad (0.069) \quad (-0.720) \quad (-0.637) \end{aligned}$$

The figures in parentheses are the t - ratios. Table 5.31 shows the means and standard deviations of the parameters.

Table 5.30 Raw Data for Estimating Hog Supply Response
Elasticities

YEAR	$\text{Log}(s_t)$	$\text{Log}(P_t^*)$	$\text{Log}(P_{t-1})$	$\text{Log}(F_P)$	F_A	$\text{Log}(T)$	$\text{Log}(D)$	$\text{Log}(N_{t-1})$
1967	1.19	1.35	1.35	-1.66	1.00	.69	2.55	1.53
1968	1.15	1.39	1.40	-1.66	1.00	1.10	2.30	1.44
1969	1.35	1.44	1.48	-.39	.00	1.39	2.08	1.53
1970	1.52	1.40	1.40	-.39	1.00	1.61	2.05	1.61
1971	1.49	1.34	2.27	-.60	.00	1.79	2.31	1.50
1972	1.21	1.32	1.31	-.51	1.00	1.95	2.33	1.36
1973	1.02	1.38	1.43	-.39	1.00	2.08	2.22	1.22
1974	.92	1.42	1.45	.03	.00	2.00	1.92	1.28
1977	1.03	1.81	1.88	.06	1.00	2.48	1.50	1.13
1978	.93	1.87	1.92	.04	1.00	2.56	1.77	1.25
1979	1.31	1.95	2.03	.22	1.00	2.64	1.72	1.13
1980	1.37	2.00	2.05	.09	.00	2.71	1.44	1.69
1981	1.38	2.00	1.99	.60	1.00	2.77	1.77	1.34
1982	1.50	2.11	2.21	.55	1.00	2.83	1.86	1.83
1983	1.54	2.17	2.22	.63	1.00	2.89	1.77	1.46
1984	1.28	2.19	2.22	.79	.00	2.94	1.19	1.50
1985	1.28	2.35	2.48	.79	1.00	3.00	1.57	1.39
1986	1.18	2.46	2.56	.84	1.00	3.04	1.84	1.36

Source; Computed from Table 5.10.

Table 5.31 Means and Standard Deviations of Elasticity
Parameter Estimates

<u>Variables</u>	<u>Mean</u>	<u>Standard Deviation</u>
$\text{Log } S_t$	1.211	0.222
$\text{Log } PP_t^*$	1.763	0.376
$\text{Log } P_{t-1}$	1.803	0.412
$\text{Log } F_P$	-0.044	0.712
$\text{Log } D$	1.872	0.325
$\text{Log } T$	2.290	0.696
$\text{Log } F_A$	0.700	0.470
$\text{Log } N_{t-1}$	1.339	0.207

Standard Error of Regression = 0.229
R Squared = 0.325
F - Statistic (7,12) = 0.824
Chi - Squared (7) = 5.659
Durbin - Watson Statistic = 1.354
Estimated Autocorrelation = 0.354

Equation (5.1) shows the various hog supply response elasticities. These can be compared with the expected elasticities that can be calculated as shown in section 5.2.

Table 5.32 Hog Supply Response Elasticities

<u>With respect to</u>	<u>Expected Value</u>	<u>Observed Value</u>
P_t^*	3.144	2.964
P_{t-1}	-2.637	-2.470
F_P	0.112	0.147
D	0.171	0.216
T	-0.228	-0.217
F_A	-0.045	-0.093
N_{t-1}	0.120	0.024

The difference between the expected and the observed elasticity values can be explained by the variations in the standard errors committed while estimating the parameters of equation (5.0) and 5.1). The standard

errors of the first and the second equations are 0.768 and 0.229 respectively. However, the parameters of equation (5.1) have relatively higher standard errors. This is because the data for that equation is computed from Table 5.10. The errors committed in the generation of Table 5.10 and in the computation of Table 5.30 give rise to the higher standard errors. This observation is supported by the relatively higher R squared for equation (5.0). Therefore, the calculated elasticities are more precise compared to those observed.

The elasticity of hog response with respect to expected price, dairy profitability, feed price and lagged number of sows is positive and negative for all the other cases. However, the elasticity estimates are only significant for expected and lagged price variables at .01 level. The absolute elasticity estimates of the above two variables are greater than unity showing that a change in any of the two variables would be reflected in the number of hogs supplied more than proportionately. A one percent rise in the expected or futures price will result in 3.144 percent increase in the number of hogs supplied. Likewise, a one percent increase in the profitability of dairy enterprise will result in 0.171 percent increase in the number of hogs supplied. The interpretation is the same for the other parameters.

Once again the elasticity estimate of hog response with respect to lagged producer price is contrary to what economic theory postulates for the same reasons as

given in section 5.2.

Looking at equations (5.0) and 5.1), one notices that the coefficients and some of the statistical properties of the regressions vary. The coefficients of equation (5.0) are the partial derivations of the dependent variable S_t with respect to the independent variable X_i (ie $\frac{\partial S_t}{\partial X_i}$ while those of equation (5.1) are the supply response elasticities.

Between the two, equation (5.0) variables have a relatively higher explanatory power of the movements in hog supply. However, the standard error of the regression is higher but lower for individual coefficients. Therefore, the linear formulation of the model is superior to the log form.

For the sake of further work in the area of hog supply response, it is in order for this paper to have a section on its major weaknesses.

5.4 Shortcomings of the Study

The model used in this study is one of many that could be used. It has merits and demerits. It is simple and easy to work with but suffers from the problems of time frame definition, variable specification and data limitation.

Concerning the time frame the model does not distinguish short - and long-run periods.

The variables used are also at a high level of aggregation. Hogs are sold at various wights and this is not caputured in the model. The feeds also differ in type and price and these differences should come out explicitly in the model. It is also not clear whether the relationship expressed in the model is of supply or demand. It is what is termed in the literature as 'mongrel' type of supply estimate in the loosely defined sense.

A proper demand - supply relationship in the simultaneous equation framework is needed for this kind of study in order to establish whether the perverse relationships observed arise from the model or otherwise.

The sample taken was rather small. Furthermore, half - year data would be preferable to capture the frequent changes in economic variables that affect the industry.

Despite the weknesses, this study is a milestone in the analysis of the hog industry in Kenya.

ENDNOTES

1. See D. Stotz, Production Techniques and Economics of Smallholder Livestock Production Systems. Ministry of Agriculture, Animal Production Division, Nairobi. 1983 P 110. (Monograph).

CHAPTER 6

SUMMARY AND POLICY IMPLICATIONS

The importance of hog products in Kenya has been underlined clearly in this paper. Hogs have the potential of being the future suppliers of red meat. It has been noted that if the declining trend in production continues, then this potential may not be realised.

Among the various factors that have been under consideration, only expected and lagged price variables have proved to be of any significant importance in explaining the movements in the number of hogs supplied in Kenya. Knowledge of the economic variables determining the demand and supply of hogs in Kenya is essential for a proper analysis of the hog industry.

Hog supply in Kenya has been found to be positively related to futures (expected) price, feed prices, dairy profitability and the stock of sows available for breeding purpose. It is negatively related to producer price, time and good seasons. Changes in supply have been found to respond most to futures and the producer price changes as shown by the various elasticities of response.

An analysis of the strategies adopted by Uplands factory competitors such as Farmer's Choice and Kenya

Bacon has shown that these firms have adjusted well enough to fill the gap left by the closure of the former. As such, the proposed Kenya National Pig Union may be redundant. Furthermore, the performance of government and parastatal organisations in the past has not been all that encouraging¹. A look at the current incentives to increase supply will show how the gap has been filled.

6.1 Incentives to Increase Supply

One of the incentives to hog farmers has been the increase of producer price (see Appendix 2). Since 1985 when shortage of hogs for slaughter started to be felt, the price has increased from sh.9.20 to about sh.24 per kg CDW (the current price as offered by Kenya Bacon). Other incentives include the extension service by Farmer's Choice and Kenya Bacon staff and the provision of transport for slaughter hogs.

Extension service has proven essential in hog farming as the advice given to farmers has helped in reducing the costs of production in addition to helping farmers identify the best period and weight at which to sell their hogs.

The farmers are also paid their dues promptly to avoid disillusioning them as happened in 1985. Transportation of feeds to the farmers by Farmer's Choice and the provision of improved breeding stocks to interested farmers is another form of incentive.

A disincentive to increased supply has been recognised in the poor rural consumption of pork and related products. It is estimated that the rural population which is about 80 percent of the Kenya population only consume 20 percent of the pork sold in Kenya². Some researchers have recommended an increase in beef and mutton prices as a way of increasing the demand for pork in the rural areas. However, the prices of pork and beef are at par in many butcherries at the moment following government decontrol of meat prices last year³ (Note that pork prices have never been under government control). There is evidence that hogs slaughtered in some rural areas are sold fast.

Thus, the problem may be one of marketing hog products rather than low demand. Pork is not found in many butcherries in some rural areas. In this regard, the recommendation should be take pork closer to the rural masses and create awareness of the benefits and presence of pork. The move by Farmer's Choice to offer pork samples to people for tasting at the leading supermarkets is in the right direction⁴. After that analysis this paper has some proposals to offer towards increasing the supply of hogs in Kenya.

6.2 Proposals for Increasing Supply

It has been suggested that Kenya can become a competitive world producer of hogs and hog products because her tropical climate is conducive to better performance and the two major feed ingredients of

cereals and protein meals are readily available. It is further asserted that Kenya boasts some modern and efficient processing factories and a body of skilled producers capable of producing porkers and baconers of high quality⁵. To realise the above potential and utilise the asserted capacity, several things need to be done to increase the supply of hogs.

It has been shown that the risk associated with hog farming has been significant and has made farmers loose confidence in the industry. The risk has also been associated with Uplands factory to a large extent. The policy in that case would be to let that factory remain the way it is now (inoperational) or sell it out to interested private individuals. So far there are very few documented grievances if any on performance of the slaughter firms that are operating at the moment. Everything should be done to ensure that none of these firms close down or else the production will go further down as happened with Uplands factory closure.

The success of hog farming was found dependant to some extent on availability of feeds at reasonable cost. The livestock sector should be given due attention when increasing the prices of grains in the country. The offals from the slaughterhouses (including Kenya Meat Commission) are not being utilised at the moment since UBF closed down, yet they offer a good protein supplement in the feed concentrates. The processing firms should consider doing that in the near future and make

the products available to the farmers at reasonable costs.

In this study, producer prices were found to be relatively lower than the expectations of the farmers. It would be prudent to raise them if hog supply is to be stepped up. Elasticity of response showed that if the futures price increases, hog supply would also increase substantially.

If all these factors are considered together with those that have been recommended in the past⁶ concerning the promotion of pork consumption, then the potential of hog industry in national development could be fully realised.

ENDNOTES

1. See J.R. Nellis, "Public Enterprises in Sub-Saharan Africa". World Bank Discussion Paper No.1, World Bank, Washington. 1986.
2. See P. Bartilol, "Livestock Production Policies". Ministry of Livestock Development, Animal Production Division, Nairobi. (Mimeo).
3. Early in 1987, the government decontrolled beef and mutton prices in the country. Consequently, the prices rose from sh.24 to sh.28 and in some places, sh.30 for beef while mutton prices rose from sh.26 to sh.30 and in some places sh.32.
4. Farmer's Choice has been frying some pork at the door-steps of the major supermarkets in Nairobi, Mombasa and Nakuru and giving pieces to customers as they get out of the markets. The customer is asked to comment on the taste.
5. See United Nations Development Programme and Food and Agricultural Organisation, East Africa Livestock Survey - Regional Kenya, Tanzania, Uganda. Development Plans. Volume II. United Nations, Rome. 1967.
6. It has been suggested by various researchers e.g. Livingstone 31, that the government should embark on a campaign to promote consumer demand through such means as advertisements in the news media.

APPENDICESAppendix 1Pig Feed Price List (shs)*

	1981 (70kg)	1983 (70kg)	1984 (70kg)	1986 (70kg)	(20kg)
Supercreep Pellets	173.40	190.75	230.35	239.25	72.90
Pig Creep Pellets	151.45	166.60	188.90	207.05	61.70
Sow and Weaner Meal/Cubes	118.00	118.00	128.85	159.99	43.75
Pig Rearer Meal	122.65	122.65	129.45	148.45	44.95
Pig Baconer Meal	100.65	107.75	112.15	126.75	38.30
Barley Balancer Meal	170.35	187.49	218.50	218.50	69.05
Maize Balancer Meal	194.90	214.45	235.00	235.00	69.90
Pig Finishing Meal	94.75	100.30	103.65	119.35	36.15

Source: Unga Feed Limited

* The prices are ex-factory Nakuru. 1981 prices lasted upto 1983. 1984 prices were effective upto 1st March 1986 when they were reviewed. The reviewed prices are still in effect.

Appendix 2

Hog Producer Prices , 1967 - 1988

(shs/kg cold dressed weight)

<u>Year</u>	<u>Price</u>
1967	4.05
1968	4.41
1969	4.04
1970	3.55
1971	3.70
1972	4.18
1973	4.26
1974	5.67
1975	6.36
1976	6.55
1977	6.84
1978	7.64
1979	7.78
1980	7.30
1981	9.10
1982	9.20
1983	9.20
1984	12.00
1985	13.00
1986*	17.00
1987*	17.00
1988*	17.00

Source: Zephania Owiro, (1987), "Livestock Production in Kenya, 1970-85 and Outlook to year 2000".

Ministry of Livestock Development Nairobi. (Monograph)

* Prices as offered by Farmer's Choice. Others are those offered by the defunct Uplands Factory.

Appendix 3

Raw Data for the Estimation of Hog Supply Response in Kenya

YEAR	SLAUGHTER 000,000 Kgs S_t	EXPECTED PRICE Ksh/Kg. P_t	LAGGED PRICE Ksh/Kg. P_{t-1}	FEEDS AVAILABILITY F_A	DAIRY PROFITABILITY D	TIME VARIABLE T	FEEDS PRICE KSH/KG F_P	NUMBER OF SOWS LAGGED ONE YEAR 0000 HEAD N_{t-1}
1955	3.16	3.22	3.66	0	-	1		-
1956	3.57	3.46	3.70	1	12.4	2		1.8
1957	4.78	3.66	3.86	1	12.5	3		2.2
1958	6.57	3.96	3.86	1	10.4	4		2.9
1959	6.27	3.81	3.86	0	11.0	5		10.4
1960	5.67	3.56	3.31	0	10.3	6		12.7
1961	4.89	3.55	3.53	1	10.1	7		8.9
1962	3.65	3.70	3.84	1		8		8.7
1963	3.29	3.72	3.74	1	9.0	9		5.5
1964	3.46	3.73	3.74	1	9.1	10		5.6
1965	3.58	3.74	3.74	0	8.3	11		5.9
1966	3.85	3.85	3.96	1	8.2	12		5.4
1967	3.28	3.86	3.87	1	9.5	13	0.19	4.6
1968	3.16	4.00	4.05	1	10.0	14	0.19	4.2
1969	3.85	4.23	4.41	0	8.0	15	0.68	4.6
1970	4.55	4.04	4.04	1	7.3	16	0.68	5.0
1971	4.43	3.80	3.55	0	10.7	17	0.55	4.5
1972	3.35	3.75	3.70	1	10.3	18	0.60	3.9
1973	2.78	3.97	4.18	1	9.2	19	0.68	3.4
1974	2.52	4.12	4.26	0	6.8	20	1.03	3.6
1975	2.98	4.90	4.67	1	6.7	21	1.10	3.0
1976	2.71	5.63	6.36	0	4.8	22	0.97	3.1
1977	2.79	6.09	6.55	1	4.5	23	1.06	3.1
1978	3.51	6.47	8.84	1	6.9	24	1.04	3.5
1979	3.72	7.06	7.64	1	5.6	25	1.25	3.1
1980	3.92	7.42	7.78	0	4.2	26	1.09	5.4
1981	3.97	7.36	7.30	1	5.9	27	1.83	3.8
1982	4.46	8.23	9.10	1	6.4	28	1.73	2.3
1983	4.68	8.72	9.20	1	5.9	29	1.88	4.5
1984	3.61	8.96	9.20	0	3.3	30	2.29	4.5
1985	2.17	10.48	12.00	1	4.8	31	2.20	4.0
1986	3.27	11.74	13.00	1	6.3	32	2.31	3.9
1987		14.37	17.00	1		33	2.31	

Source:

Republic of Kenya, Ministries of Agriculture and Livestock
Development Annual Report(s), Nairobi
(various issues, Mimeo) ;

Republic of Kenya, Ministries of Agriculture and Livestock Development, Economic Review of Agriculture, Nairobi (various issues, Mimeo);

_____, Central Bureau of Statistics, Kenya Statistical Digest. Government Printer, Nairobi. (various issues);

_____, Statistical Abstract, Government Printer, Nairobi. (various issues);

R. Tichaendepi Masaya, "Spectral Analysis of Rainfall series in Kenya". Working paper no.211, Institute of Development Studies, University of Nairobi 1975;

Price Controller's Files.

Appendix 4

QUESTIONNAIRE

This questionnaire helped to find out from the farmers the factors influencing the supply of hogs in Kenya, and from the slaughter firms, the strategies they have adopted following Upland Bacon Factory's closure.

Questions to the Farmer

Question 1

1. Please give me a brief history of your hog farming in terms of:
 - a) When you started the pig enterprise,
 - b) what attracted you to it and
 - c) the salient problems you encountered while starting hog farming.
2. Did the presence of many buyers (i.e processing factories like Uplands Bacon Factory, Farmers Choice, Kimble Bacon Industries, Kenya Cold Storage individual licenced butchers etc) influence your entry into the industry in any way?
Explain.
3. What were the initial investment costs of the piggery?
4. Have you at any one time operated under contract?
Explain. What's your perception (or experience) of the advantages and disadvantages of contract farming in the hog industry?

5. Is situation (4) likely to change in future?
Explain.
6. What was the size of your initial hog herd?
How has the progress been since then.
7. What have been the causes of the fluctuating trend (depending on (6) above)?
8. Feeds have been said to constitute the greatest part of input costs. What percentage of your total operation costs would you attribute to feeds?
9. Where do you get your feedstuffs from? What are the types that you buy?
10. Observations have been made to the effect that during dry seasons commercial feeds disappear from the shops and where they are available , they sell at a higher price. What's your experience in that regard? How have you been coping with a such situation?
11. Some farmers use foodwastes from hotels, educational institutions, hospitals, food processing factories, etc to feed hogs. Others select some farm produce which they mix to get hog rations. It has been suggested that dried poultry manure if not exceeding 30% of the pig ration can be a good source of hog nutrients. How far do you rely on these types of feedstuffs?
Explain.

12. The current hog price as offered by Farmer's Choice has shot up to Kshs.17 = per kg baconer. What production adjustments have you made to take advantage of that price increase?
13. Every producer goes about his activities with the hope that his output will fetch a certain price. In your case what prices do you expect for your hogs? How do you form your price expectations?
14. In Kenya, we have Farmers Choice, Kenya Cold Storage and individual butchers being the main market outlets for hogs. A farmer may slaughter the animal and sell pork. Which of these channels do you prefer? Why?
15. How was your preference before Uplands Bacon Factory went under receivership? (if different from (14) above).
Why were you preferring that channel at that time?
16. How do you compare the producer prices associated with these marketing channels?
17. Recently, Farmers Choice came up with an incentive package to the farmers. They are offering cash bonus to farmers who deliver their hogs to the factory, special transport to farmers who cannot afford to do that, and they have started visiting and advising farmers on better methods of hog rearing. How are you benefiting from these incentives? Assuming that these incentives will

you increase production to take full advantage of them?

18. In your view, which is the more profitable enterprise between hog rearing, dairy farming and poultry? Explain. (if different from hog rearing) Why do you rear hogs then?
 19. Farmer's Choice have come up with a breed of hogs that they claim to be better than the ones being reared in Kenya at the moment. They are said to have a high feed conversion ratio. Are you ready to change your breed for those? Explain. Have you ever changed your breed? Explain.
How was the outcome (If the answer is positive)?
 20. Early in 1987, Uplands Factory closed its gates to the farmers and halted operations. How did that affect you? Have you changed your hog farming activity since then? Explain.
 21. In your view, what are the major factors that determine the number of hogs that you rear and put on the market? Explain.
 22. What are the major problems that you face as a hog farmers?
 23. Currently, the country needs more hogs than the farmers are able to supply. What measures would you consider suitable to be taken to increase hog supply?
 24. What other suggestions would you like to make on hog rearing and marketing?
- Thank you for sparing time to answer my questions.

Questions to the Factory Manager

1. Please give a brief history of your company in terms of:
 - a) When it was opened,
 - b) its purpose,
 - c) progress since inception.
2. What incentives do you give to the farmers now to supply more pigs? What about in the past?
3. How have your slaughter figures been fluctuating over time since you started operations?
4. Where (district) do you get most of your pigs from?
5. Last year, it was reported in the papers that some firms were importing hogs from Tanzania. How many did you import? Distribution per month?
6. Do you export any of the hog products that you manufacture? If yes, specify and to which countries the exports are destined. If no give reasons as to why not.
7. How do you grade the pigs you receive? (Any copy of grading system available?) How are the prices determined?
8. Who are your major competitors in the industry? What about before UBF closed?

Were you getting serious competition from Uplands Factory? Explain.

Was UBF behaving as a price leader?

9. When UBF closed down, its position in the industry was left as a gap. How have you adjusted your operations to fill that gap in terms of:

- a) Number of hog intake per month?
- b) Labour employment?
- c) Expansion of buildings and machinery?
- d) Number of shifts?

10. (A tour around the factory).

How many sows do you keep in the factory?

How do you distribute piglets to the farmers?

11. What strategies do you have to promote consumption?

12. How much do you spend on consumption promotion e.g. advertisements on papers and radio?

Have you started contract arrangements with farmers?

13. One of the variables affecting the demand for hogs is profits or income of the buyer. How have your profits been fluctuating since you started operation? Would you mind providing me with the Annual Profits from the Profits and Loss Account that you give to the department or shareholders?

14. What plans do you have of improving your firm in future?
15. What is your view on the future of the hog industry in Kenya?

Thank you for answering my questions and taking me round your factory.

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