

## A MEAT PRODUCTION STRATEGY FOR SOUTHERN AFRICA

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(Sleutelwoorde: *Strategie, Vleisproduksie*)

The title of this paper namely "A meat production strategy for Southern Africa" required some analysis which aided the author in deciding on the approach to be followed in the discussion. The word strategy (strategem) derives from the Greek words strategos – a general, stratos – an army and agein – meaning to lead, collectively yielding the word strategy which freely translated would describe carefully plotted offensive or defensive tactics to outwit an enemy. In this instance, conscious, calculated planning for the production of meat to "outwit" the "enemy", namely protein hunger. At the 1978 congress of the South African Society for Animal Production, Dr H.C. Luitingh, presented a paper entitled "An animal production strategy for South Africa". Without wishing to detract from the excellence of his paper, one has to conclude on perusal of its contents, that Dr Luitingh presented a detailed overview of the relative contribution and importance of the various factors which influence a production strategy, rather than defining the strategy. In defence of his approach he queries in the introduction to his paper, the decision of the organising committee of having assigned the task to an individual instead of a committee, which viewpoint the author shares, since he also is of the opinion that the task of formulating a meat production strategy for Southern Africa is hardly a one-man assignment. The author does not wish to be considered a defeatist nor to be thought facetious, but one cannot help but wonder what action, if any, would result from the suggestions or criticism offered in such a paper. The author wishes to approach the planning of a strategy for production in a rather unconventional way. Instead of attributing as is customary in papers of this nature, lack of progress or slow progress by the industry to a dearth of information and technical knowledge, it is believed that the obstacle to the successful implementation of the many well defined strategies for production which have preceded the present one has been the failure of producers, the department of agricultural technical services, statutory bodies, co-operatives, professional animal scientists and academicians to form a unified front, responsible for the formulation of production policies required to be implemented through legislation and/or extension efforts. This point will be further discussed anon. Furthermore, in planning a strategy for meat production, the operative word is production (or producer) and a careful study of the producer's environment to identify barren or shady areas must surely be the first steps in strategic planning. The next question to ask is what is known of these environmental components? Accordingly, this paper will be based on the scheme outlined below:

Meat production (producer):

- Beef production
- Mutton production
- Pork production
- Poultry production
- Beef from dairy production

Production (producer's) environment:

- Natural environment
- Educational, research and extension environment
- Socio – political environment
- Economic environment
- Policy environment
- Marketing environment
- Consumer environment

### **Meat production**

#### *Beef production*

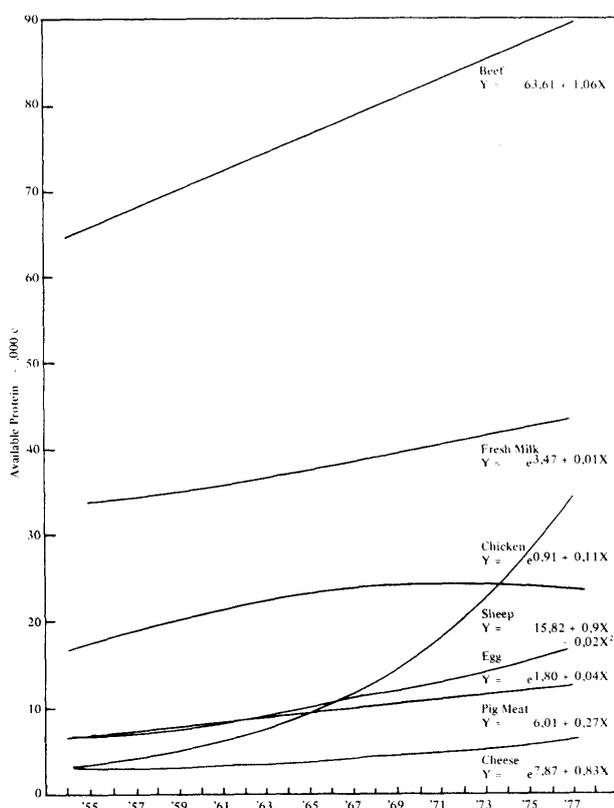
Animal production in southern Africa over the past 50 years has been closely studied (Verbeek, 1966; Van Wyk, 1967; Hirzel, 1968; Hamburger & Waugh, 1968; Louw, 1968; Raath & Elliott, 1968; Joubert, 1975; Hofmeyr, 1968, 1975; Lombard, 1978) and is fairly well documented. In most studies production was reviewed and future trends were predicted by extrapolation from simple graphs but few, if any, studies have been undertaken to predict future production trends by using sophisticated econometric procedures. A regrettable tendency presently, is the fact that red meat production tends to be contrasted to the production of poultry and that producers of beef and mutton (and to some extent pork as well, although there is no biological justification for pork to be classified as a red meat) saw the growth of the poultry industry as a threat to the red meat industry. Most animal products are mainly sources of protein so that globally, about 25 per cent of man's protein requirements and only 10 per cent of his energy (caloric) needs are provided by livestock and poultry. In South Africa the shortage of protein of animal origin has remained fairly constant over the past 15 years (1964–1978) (Table 1) and had it not been for the rapid increased production by the poultry industry which compensated for fluctuating supplies of beef and the declining availability of mutton, the deficit caused in part by the steady increase in human numbers could have reached alarming levels. (Fig. 1).

**Table 1**

*Proteins of animal origin as percentage of national human population needs, 1964–1977*

Year	Human population '000	Protein requirement (1) '000 t	Available protein (2) '000 t	(2) / (1) x 100		Protein deficit %
				(1)	%	
1964	18 569	477,22	165,71	34,72		65,28
1965	19 067	490,02	161,75	33,01		66,99
1966	19 589	503,44	166,45	33,06		66,94
1967	20 124	517,19	169,29	32,73		67,27
1968	20 666	531,12	174,89	32,93		67,07
1969	21 235	545,74	180,94	33,15		66,85
1970	22 469	577,45	191,21	33,11		66,89
1971	23 032	591,92	198,82	33,59		66,41
1972	23 670	608,32	202,91	33,36		66,64
1973	24 317	624,95	207,95	33,27		66,73
1974	24 942	641,01	209,67	32,70		67,30
1975	25 471	654,61	208,17	31,80		68,20
1976	26 129	671,51	224,06	33,37		66,63
1977	26 410	678,74	232,96	34,32		65,68
1978	26 970*	N.A.	N.A.	N.A.		N.A.

\*Preliminary



*Fig. 1 Edible protein derived from various animal products, 1954–1977*

In order to illustrate trends of protein availability regression models of best fit have been determined and

are given in Fig. 1. If the total protein available from the total production of animal products in the years 1976 to 1978 are expressed as a percentage of total protein requirements by the human population of South Africa, assuming that each individual receives the recommended average daily allowance, then it is evident that beef and veal, despite the competition of other protein sources still command the major share of the protein market (Table 2).

**Table 2**

*Percentage of protein requirement supplied by various animal sources, 1975–1977*

Product	Contribution to requirement		
	1975	1976	1977
Beef and veal	10,88	12,3	14,60
Sheep and goats meat	3,04	3,8	3,71
Pork	1,75	1,7	1,95
Chicken	4,73	5,6	6,69
Fresh milk	5,66	5,7	6,26
Cheese	0,85	0,9	1,07
Eggs	2,06	1,9	2,93
Meat substitutes	—	—	0,30
Other and deficit	68,32	68,1	62,49
Total requirement	100,00	100,00	100,00

**Table 3**

*Percentage of total imports into the R.S.A. according to source, 1967-1978 (Carcase equivalents)*

Year	R.S.A. production	S.W.A. imports	Other countries	Total
1967	77,7	14,5	7,8	1 649 402
1968	72,6	16,0	11,4	1 623 918
1969	73,1	15,7	11,2	1 629 806
1970	71,5	17,7	10,8	1 851 299
1971	71,0	19,5	9,5	2 026 872
1972	72,2	20,0	7,8	2 211 907
1973	76,1	15,2	8,7	2 237 907
1974	73,5	11,9	14,6	1 842 088
1975	73,9	13,7	12,4	1 863 921
1976	76,9	13,9	9,2	2 068 236
1977	72,0	12,9	5,1	2 124 642
1978	85,1	12,9	2,0	2 327 272
Average	74,6	15,3	10,1	1 954 772

Whilst this may be a soothing thought to beef producers, it is a disturbing one to animal productionists who carry the responsibility of having to plan production strategy, especially if it is viewed against the rapid increase in human numbers and the fact that the Republic is dependent on imports for approximately 25 per cent of her requirements (Table 3). These are mainly beef of the average to lower grades for which demand for most part of the year greatly exceeds supply.

#### *Mutton production*

It is evident from the figures presented in Table 4 for woolled sheep, from which most of the mutton

**Table 4**

*Total sheep population, number of woolled sheep and total number of white-owned sheep, 1921-1978*

Year	Total	White-owned	
		Woolled	Total
	million	million	million
1921	31,7	27,8	—
1926	38,8	35,3	—
1936	39,7	33,3	—
1946	30,6	24,2	—
1956	37,4	30,4	33,8
1966	—	32,7	37,4
1976	—	23,9	31,0
1977	—	26,8	31,9
1978	—	—	31,4

produced locally is derived, that following a marked increase until 1966, the population declined in 1977 to a number slightly lower than what it was 56 years earlier.

Unlike the beef and pig industries, the sheep industry as regards mutton production can hardly be considered independent from that of wool because of their close relationship. Past growth (Table 5), as would probably be the case in future, is governed by local and international developments in the production of, and demand for wool. The production of mutton is therefore essentially a by-product of the wool industry. Except for the few years of the stock reduction scheme (1968-1971) when the prices for the two commodities moved in opposite directions the market prices of mutton reacted in sympathy with those of wool to the extent that over the past 20 years the wholesale price of mutton increased by 0,74 c/kg for every 1 c/kg increase in the market price of wool. Likewise, an increase in annual take-off (slaughterings as percentage of total population) tends to be associated with a decline in the price of wool. The significance of these relationships will be appreciated when it is realised that presently 75 per cent of the mutton produced in the country is derived from the 21 million pure-woolled merino and 8 million cross-bred and dual purpose breeds which also produce wool.

Traditionally South African consumers prefer mutton to most other meats so that despite its comparatively high price, the liquidation of flocks as a result of a drop in the price of wool, does not result in a drop, but merely a decline in the price of mutton. Even if the percentage of the population that can afford the higher prices remains unchanged in future, demand will continue to grow since this percentage represents an increasing number of consumers in a growing human population.

The question that immediately arises is that if demand and price favour the producer why does the mutton industry not expand? The answer lies in that South Africa, as in most other countries of the world that are subject to periodic and severe droughts, areas suitable for sheep are better utilized for wool production than for growing mutton. This is because the economic viability of a wool-producing enterprise is less dependent on lambing percentage than is one producing mutton. Furthermore, systems of mutton production are extremely capital and labour intensive and even slight increases in these items tend to discourage growth of the industry. In such circumstances, as well as during droughts, wool producers can, despite low lambing percentages, recover at least their cost of production and often even show a profit from the sale of the wool of the ewe. Poor lambing percentages certainly reduce production, but not necessarily efficiency and profitability since it has not been proved beyond all doubt that the biologic response to supplementary feeding of sheep in the arid and semi-arid parts of the country is economically justified.

Table 5

*Production of mutton in the Republic of South Africa, in relation to total red meat available and that produced locally*

Year	Local production '000 t	Take-off %	Mutton as percentage of red meat produced %	Mutton available '000 t	Auction price of mutton c/kg	Auction price of wool c/kg
1959	73,9	13,3	21,0	135,2	36,6	60,0
1962	81,7	14,7	20,3	152,2	38,0	69,1
1965	88,9	15,6	20,8	146,2	43,5	74,7
1968	113,2	19,4	27,1	176,4	45,6	69,1
1971	139,5	30,6	27,7	219,4	52,1	45,7
1974	83,8	17,2	18,6	143,7	109,2	151,0
1977	98,9	19,0	17,8	166,2	127,7	162,1

Whereas the production of certain crops and milk can be undertaken in temperate areas that are well suited to high human population density, sheep, owing to their much lower productivity, cannot be maintained economically in these areas. Thus, it would seem that production for the foreseeable future is destined to be localised in areas with extremes in climate and topography where sheep are maintained at low grazing intensities, but where production costs are equally low, for example the Karoo.

Alternatively, in-house production systems may have to be developed. Their inception will be very gradual since the market price of mutton which is governed mainly by production costs under extensive situations, is not sufficiently high to result in profits that would yield acceptable returns on the kind of investments required for intensive production.

Considering that expansion of the industry will mainly depend on growth of the White-owned sheep population, it would seem that production of mutton will in future at best remain at fairly constant levels or decline slightly unless a marked swing occurs in numbers from woolled sheep to dual purpose and the pure mutton breeds. This trend is unlikely to occur for reasons submitted previously. It may therefore be concluded that, viewed over the long-term, both demand and price will remain high.

#### *Pork production*

Over the past 20 years growth in the pig industry has been positive and linear, at a rate of 20 000 animals per year. This upward trend was characterized by definite four-year cycles during which times the increase in population numbers over the first two years of a cycle was invariably followed by a decline during the subsequent two years. The end value of each cycle is considerably higher than that of the preceding cycle.

On the whole, growth in the industry has occurred parallel to growth of the human population so that the annual slaughterings are virtually 100 per cent positively correlated with the total pig population. Traditionally, South Africans are not major pig meat consumers and future growth is expected to continue, as in the past 20 years, in relation to the human population growth.

#### *Poultry production*

The poultry industry in the Republic experienced extremely rapid development since the Second World War. During the period 1967/68 to 1977/78 egg production increased from 138 million dozen to 237 million dozen, which represents an increase of 172 per cent. Efficiency of egg production increased from 215,3 eggs produced annually per hen to 238,2 eggs per hen over an eight-year period. During this same period average egg size increased from 57,2 g to 58 g and bodymass from 2,2 kg to 2,34 kg. The implementation of improved breeding and selection programmes, feeding, housing and management resulted likewise in a 32 per cent increase in the 56-day mass of broilers (mass increased from 1,41 kg in 1968 to 1,87 kg in 1977) and a 17 per cent improvement in feed efficiency (feed conversion improved from 2,28 kg feed per kilogram mass to 1,89). Owing to the fact that distribution takes place directly from producer to retailer, the price to the consumer remained comparatively low. Furthermore, the product is available on a 24-hourly basis to consumers. Viljoen (1979) points out that the Black population is the major consumer of the  $\pm$  14 million culled laying hens which not only is an economical purchase, but preferable in taste. The poultry industry is second only to humans as a user of maize. In 1977/78 maize to the value of R128 million, as well as R184,5 million's worth of balanced feed was fed to poultry. The achievements of poultry producers are even more remarkable when it is realised that the Land Bank does not provide poultry producers with loan capital for development. Annual consumption per capita

increased from five kilogram in 1970/71 to 12,4 kilogram in 1976/77. Apparently, a decline in consumption occurred from 1977 to 1978. Future developments in the poultry industry will be referred to in the concluding remarks to this section.

#### *Veal production and beef from the dairy*

Apart from what is used by the hotel and restaurant trade very little true veal is consumed in the Republic. This may be attributed to the fact that the cost of vealer production cannot be offset by the consumer price owing to the poor demand. On the whole little, if any, true veal is produced in the country and apart from the five to seven per cent Super grade calves which are probably beef weaners that are marketed off their dams from isolated areas in the country such as the Molopo, the majority of vealers are dairy calves killed at varying ages soon after birth. Over the past decade veal or rather, calf slaughterings, constituted from 1,3 to 1,7 per cent of total available beef. This contribution could be considerably increased if the number of calves marketed on the nine controlled markets (approximately eight per cent of total beef cattle marketed, Table 5) were reared to older ages and heavier masses. The main reason for this not happening is the fact that dairy calves are produced as single births throughout the year and not as batches of the same age which would justify the expenditure for facilities and other costs related to rearing and finishing. The thought may not be too far fetched that dairies which are mostly situated close to metropolitan areas could deliver new born calves to a central location where they could be reared on a co-operative basis, the consumer price of beef permitting. A practical problem that would have to be overcome is to get calves which are biologically speaking monogastric at this young age to perform on all-concentrate, high energy rations.

This would need to occur in spite of having been removed from their dams at three to five days after birth and in many cases the calves would not have received colostrum. Other problems to be surmounted are hygiene, veterinary, labour and transport costs.

Lastly, some comment on textured vegetable protein (TVP) is pertinent. Much is presently being said about proteins of plant origin structured for human consumption and the competition they will provide for animal proteins. Whilst plant proteins are qualitatively highly competitive, the likelihood of them contributing significantly to meeting the rising world and national demand for protein appears slight. This viewpoint is substantiated by the fact that the world's land is classified presently as being approximately 10 per cent arable, 20 per cent pastoral and meadows, 30 per cent forest and 40 per cent non-productive (mainly desert and rocky mountains). Because of the constraints of climate, soil and topography, the ruminant animal currently provides the only economic way of converting range and grasslands, forages, plant by-products and browse into food for man. In fact, it would be true to say that without the ruminant, most range and permanent pasture land would be practically useless in producing food.

Swine and poultry are omnivores and can eat garbage, animal wastes and animal by-products. Until recently they were not in competition with the human for certain food resources such as grain. However, over the past decade with ever increasing input costs and declining profit margins, production efficiency and profitability in the pig and poultry industries could be increased only through the use of balanced rations into which are included a high percentage of grain suitable for human consumption. Further increases in the price of grain would seriously affect profitability in these industries.

**Table 6**

*Total number of calves and beef cattle marketed on the nine controlled markets, 1976/77 - 1977/78*

Grade	1976/77			1977/78		
	Number	%	Mass/kg	Number	%	Mass/kg
<i>Calves:</i>						
Super X	5 315	5,3	82,7	8 015	7,2	83,1
Grade 1X	45 474	45,1	46,1	49 858	44,4	48,2
Grade 1Y	2 539	2,5	22,3	913	0,8	21,7
Grade 2	28 853	28,6	27,8	30 018	26,8	29,3
Grade 3	18 613	18,5	21,2	23 372	20,8	21,8
All Grades	100 794	100,0	37,6	112 176	100,0	39,3
Total beef cattle	1 116 796			1 171 494		
Total	1 217 590			1 283 670		

Although profit margins would tend to decline, the poultry industry and to a lesser degree the pig industry, will continue to expand in the developed countries of the West because of the comparatively low cost per kilogram of the available proteins.

In the developed countries of the West, but to a greater extent the underdeveloped countries of the Third World, the most promising opportunities for improving domestic animals as food sources reside with ruminants. This is because they are less competitive with man for both protein and energy which they derive from forage and which could be supplied in ever increasing quantities through improved pasture management programmes. Furthermore, if all the available arable land in the Republic was planted to legumes suitable for the production of T.V.P. after allowances have been made for areas which have to be grown to maize and wheat alone, it is unlikely that sufficient of such crops can be produced from which T.V.P. can be manufactured in amounts to have any adverse influence on meat production and thus consumption.

As justification for the rather lengthy preamble on production, which in essence differs little from the remarks made by Luitingh (1978), but has viewed certain aspects from a different angle, and for the lesser emphasis that poultry and pigs will receive in the subsequent discussion, the following additional remarks are offered.

The pattern of meat production in the Republic of South Africa, apart from the innovation of feedlots, has changed little during this century. Innovations such as feedlots, artificial pastures, the provision of supplementary feed and improved pasture management have contributed towards increasing production, but have not changed the pattern, probably because production is so dependent on natural pastures. The extent to which these innovations could be brought into practice depended on their contribution to overall profitability of meat production rather than a lack of know-how. The reasons for this unaltered pattern will be discussed in the section dealing with the production environment. Although the poultry industry has contributed much towards feeding the nation and the world in general (and probably will continue to do so) poultry scientists and animal scientists whose main interests concern ruminants, are gradually drifting further apart. This is understandable and is the kind of development that may be expected to occur where livestock production lends itself to industrialization. Although there are limitations to extrapolation from poultry to pig production, the author is of the opinion that similar developmental trends must of necessity occur in the pig industry. Future production strategies for these two industries will depend heavily on the use of computerised production models. One of their main problem areas is how to adjust production to consumer demand without cyclical gross overproduction and ever narrowing profit margins?

Problems related to nutrition, disease and hygiene control, housing, herd (flock) management and waste disposal have been extensively researched and experimental results are successfully applied in practice in most parts of the world including the Republic of South Africa. Here the only limitation to the introduction of advanced technology is one of cost effectiveness. In contrast to the poultry industry, genetic improvement through the introduction of superior germ plasm, the application of systematic cross-breeding and improving accuracy of selection for pre-defined performance goals have, despite advanced theoretical knowledge, enjoyed little attention experimentally and practically in pigs. Whether at this stage experimentation is justified is questionable since the principles for maximising accuracy in estimating economic breeding value have been well established by researchers in other parts of the world. Thus, apart from the importation of superior boars or semen, future strategy for herd genetic improvement will depend on the efficiency and speed with which on-farm recorded performance and production data are processed and returned to producers. In this connection, performance goals for swine should be governed by the biological potential of pigs, and by anticipated future management practices, production costs and consumer preferences. These goals necessarily include multiple, biological components, such as sow prolificacy and productivity, individual viability and the efficiency and composition of growth. The relative economic importance of these components is proportional to their respective effects on cost per kilogram of "high quality" lean pork. The nature and number of components chosen for use in selection programmes should be guided by their contributions to prediction of breeding value for cost per kilogram of pork.

It seems clear that consumers want lean, but firm, tender and tasty pork. Acceptance of lean pork goals by producers certainly would be enhanced if pig price differentials reflected the consumer preference more closely. Live animal back-fat probes of K40 counts plus body mass will permit selection for non-fat growth, without carcass data, but the latter are still necessary to determine whether reducing external fat leads to acceptable quality of lean pork.

Part of the definition of performance goals rests in defining the environments in which performance should be measured. For example, changes in husbandry, such as very early weaning, would re-emphasize milk production. Restricted feeding of breeding gilts might expose new genetic variability in prolificacy for selection. Restricted feeding of market pigs certainly would shift emphasis away from differences in appetite and fat deposition.

#### **Production environment**

From the discussion on production and particularly

the extent to which aspects regarding future strategy in pig production have been laboured in the concluding remarks of the previous section, the author suggests that the planning of production strategies for monogastrics (swine and poultry) should be divorced from that of ruminants (cattle and sheep). Mutton production is inseparably linked to wool production so that it would appear that the ensuing discussion will centre on beef production with intermittent reference to the other species, when relevant.

#### *Natural environment*

The effect of sub-optimal nutrition during certain seasons (primarily winter) of the year on reproduction, growth and development of grazing animals must be singled out as the most important environmental stress factor which adversely affects quantitative, qualitative and economic production of meat, particularly beef in the Republic of South Africa. So pronounced is this effect that most production, marketing, farm-profitability and even consumer-related problems could either entirely, or in part, be attributed to seasonality of production. The detrimental effects on production will be appreciated when it is realised that approximately 83 per cent (i.e. 7,8 million) of the Republic's 9,4

million head of white-owned cattle are kept in areas where severe mass loss occurs for periods of the year ranging from 120–180 days (Fig. 2). Whilst research has shown that mass loss may be checked by the provision of minerals (phosphorus, calcium), proteins (including NPN) and even certain sources of energy during this period (Fig. 3), research has not been successful in demonstrating how this could be achieved economically with escalating production costs. Of these livestock feed alone contributes 32 per cent to total the cost of production of one kilogram Super grade beef.

As a result of the adverse effect of mass loss in winter on fertility, breeding cows are mated soon after the onset of the rainy season so that the majority of calves born in the ranching areas are dropped during the summer months of October to February. This is substantiated by data obtained from participants of the National Performance Testing Scheme (N.P.T.S.) (Bosman, 1979, personal communication) which show that 63 per cent of the 307 825 births recorded for commercial cows from January 1972 through December 1976, occurred during the months September to December. In the majority of these herds, selection pressure is applied against infertility and poor reproduction which would tend to shift the mode earlier (Table 7).

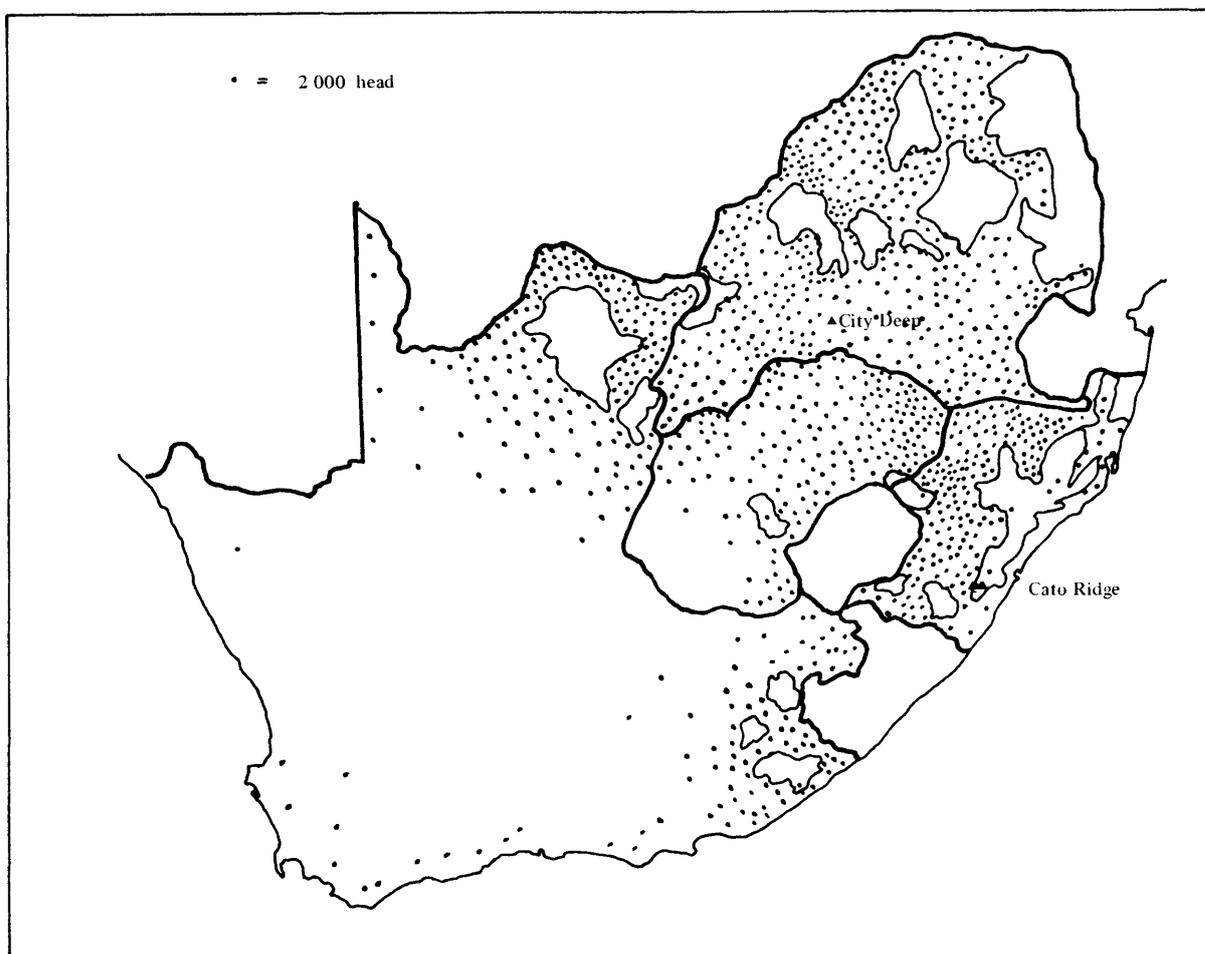


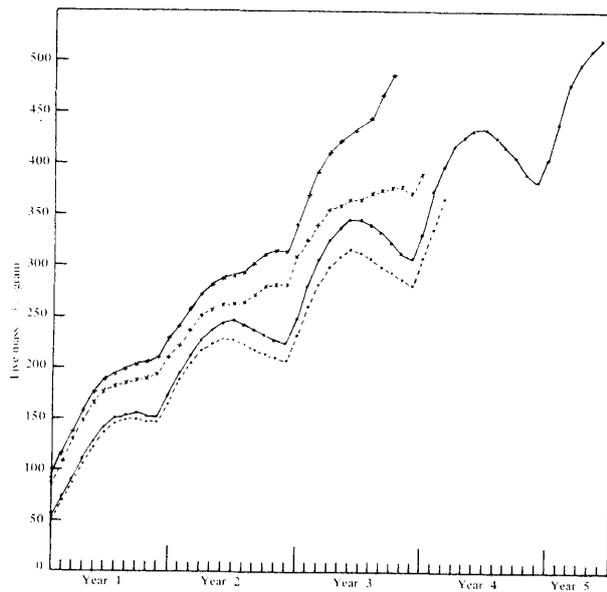
Fig. 2 Distribution of beef cattle in the Republic of South Africa

**Table 7**

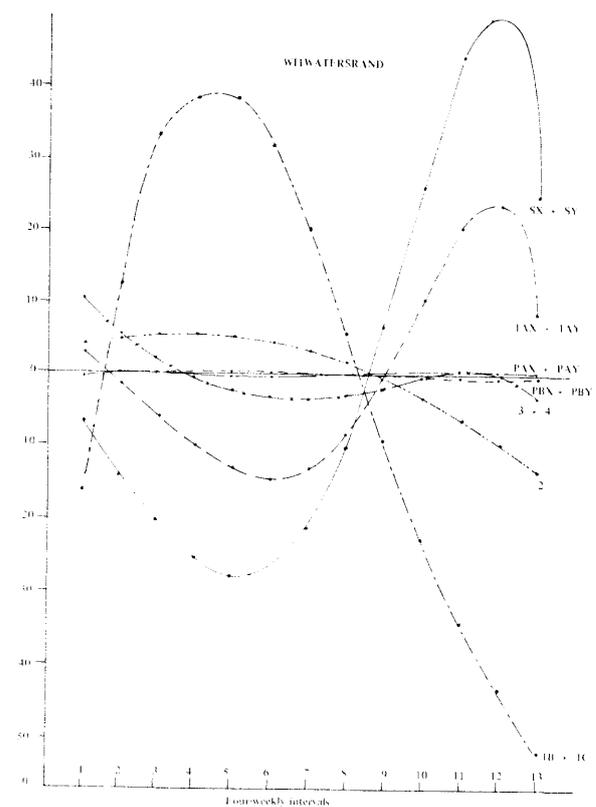
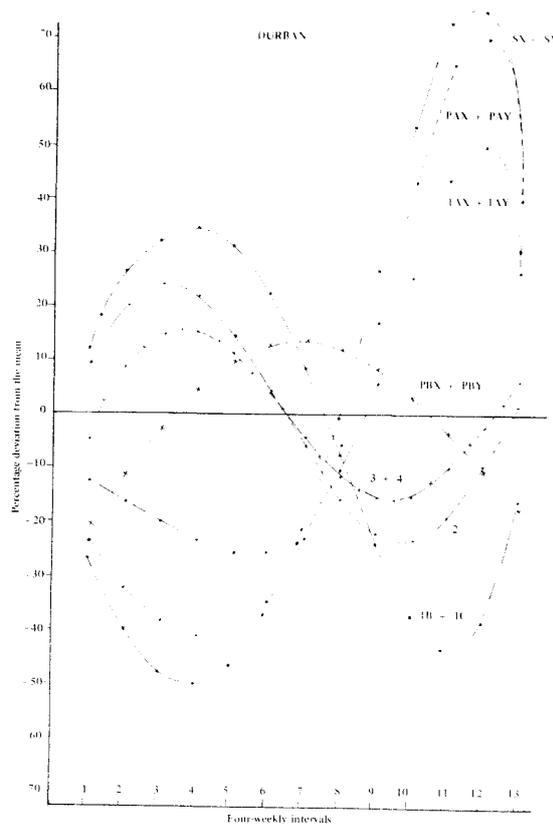
*Percentage of cows that calve in various months of the year*

Month	N.P.T.S.* (All breeds) %	Grade Afrikaner Cows**	
		Fed supplements in winter	Not fed supplements
		%	%
January	5,4	7,6	31,9
February	2,5	1,0	8,2
March	2,2	0,2	2,2
April	2,7	—	—
May	4,4	—	—
June	6,0	—	—
July	5,3	—	—
August	8,2	—	—
September	12,7	0,4	—
October	19,1	28,1	—
November	19,2	40,3	0,5
December	12,3	21,5	57,2
Total	100,0	100,0	100,0
Number of births	307 825	1 050	633

\* Bosman, personal communication, 1979. (N.P.T.S. = National beef cattle performance testing scheme.)  
\*\*Steenkamp, *et al.* (1975)



*Fig. 3 Growth of grade Afrikaner steers and heifers fed or not fed supplements in winter to maintain mass (x-x steers fed supplements; x---x heifers fed supplements; --- steers not fed; — heifers not fed)*



*Fig. 4 Seasonal variation in supply of beef grades to the Durban and Witwatersrand markets*

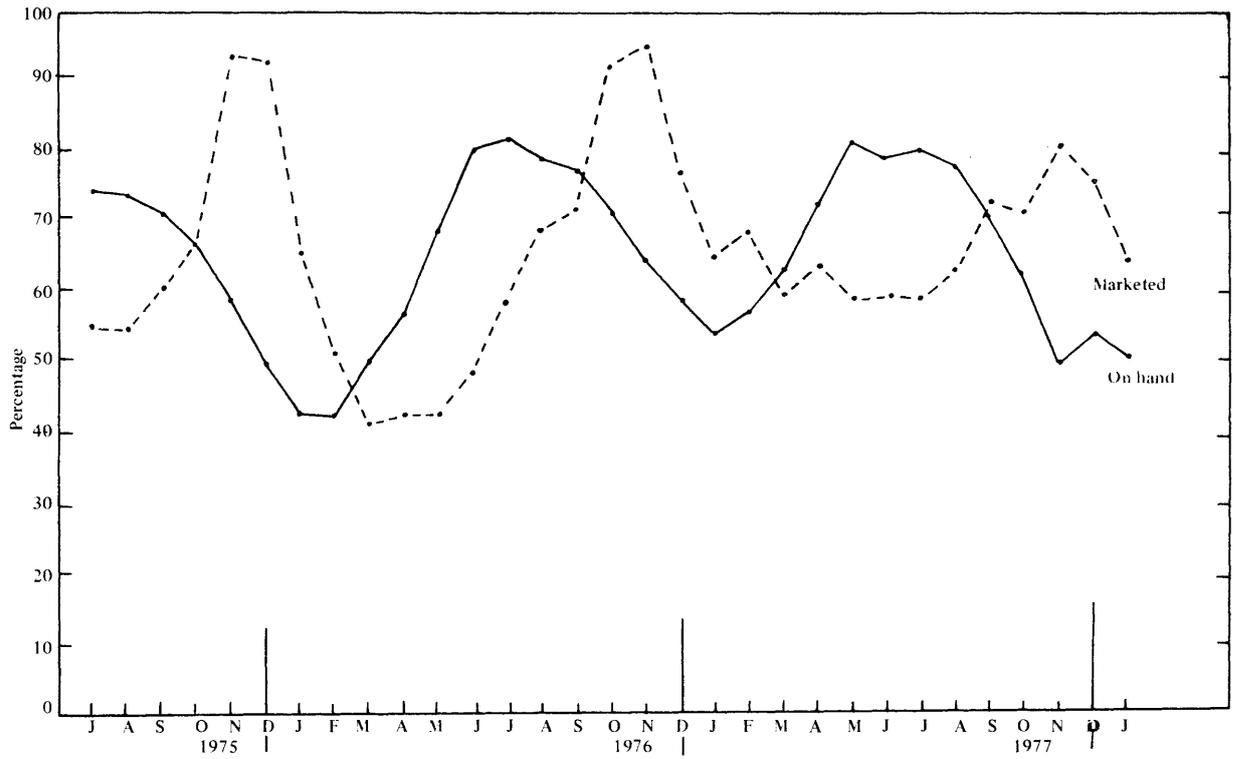


Fig. 5 Feedlot cattle on hand and marketed as percentage of feedlot capacity

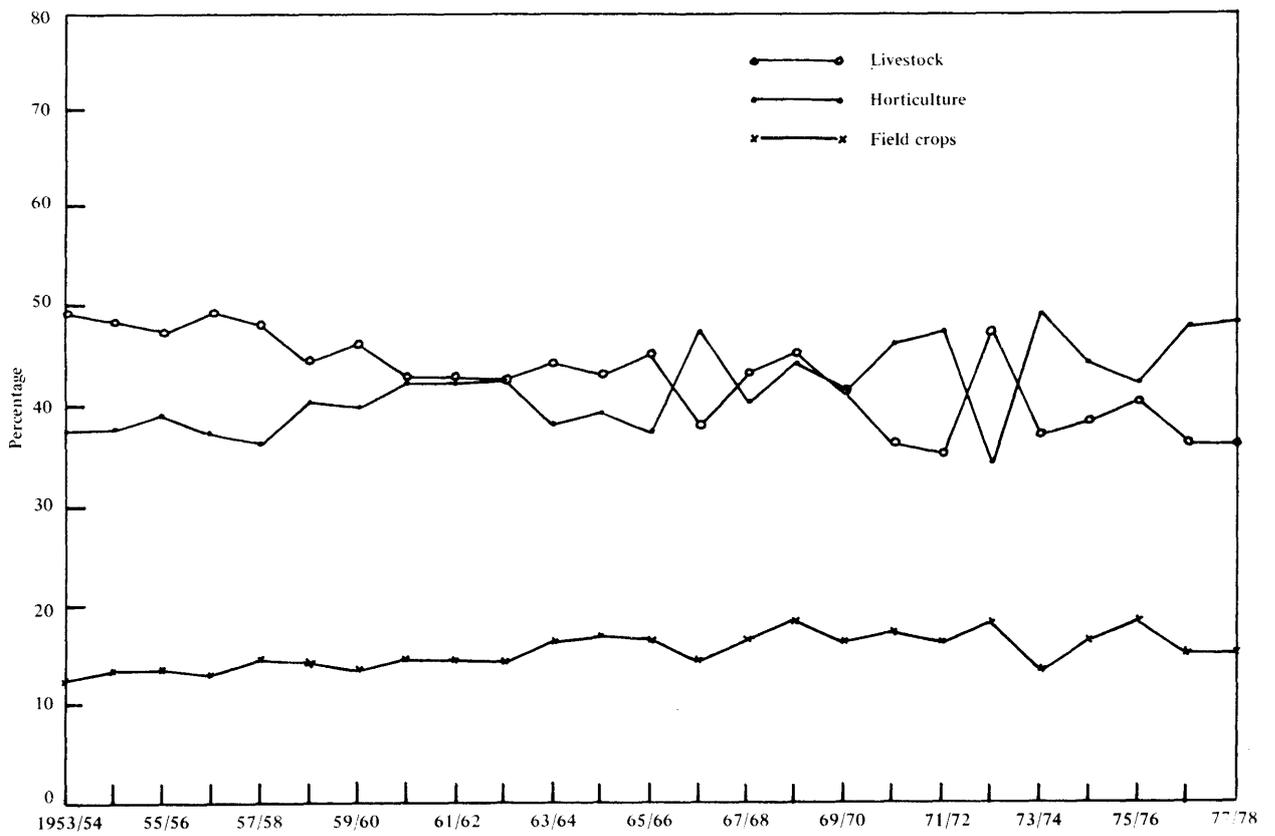


Fig. 6 Livestock, horticulture and field crops as percentage of gross agricultural production.

This seasonal production has as its consequence a tremendous fluctuation in supply of the various grades to the Witwatersrand and Durban markets which may be regarded as the major markets of the traditional beef producing areas (see Fig. 2 and 4). Intake as well as marketing from feedlots are likewise cyclical (Fig. 5). The likelihood of the spread of the calving season being affected by the supplementary feeding of breeding cows seems to have been thwarted by escalating feed prices. Thus, an accentuation of seasonality may be expected rather than the reverse.

In formulating a meat production strategy for Southern Africa it should be realised that, in view of the aforementioned limitations, drastic increased production can be brought about only through intensification. For some time to come this may not be cost effective. This intensification can only occur through expansion of the feedlot industry, the growth of which is dependent on the number of calves that can be raised on natural pastures. There is a limit to the improvement of natural pastures. These can be improved through management, the introduction of legumes and fertilization. Certain areas that are suitable can be developed as artificial pastures although the total area suitable is in any event so limited that even if the productivity is raised to maximum, it is doubtful whether the increased meat which can be produced off that area could compensate for the deficit that may occur in time. In contrast to developmental tendencies in the temperate regions of the world where crop and horticultural production during the past two to three decades outstripped animal production in terms of their contribution to the gross value of agricultural products, the ratio in the Republic has remained nearly constant at rough 50 per cent field crops, 15 per cent horticultural products and 35 per cent livestock products (Fig. 6). That climate and topography have a restrictive effect on production is evidenced by the fact that of the 80 per cent gross value of agricultural production 32 per cent is derived from three field crops, 10 per cent from three horticultural crops and 38 per cent from six livestock products. The contribution of these has remained in the aforementioned ratio for the past 12 years (Table 8).

In summary and with particular reference to the influence of environment on production, it would seem that the possibility of altering production patterns is limited and that increased production will occur in time only if the cost of intensification is offset by product prices.

#### *Educational, research and extension environment*

A brief reference to the series of papers presented at a recent symposium on "New demands to agricultural research in the R.S.A." (Tegnikon, 1978), would be sufficient to serve as assurance that the amount of effort

expended in the R.S.A. on education and research over the past decade alone has been considerable. From the information presented by Coetzee and Van der Watt (1978) on the expenditure for research by the various disciplines during 1975/76, it is evident that 46,3 per cent was directed towards livestock related research, 34,6 per cent towards agronomy related problems, 5,8 per cent towards soil science, 5,4 per cent towards genetics, 4,2 per cent towards agricultural engineering and only 3,3 per cent towards agricultural economy and extension. After studying the papers by Verbeek, Louw and Le Riche who described research in agriculture conducted by Government, Universities and commercial organizations, respectively, it is blatantly evident that the expenditure on extension is a gross underestimate of what would be required not only to disseminate available scientific information to producers timeously and efficiently, but also to shorten the time-lag estimated at between 10 to 15 years from the time research results become available until such time as they are applied in practice. This raises one of the most controversial yet in terms of the formulation of a meat production strategy, probably one of the most important issues namely, the effectiveness of Government directed extension versus services that could be rendered by private enterprise. This issue should enjoy absolute priority since it is certain that lack of progress in production can no longer be attributed to inadequate knowledge, but must be ascribed to the failure of information and knowledge being reported to producers by specialised consultants professionally qualified to do so. The impact and value of research findings are so diluted by the time they reach producers via the usual cumbersome long communication channel of the civil service that much of the effort and finance expended on the original research seem wasted. The necessity for professional consultation to be conducted by private enterprise and under the auspices of statutory bodies rather than by the Government which should concern itself solely with conservational programmes, is long overdue.

The Government could contribute financially by subsidising individual consultants who operate under contract. Subsidization could gradually be withdrawn as the profession establishes itself and the concept of professional consultation gains acceptance among producers. In the author's opinion, papers like that of Dr Luitingh and also the present one are a complete waste of time unless Government and the private sector (which includes Statutory bodies, co-operatives, commercial organisations, breed societies and individuals through the Board for professional animal scientists) reach accord on the strategy and future *modus operandi* to be adopted regarding dissemination of information and consultation with the prime objective of raising standard of service to a professional level. Services should be rendered exclusively on a remunerative basis in order to establish the understanding of mutual obligation so necessary between client and consultant.

Table 8

## Gross value of certain agricultural products

Product	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/67	Mean
	%												
Maize	27,4	16,0	15,9	17,0	22,0	22,9	10,8	24,4	20,9	16,5	20,3	21,3	19,6
Sugarcane	5,4	6,6	5,4	6,3	5,1	5,5	5,6	4,3	5,5	7,0	6,2	6,1	5,8
Wheat	2,7	6,2	6,4	6,7	6,2	6,9	6,0	5,5	5,6	6,3	7,6	5,8	6,0
Sub-total	35,5	28,8	27,7	30,0	33,3	35,3	22,4	34,2	32,0	29,8	34,1	33,2	31,7
Deciduous and other fruit	4,1	4,2	4,6	4,2	4,6	4,7	5,1	3,4	4,2	4,0	3,6	3,4	4,2
Vegetables	3,2	3,6	3,4	3,6	3,3	3,1	3,7	2,6	3,4	3,7	3,4	3,3	3,4
Viticulture	1,9	2,5	2,4	2,1	2,9	2,6	2,6	2,1	2,4	2,6	2,0	2,0	2,3
Sub-total	9,2	10,3	10,4	9,9	10,8	10,4	11,4	8,1	10,0	10,3	9,0	8,7	9,9
Cattle and calves	10,4	11,7	10,8	11,0	10,6	10,4	13,9	11,4	11,4	10,8	10,7	10,6	11,1
Sheep and goats	4,6	5,2	5,3	5,8	5,4	5,2	5,8	4,5	4,9	5,0	4,5	4,3	5,0
Pigs	1,5	1,8	1,7	1,8	1,8	1,8	2,0	1,7	2,0	2,0	1,7	1,6	1,8
Poultry and eggs	4,1	4,8	4,8	5,3	4,8	5,0	7,3	6,9	7,9	8,2	7,3	8,0	6,2
Milk and dairy products	9,5	11,0	10,5	10,1	8,7	8,1	8,3	6,3	8,0	8,7	6,7	6,3	8,5
Wool and mohair	7,1	7,6	7,8	6,5	4,1	3,7	8,6	5,4	3,6	4,7	4,5	4,5	5,7
Sub-total	37,2	42,1	40,9	40,5	35,4	34,2	45,9	36,2	37,8	39,4	35,4	35,3	38,3
Total	81,9	81,2	79,0	80,4	79,5	79,9	79,7	78,5	79,8	79,5	78,5	77,2	79,6
Gross value of agricultural production (R1 000)	1 331 482	1 200 533	1 307 100	1 325 068	1 519 262	1 734 403	1 826 024	2 662 936	2 787 289	2 993 519	3 596 616	3 794 688	

### Socio-political environment

Planning a meat production strategy for Southern Africa without recognizing the economic interrelationship between South Africa and other countries on the African continent would be to ignore some of the major issues that will confront the Republic in the role she has to fulfil of feeding and educating the developing nations of Africa. Educationally and technologically South Africa would experience little difficulty in sharing her vast experience and knowledge with less fortunate nations once political barriers are crossed. One of the main problems of the future, however, is to know to what extent South Africa can continue to meet the nutritional requirements of its population from its own resources. This will not only depend on demographic growth, but also on the evolution in the standards of living of its peoples. For many reasons, some more obvious than others, South Africa would wish to remain independent with regard to the provision of food. Certain products will always have to be imported (rice, tea, coffee, etc.) whilst others such as maize, groundnuts, sugar and fruit are produced in sufficient quantities to allow export. Because of certain natural environmental limitations, referred to previously, the production of beef, mutton and various dairy products is unlikely ever to meet the rising demands. Referring to the fact that production-increases in the Republic are approaching upper limits, Thomas and Boyazoglu (1978) state:

“Considering the already relatively advanced degree of sophistication of white agriculture in South Africa, the fact that there remains little new arable land to exploit and that development of irrigated agriculture will be curbed by limited water resources, it is clear that, in the long run, we are going to have difficulty meeting our future food requirements, unless there is an unexpected change, either in population growth or productivity levels. Here we are referring to a projection of only 20 to 30 years, which is within our predicted life span.

What is, however, not often pointed out in projections of food supply and demand in South Africa, on the one hand, is that a small proportion of the population, the white farmers, account for virtually the total production and, on the other, that the extremely low productivity of the Black farmers often occurs in areas with an extremely high potential. Therefore, whereas increase in production in the white areas is limited by virtue of its already relatively elevated position on the classical production function of diminishing returns, tremendous scope still remains for growing more food in the Black areas. For example, the Republic of the Transkei could produce more than three million tons of maize, but its present production is not even one-tenth of this potential. According to recent statistics, the homelands, although the potential is present and the necessary know-how available at their doorstep, do not produce sufficient food to supply the basic requirements

Table 9

*Southern Africa: Area, population and gross national product, 1975*

Country	Population				Gross National Product		
	Area 1 000 km <sup>2</sup>	Total 1975 (’000)	Persons per km <sup>2</sup> Number	Growth rate %	Total 1975 = R million	Per caput 1975 = R	Growth rate real GNP per caput 1970–75 %
Angola	1 247	5 470	4	0,1	2 030	370	3,2
Bophuthatswana	40	1 200	29	2,7	302	265	N.A.
Botswana	570	666	1	1,9	230	350	8,4
Lesotho	30	1 217	41	2,2	190	160	7,3
Malawi	93	5 044	54	2,3	660	130	7,0
Mozambique	783	9 240	12	2,4	1 640	180	2,6
Rhodesia	389	6 310	16	3,5	3 460	550	2,8
South Africa	1 136	22 070	22	2,6	33 540	1 320	1,7
South West Africa/ Namibia	824	880	1	2,8	860	980	3,7
Swaziland	17	494	29	3,2	220	440	7,9
Transkei	45	2 200	48	2,7	539	263	N.A.
Zambia	753	4 920	6	2,9	2 090	420	0,9
Southern Africa	5 954	59 711	10	2,7	45 760	770	
Africa	30 244	414 000	14	2,6	163 000	390	
Southern Africa as % of Africa	19,7%	14,4%	—	—	28,1%	—	—

Source: World Bank Atlas 1977. Washington D.C. – Africa Institute, Africa at a Glance 1978. Pretoria.

of their own people. This is most evident in the Transkei and the homelands of KwaZulu, Venda and Gazankulu, which, owing to favourable rainfall, soils and climate, include some of the best agricultural areas in South Africa."

The position in the homelands is not unique, but also exists in most developing countries in Africa where economic activity has slowed down alarmingly whilst natural population growth rate (i.e. births minus deaths) has shown a disturbing increase from 2,0 per cent annually in the sixties to 2,9 per cent in the late seventies. Although several impediments are retarding more rapid economic growth, it may be over-pessimistic to project the poor progress and the many past failures of production policies into the eighties and nineties. Yet, it would be equally unrealistic to believe that these countries could raise production in this short period of time to levels of self-sufficiency. In other words, on their own initiative they cannot produce sufficient for themselves, let alone for export. Thus, instead of planning a meat production strategy for Southern Africa to effect increased production in order to meet future demand, and instead of South Africa aspiring to provide Africa with meat, the situation should be the reverse namely, South African expertise should be instrumental in devising a strategy for African developing countries specifically neighbouring territories, in order to ensure a consistent supply. In this connection neighbouring territories are those included in the Southern Africa Customs Union, that is, the Republic of South Africa, Transkei, Bophuthatswana, the so-called BLS countries (Lesotho, Botswana and Swaziland), and South West Africa/Namibia, and extends to include Rhodesia, Malawi and Zambia as well as Mozambique and Angola.

The region as defined, has a population of some 60 million people, one-seventh that of the whole continent, and extends over an area equal to one-fifth of Africa in size. Southern Africa's Gross National Product is in excess of US\$ 45 milliard (in 1975), close to 30 per cent that of the whole of Africa (Table 9). The subcontinent's average income per capita was approximately \$ 770 in 1975, almost double the estimated \$ 390 for Africa as a whole. Figures for individual countries indicate a considerable fluctuation around this average. Agriculture is a prominent feature in the production structures of the various countries. The exceptions are Zambia and South West Africa/Namibia where mining plays a dominant role, and the R.S.A. which is industrially far more advanced than the rest of the region. With the exception of the R.S.A., Rhodesia is the only country that has a manufacturing sector of some importance.

Many African countries have, however, come to realise they require a more realistic policy to bring about any real economic progress. The present approach to development is unhealthy and out of keeping with the laws and priorities that govern economic progress.

It is of cardinal importance that African nations return to healthy development principles. To date foreign aid has proved of little benefit since the African countries have been unable to exploit the grants and support of the industrial countries. The aim should therefore be to improve the human capabilities of Africa's inhabitants. This requires a slow and painful process, one that cannot be forced by foreign contact or expertise. African countries must therefore adapt their prosperity to their inherent capability and then set their own pace of development. To surmount the present economic crisis demands control of the population increase, structural adaptation, the establishment of individual development programmes and foreign aid limited to projects that increase the inherent ability of the African people. This philosophy may even apply to the Republic of South Africa.

#### *Economic environment*

The economic difficulties which producers of meat (beef, mutton, pork and chicken) currently experience have been the subject of several committees of enquiry appointed by both Government and organised agriculture. The most recent being the Jacobs Commission of enquiry whose function is to recommend Government procedures which could be implemented to improve the economic situation of farmers in South Africa. The final report is expected before June 1979. Whether the findings and recommendations resulting from enquiries justify elaboration in a paper of this nature is questionable, suffice it to say that the underlying reason for the declining profitability of meat production is simply the fact that over the past five to six years, cost of production has escalated at a rate that exceeded the rate at which consumer prices increased. The rate of decline in the profitability of producing beef, mutton and pork has been researched by Lombard (1978, Fig. 7) who no doubt will discuss this aspect in more detail in his paper. From a strategy point of view the question that should be asked is what course of action should be followed to alleviate the position? Production cost *per se* can hardly be reduced and will, if anything, increase further with fuel price increases and the inflationary influence which the uncertain international economic climate has on the local economy. Subsidization of product prices and the ready availability of long-term, low interest loans to producers will not provide a permanent solution. There appear to be only three ways in which profitability can be improved:

- i) Improving efficiency of production in order to reduce the cost of production per kilogram meat produced.
- ii) Increase consumption at the same or higher consumer prices.
- iii) A return to realism in the industry.

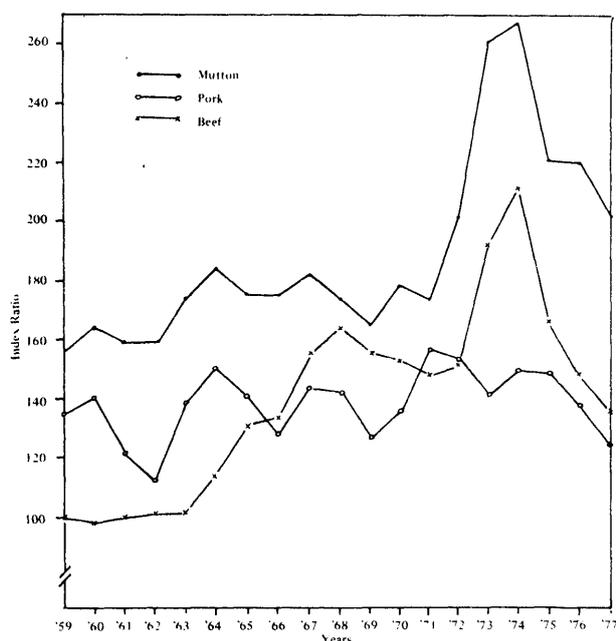


Fig. 7 Trends in profitability of producing beef, mutton and pork. (After Lombard, 1978)

Regarding increasing efficiency: Ways and means of increasing production efficiency in order to reduce cost of production per unit product produced have been discussed and written about to exhaustion. Documentation is so voluminous that no attempt will be made to review or refer to it. Aspects that should enjoy serious attention by researchers and economists are firstly, whether it is to the producer's economic benefit to increase production by applying research findings and secondly, whether the so-called poor production of producers is not in fact a measure of efficiency in relation to production cost and product price. In other words, what is meant by efficiency? Regarding consumer price, the author has no doubt at all that the price of meat to the consumer will have to increase. However, he regrets to have to admit that to his knowledge too little in-depth research has been conducted to define the magnitude of the relationships between a *supply*, which is largely under a natural environmental influence, *market price*, which often appears to be influenced more by the whims of wholesale and retail buyers than by economic law, consumer *purchasing power* and its interaction with *preference* for consumer goods and within consumer goods, for example meat, preference for kind and quality as against volume and value, and, cost of production. It seems that knowledge of the aforementioned factors is more necessary in our attempt to define a meat production strategy than the aspects of biological production with which we seem to be so preoccupied. A disturbing tendency in recent years is the extent to which the producer's share of consumer value of meat has declined whilst production commodities have increased. Stated differently, whilst the commodity the farmer produces for sale has decreased in price, the commodities he bought increased in price. (Table 10).

Table 10

Change in price of certain producer items and consumer goods from 1974 to 1978

Item	1974 = 100
Producer's share of consumer value:	
Meat	80,8
Wholesale price index	191,3
Consumer price index	174,9
Retail price index	173,5
Producer price (all products)	134,4
All farming requisites	172,3
Capital goods	188,9
Non-capital goods	164,6
Tractors	206,4
Lorries	192,3
Pumping equipment	186,0
Fertilizer	197,6
Fuel	165,7
Farm feeds	197,8
Dips and sprays	222,4

Whilst price increases of meat are inevitable it is equally necessary for producers to adopt a more businesslike approach to farming. More often than not, prospective farmers commit themselves financially (usually long-term loans) without having established the ratio of the potential value of the unit and its market value. Instances where the market value exceeds the potential value are numerous. A recent study (Steenkamp, 1978) of six farm units which are entirely dependent on income derived from beef production and where the possibilities of practising alternative production systems to those presently in operation are limited, showed that only in once case (System 6) did potential value approach market value (Table 11).

The inflationary tendencies which land values have exhibited over the past decade may be attributed to a number of factors amongst which the Government's policy of purchasing white-owned farm land for establishing Black homelands is not the least. Consumers cannot be expected to pay for the uneconomic commitments of producers.

#### Policy environment

Formulating a production strategy is theoretical and of academic interest only unless it could be applied in practice. This presents a problem, for the author cannot see how, in a democratic and free enterprise society, producers could be forced to implement specific production systems in order to comply with the ideals set forth in policies formulated by politicians. It is the least of the author's intentions to imply that political

Table 11

Potential value and market value of six operational beef production systems, 1978

Item	System						
	1	2	3	4*	5**	6	
Marketing age	Weaning	Weaning	18 months	18 months	18 months	18 months	
Arable land as percentage of natural grazing,	%	0	2,1	5,9	22,0	0	
Beef production/ha,	kg	16,9	14,6	18,4	44,2	35,2	14,0
Net return/ha	R	7,88	8,32	10,57	14,52	15,57	4,53
Potential value/ha at 14% return on investment	R (1)	56,28	59,43	75,50	103,71	111,21	32,36
Weighted mean market value/ha	R (2)	191,70	187,00	191,50	199,50	260,00	50,00
(1) as percentage of (2)	%	29,4	31,8	39,4	52,0	42,8	64,7

\* 65% of sales at 18 months are speculation purchases that were finished on pasture.

\*\*Certain area of arable land cultivated to maize for silage and grain whereas in other systems all arable land is used for pastures

and administrative heads of departments are incompetent or out of touch with reality, but that continuity suffers each time leadership changes, cannot be denied. A further problem that arises with change of leadership is the fact that the field of specialised knowledge and interest of incumbents may differ from that of their predecessors which may not necessarily result in a change in policy, but in emphasis and thus a slowdown in momentum. It appears that only one policy will, in the end, ensure economic survival of producers together with stability in the industry and that is a policy which encourages the production of a commodity of a kind that will remain in demand and will sell. The production of meat, especially beef, is long-term and since demand is influenced by a price structure which is operative long after production was initiated, continuity of a production policy with an interrelated pricing policy is essential. This being so it is imperative that producers through their medium of organised agriculture, professional animal scientists, through their professional board and statutory boards, which in future probably will have to be more involved with research in marketing, consumer and demographic trends than with regulatory services, have a more decisive say in production and price policies as has been the case until now. That this should happen in collaboration with Government departments goes without saying since departments will have to retain the function of evaluating priorities between commodity associations in terms of the funding of research, education, conservation and subsidization. A closer look at the functioning of Rhodesia's Agricultural Marketing Authority and its role as the governing body of agriculture's production and pricing schemes is timeous. Research outside the structure of Government and under the auspices of an Agricultural Research Council which is dependent for financial aid on commodity associations is a further development that requires urgent investigation.

If by touching on these matters, the author moves outside the field of discussion encompassed by the title of this paper, then he seeks justification for his actions in the fact that he believes one of the reasons why a workable production strategy cannot be formulated is that research, commerce and practical farming are too far removed from one another.

#### Marketing environment

This subject will be discussed in detail in a subsequent paper. Several overviews of agricultural marketing in the R.S.A. have been published and two recent commissions of inquiry reported on weaknesses in the Act of 1968 (Commission Report 1976) and of the present Meat and Livestock Scheme (National Marketing Board Rept., 1977). An evaluation of the various meat marketing schemes which have been operative since the inception of the Meat Board in 1932 and their effectiveness in stabilizing price and controlling supply suggests two alternatives, a free enterprise system or co-operative marketing through a central specialised commodity organization. The latter system has the decided advantage of giving the producer negotiating power for price through the co-operative movement. This could lead to a pricing scheme whereby fixed prices according to mass and grade could be announced virtually a year in advance.

For example, regression analyses by least squares procedures whereby the relative contribution of monthly supply, floor price and market off-take (consumption) from 1971 through 1978 were considered in models developed to predict market price and off-take for representative grades of high quality beef (Super), average quality (Grade 2) and poor quality (Grade 3), showed extremely good fit with exceptionally high coefficients

**Table 12**

*Regression analysis of market price on average monthly floor price, monthly supply and consumption from 1971 through 1978*

Grade		Effect of years	Coefficient of determination – %					Model of best fit					
Name	Type		Years (j)	Floor price (f)	Supply (s)	Interactions	Total	Y (market price)= $b_0 + b_1x_1, \dots, b_nx_n$					
Super	Good	Entered	89,43	–	–	–	89,43	26,76	+23,07j	–	1,623j <sup>2</sup>		
		Omitted	–	77,63		1,25	78,88	5,03	+ 1,63f	–	0,0091f <sup>2</sup>	+ 0,461jf	
		Floated	89,43	–	–	–	89,43	26,76	+23,07j	–	1,623j <sup>2</sup>		
Grade 2	Average	Entered	2,44	76,86	8,32	2,74	90,36	97,60	+ 0,346f	– 0,0098s	– 0,497j <sup>2</sup>	+ 0,268 x 10s <sup>2</sup>	+ 0,00089jc <sup>-6</sup>
		Omitted	–	76,86	8,56	4,79	90,21	88,29	+ 0,738f	– 0,0103s	– 0,293 x 10s <sup>2</sup>	+ 0,918 x 10sj <sup>-6</sup>	– 0,0834jc <sup>-3</sup>
		Floated	72,22	0,78	15,76	0,63	89,42	53,33	+ 5,55j	– 0,00299s	– 0,773j <sup>2</sup>	+ 0,481 x 10jc <sup>-3</sup>	+ 0,419f
Grade 3	Poor	Entered	11,51	71,86	0,32	3,78	87,46	–29,64	+ 1,99f	– 0,296jf	+ 14,52j	+ 0,455 x 10jc <sup>-3</sup>	– 0,78s <sup>2</sup>
		Omitted	–	71,86	5,48	7,05	84,39	32,88	+ 1,64f	– 0,158jc	+ 0,125 x 10sj <sup>-2</sup>	– 0,794 x 10s	+ 0,234 x 10s <sup>2</sup>
		Floated	80,70	2,63	1,75	1,45	86,52	27,91	+ 7,04j	– 1,293j <sup>2</sup>	+ 0,737f	+ 0,925 x 10jc <sup>-3</sup>	– 0,316 x 10s <sup>-2</sup>

Notes: Consumption (c), the difference between supply and Meat Board purchases was only important in the interaction terms.

of determination. Because of the confounding effect of years with floor price (floor prices increased with advance in years) floor price and years were entered into the models alternately as forced or floated variables. A limited number of interaction and quadratic terms only were considered.

The results offer encouraging prospects whereby market price may be predicted in advance and fluctuation about this price restricted to a minimum by accepting a value equal to the predicted price minus its standard deviation as the minimum (or floor price). Should weekly (or even daily) data as well as carcass mass be used in the models much higher coefficients of determination are expected. The necessity for the inclusion of mass arises from the high degree of association between carcass mass, fleshing, fat cover (finish) and bone content. The findings of research conducted in Rhodesia to establish the relationships between these carcass components for different breeds have recently been confirmed by South African workers (Klingbiel, Irene, personal communication) and it would appear that the only remaining void area is that of developing accurate prediction models. A prerequisite for the success of the implementation of such a scheme (that is of pre-announced fixed market prices with minimum fluctuation values according to grade and mass) is that producers should market all cattle co-operatively. Strife in the co-operative movement presently prohibits this overdue development.

#### Consumer environment

It would be short-sighted to formulate agricultural policies in the Republic of South Africa under the pretence that local and foreign political influences do not play a major role. Apart from external economic and political pressures against the Republic of South Africa which in future will only increase in intensity and severity, the R.S.A. internally has to satisfy the needs of an extremely diverse consumer public of which level of income is confounded with race. From the differences between auction and guaranteed minimum support prices for the various grades of beef (Table 13) it is evident that present demand and probably that of the immediate future is for beef of average to poor quality.

The reasons for the differences between the floor and auction prices of the poorer grades of beef being considerably larger than those of the higher grades are two-fold: Firstly, though it is said that the rise in the living standards of the non-whites will result in an increased demand for top quality beef, it must be accepted that with a consumer public comprising a majority Black sector, a minority white sector and a continuously expanding armed force, the demand for average and poor quality beef will for some time to come be greater than for top quality. Secondly, the decline in the purchasing power of the Rand has left the average housewife poorer as before and she was compelled to sacrifice quality in order to be able to afford quantity.

**Table 13**

*Floor and auction prices and Meat Board (MB) purchases as percentage of total supply of various grades, nine controlled areas 1976, 1977*

Grade Category	Grade	1976				1977			
		Floor c/kg	Auction c/kg	Difference %	MB- Purchases %	Floor c/kg	Auction c/kg	Difference %	MB- Purchases %
Good	Super	95,5	108,2	13,30	16,4 3,2	106,32	106,32	-0,09	16,8 7,2
	Prime A	89,8	103,7	15,48		103,47	103,59	0,12	
	Prime B	87,0	96,6	11,03		95,51	97,96	2,57	
Average		90,77	102,83	13,29		102,49	103,13	0,62	
Average	1A	85,0	99,8	17,41	0,7 0,4	96,97	99,25	2,57	3,0 0,9
	1B	80,0	91,0	13,75		88,00	92,48	5,09	
	1C	77,0	86,5	12,34		83,00	88,70	6,87	
	2	72,0	85,3	18,47		77,0	86,3	11,73	
Average		78,5	90,65	15,48		85,31	90,88	6,53	
Poor	3	65,5	79,4	21,22	0,2	69,00	78,76	14,14	1,1
	4	-	65,8	-	-	54,00	70,50	30,56	-
Average or Total		65,5	79,4	21,22	20,9	66,87	77,76	16,29	29,0

Results from analyses in which the same data as that reported previously were used showed that considerably more research in beef, mutton and pork consumption trends is required to establish the functioning of the supply/demand/pricing mechanism within the constraints of seasonal production, consumer preference and competing products. An interesting result and one which agrees with the findings of consumer surveys is that market price was not once selected as being an important variable in any model in which consumption was entered as the variable dependent on supply, floor price and market price over years.

### Conclusion

In the preparation of this paper a concerted effort was made not to duplicate the discussion on production and certain environmental influences offered by Luitingh (1978) but to attempt to supplement that paper by viewing the meat industry from a different angle. By so doing there are bound to be differences of opinion, which, if that is the case, goes to show that not only was the call for discussion of the subject of strategies for production justified, but that further research is necessary. The conclusions drawn below and the suggested action should be read against the background of the discussions offered in the present paper as well as that of Luitingh (1978). Also, where it is suggested that the implementation of proven research findings in certain areas may lead to increased production it is done with the full understanding that the economic viability of such practices at this point in time may be questionable. Likewise, in the case of research the approach is adopted that should an increase in product price owing to a drastic rise in consumer demand result in meat production being highly profitable then a lack of knowledge on the biological feasibility and applicability of practices should not be the limitation to increased production.

In conjunction with the first point it is imperative that the economic feasibility and practical applicability of various grazing systems to maximise utilization of natural (including legume fortified grazing) and artificial grasslands in high potential areas be investigated and defined. Luitingh (1978) maintains that some 12 million hectare of so-called high potential land could be improved, either through the introduction of superior grass species, or through grazing management and the establishment of artificial pastures where annual precipitation is sufficiently high. Economically, the cost of production of these areas would have to be offset by returns which must be at least equal to or more than what could be obtained had the same land been utilized for the production of field crops. Depending on rainfall and the level of fertilizer applied, hay yields off artificial pastures could vary from 10 to 30 tons per hectare.

Economic considerations rather than technological know-how will determine the extent to which land in these areas will be exploited.

Many practical problems inhibit the large scale production of beef from dairies. The decided advantages which the application of crossbreeding systems hold for producing two-breed and backcross calves from purebred dams have thusfar only been investigated by American workers (Willham, 1973). The potential for producing beef from dairies should be investigated.

The economic viability of intensive in-house mutton production systems using dual purpose breeds which incorporate the limited use of artificial pastures have thusfar not been compared with the levels of profitability attained by milk or crop production.

### Marketing:

A unified co-operative movement could successfully fulfil the same role in the R.S.A. as the Agricultural Marketing Authority does in Rhodesia. Agricultural research could well be administered along the lines of the Agricultural Research Council. The advantage of research being governed by such a body has apparently never been officially investigated and reported on.

Consultants, extension officers and research scientists alike often ignore the economic consequences of the application in practice of experimental research findings as well as the implementation of specialist advice. Although it may be difficult and some time before legislation could be introduced to protect the interest of producers, it is the responsibility of Government, private enterprise and statutory organisation to reach accord on policy in this respect. In this connection the role of the research scientist may have to change inasmuch that he should lead and introduce his research findings to practice, if necessary by means of demonstration units in which the economic implications may be assessed.

The necessity for specialised commodity organisations to be involved not only in policy matters but also in research and extension practices has been referred to by Luitingh (1978) and must once again be stressed.

Finally, it is recommended that a working group on which private enterprise, universities, statutory bodies, organised agriculture and government departments are represented, be established through the initiative of this Society to investigate and report on the aforementioned aspects.

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