

## THOUGHTS ON MEAT PRODUCTION

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Sir John Hammond frequently used to preface his remarks with "As I see it .....". Humbly, and in memory of a great man, I wish to use the same words. I shall not review the vast subject of meat production but I shall rather find a few blocks in this vast and complicated jigsaw puzzle which — as I see it — will lend perspective to the picture.

When in the past the founders of many of today's well-known breeds set to work to bring about improvement of livestock, they did so with sound economic principles in mind. With the high proportion of labourers in the old days and the massive physical expenditure of energy in industrial production, fat was prized for the energy it provided and for the flavour it imparted to simple foods. In my youth English miners sopped up bacon grease with dry bread and workers at the Cape used the massive amount of fat from fat-tailed sheep to flavour the simple, cheap carbohydrate foods. Out of this demand for fat meat over many years grew a fashionable pattern of animal shape — deep, smooth, blocky animals carrying considerable subcutaneous fat. In cattle it reached a climax in this century when the ultimate in "compact" type resulted in superfatted animals at a time when the demand for fat meat was declining.

Within a breed, type has frequently not kept pace with consumer demand and to this day there are types within the recognised breeds of different species (goats excepted) which, at the cost of red meat, tend to extreme waste on high nutritional levels. Breed standards are slow to change, as breeders often have little knowledge of the market and sometimes heed out-dated fashions in breed standards rather than consumer demand. The Blackhead Persian sheep, once the biggest producer of lamb in South Africa disappeared from the commercial scene because breeders persisted in selecting for excessive fat in the face of consumer resistance to this characteristic.

Not only did too many breeders of meat animals pay too little attention to the end product, the carcass, but in their loyalty to the breed as such, many failed to recognise that some breeds do not necessarily thrive under all conditions. Even given a lead as to the morphological requirements of an environment, most breeders failed to respond. Breeds which could have been well adapted by selecting for existing suitable type within their own ranks were retarded in their development by slavish adherence to outlandish standards not suited to local conditions or requirements.

A few examples of where we have failed to bring about general improvement will be relevant. In beef cattle there are still many curly coated animals. This is a handicap in a country with fairly high summer temperatures and

relatively mild winters in the cattle ranching areas. Unpigmented eyelids bring about an unnecessarily high incidence of cancer of the eye. Ultra-heavy fat deposits in brisket and flanks under good nutritional conditions depress carcass value. Lack of muscularity is a common fault. Too often a full smooth roundness brought about by excess fat is mistaken for thickness of red meat. Our own potentially excellent Africander, whose blood is evident in the majority of cattle slaughtered in this country, has, as I see it, failed to progress in some ways for many years. It had developed from indigenous, hardy, freely-moving, well adapted cattle to become an excellent draught animal with an outstanding *longissimus* muscle (expensive meat). However after the trekox had made way for the tractor the Africander tended to follow the fashion of the smooth round beast, in some cases losing valuable muscle. Too widely-spaced incisors and unbalanced hoofs interfere with feed intake and locomotion respectively and when these faults occasionally appear they interfere with the animals most valuable attribute — adaptability to the exacting local environment. With intensive finishing becoming ever more prevalent it is distressing to see how frequently the hoofs grow out and laminitis causes the animal to go off its feed. There is no intensive search for lines without genetic faults, and rigid culling for commercial characteristics is not common practice. Calving percentages are low on average and a fine show cow will not automatically be penalised in the show ring or culled by all breeders for low fertility.

The Merino, though not bred primarily for meat, is the largest source of mutton in this country. Yet fertility in the Merino is low. The Dorper produces the bulk of lamb consumed. It was originated by research workers of the Department of Agriculture by crossing the Dorset Horn with the Blackhead Persian to supply a less fatty type of carcass. Breeders have subsequently made great progress in developing a colour pattern by which the breed is readily recognised; but only a few have improved the carcass beyond that produced by the first cross. Most breeders have no scheme of assessing carcass merit on slaughter or to relate it to sire or dam. Excess fat, particularly on the rump and underline, remains a common fault.

Pigs are less subject to criticism. However, leg weaknesses are apparent, more lean and less fat is required, pale, soft, exudative pork has put in an appearance, and the average level of feed efficiency can be improved. Test ing schemes are available to stud breeders for evaluating their stock but it would seem that some breeders do not use available data to effect purposeful improvement.

There is, however, a positive side to the overall picture. In cattle one breed and two developing breeds

have been evolved — the Africander, the Drakensberger and the Bonsmara. These cattle are well adapted to the environment. It is indeed fortunate that the Bonsmara, initiated by an animal scientist of the Department of Agriculture, has continued to develop in the commercial field under the guidance of the Department which works in close collaboration with the breeders. Departmental officers have introduced three very useful types of sheep; the Dorper, the Dormer and the Dohne Merino. Here again the Department has been able to influence subsequent development depending, of course, on the extent to which breeders are prepared to accept the advice of the animal scientist. Private breeders themselves have developed some types such as the Walrich Merino and the Letelle which can make a valuable contribution to meat production. Pig breeders in general have made a considerable effort to improve the quality and efficiency of their stock and have been willing to avail themselves of the tools and advice available. Breed standards have been tailored to commercial requirements and breeders support ever-stricter standards of carcass grading. Petty competition has been avoided by grouping Landrace pigs of different origin (Sweden and Holland) into one breed and at boar testing stations animals which fall below a standard of acceptability are slaughtered. In consequence pork meets market demand and the dictates of efficient production more nearly than any of the other meats. Pig breeders have also been the first to make measures of performance available to assist judges in the show ring. Exotic breeds have contributed much towards what has been developed locally and continue to play an important part in meat production in the country.

If progress in animal production is to be speeded up to a realistic level, means must be found to extend existing scientific principles and methods over a far wider sphere. The path ahead is a difficult one in the short term. To date the number of cups and ribbons collected by the breeder at shows has often been the measure of his success. But these awards are the result of subjective appraisal, are unrelated to records of performance and very often retard progress. A beautiful cow capable of producing but a few calves or a magnificent bull which begets few progeny would best serve the industry at the abattoir. Judges of meat-producing animals should be able to assess the underlying carcass composition of the live animal. This is frequently not the case. Some cattle breeders of high standing in the show ring do not avail themselves of the testing facilities available to them through Departmental agencies despite the fact that a knowledge of the growth rate and feed conversion potential of their stock is of tremendous commercial importance. I fear that this unsatisfactory state of affairs will be resolved only when buyers insist on reliable records of an animal's performance. These records should include the animals antecedents and extend to its progeny. Things are slowly but surely moving in this direction, in a small way with cattle and to a greater extent with pigs.

It is now up to us to lay down guidelines and procedures which will result in the maximum economic pro-

duction of suitable meat animals per unit of agriculturally stabilised or improved land. To this end we should draw on both local and overseas experience to develop our own local criteria for the beast both before and after slaughter.

Nothing contributes more towards success in meat production than adequate nutrition. Such a statement may seem to the animal scientist and good farmers so self-evident as to be banal. However, in a country subject to severe droughts such as South Africa a peculiar fatalism in regard to feed supplies is common amongst producers. It is generally accepted that production in any one year is dependent on rainfall. Efforts at supplementation or the building up of feed reserves are minimal on many farms. In those parts with severe winters but with a fairly reliable rainfall and less subject to drought, the nutritive value of natural grazing in winter is low and weight losses on natural pasture high. Producers in these areas have come to realise that it is false economy to permit the sharp weight recession which has to be recouped in the growing season leaving an all too short period for profitable growth. In these parts there has been progress in the provision of supplementary winter feed. In other areas with a lower rainfall, milder winters and winter grass of higher nutritional value, supplementation in the dry season is not so important as the gathering in good times of feed reserves to combat the inevitable periods of drought. Overstocking is so prevalent that in the Karoo it has culminated in a subsidised stock reduction scheme introduced by the Government in order to save what land possible. Bush encroachment in good ranching country as a result of overgrazing and poor veld management is extensive. In parts it has greatly reduced the productivity of the land. These problems are fully recognised but attempts to combat them frequently meet with little success. In other directions there has been progress. With the quality of winter veld declining to a greater or lesser extent according to rainfall and area, there has been a valuable contribution in the form of NPN supplementation and licks designed to keep the ruminal microflora viable in order that they may better cope with low quality roughage. Unfortunately much coarse material, a source of energy, is still being sent up annually in smoke — "burnt offerings to the god of ignorance". It may not be practical in all circumstances to dispense with burning, but very often it is unnecessary. Enough maize and silage can be produced for intensive fattening programmes but profits go haywire when ill-grown feeders, the result of rearing on poor pastures, spend too much time utilising expensive feed for compensatory growth instead of fattening. I mention the nutritional aspect not alone because of its vast importance but because efforts to improve the efficiency of stock are largely negated if good animals are not given the opportunity to express their genetic potential in full.

In economic production nothing affects the rancher's profits more than the size of the calf crop. Sufficient work has been done to show that an adequate nutritional level for the breeding herd is of cardinal importance not only to enhance the calving percentage but also to provide a well-

grown weaner. In some breeds such as the Africander – a particularly shy breeder on poor nutrition – the slow uphill battle of selection for inherent fertility is of particular importance. Where an Africander cow 18 years old is known to have had 15 calves it is obvious that the potential for both the valuable factors of longevity and fertility exists in the breed. Ruthless culling of shy breeding heifers is the first step towards greater fertility. Far too many animals are given a second chance because they are goodlooking. With the average calving percentage for South Africa estimated at between 50 and 60 per cent, we have a long way to go before reaching an efficiency target of 90 per cent such as has been achieved in certain herds where selection for fertility and a proper nutritional level have gone hand in hand. Judicious use of crossbred females can be used to step up the calf crop; but there is no need to preach the gospel of crossbreeding in South Africa. South African farmers have used crossbreeding widely – and often indiscriminately – whilst neglecting the nutritional status required to take full advantage of hybrid vigour.

Much that I have said about the nutritional level for cattle applies equally to sheep. However in much of the sheep country such as the Karoo, problems of digestibility of available veld are less important because of the nature of the vegetation and the grazing habits of the sheep. In the Karoo it is mainly a question of volume of feed. On the grass of the highveld problems occur similar to those among cattle. Nutrition in relation to pigs poses no problem.

Cattle farmers often ask me “What is the best breed to use?” There is no best breed. Provided an animal is adapted climatologically to its environment and due regard is given to functional efficiency, I know of no breed in either purebred or crossbred form, which is unacceptable for the purpose of yielding meat if properly finished. One finds that weight and growth rate of a breed are used as advertising gimmicks. It is not weight *per se* that counts but the amount of feed required to put on a unit of weight. Although the results are as yet not conclusive, it is of interest to note that at the Irene bull testing station ‘Nguni bulls (a native breed) averaging 390 kg at 16 months of age, had an average feed conversion equivalent to that of the Charolais weighing 650 kg at the same age. The relatively rapid daily weight gain of the Charolais of 1,59 kg per day against that of the ‘Nguni of 1,01 per day gives the larger breed no advantage over the smaller purely on basis of weight. Each breed has its virtues and its drawbacks and provided the producer is aware of these he can steer a course to yield a product satisfactory to the buyer in all or most respects. It may be well to look at a few of the idiosyncrasies of some breeds. I do not propose to deal with heritable tendencies such as cancer eye, tendency to bloat and distocia, which can be selected against and which may crop up in some breeds or strains within breeds more than in others. My remarks are confined to some characteristics which affect the quality of the carcass.

The carcass consists mostly of bone, muscle and fat. At the same age, bone percentage varies little from one breed to another but the ratio of muscle to fat varies tremendously. Until our market demand becomes more refined we need not concern ourselves with the bone content of carcasses. What we must know are the fattening characteristics of different breeds. All are capable of fattening sufficiently to meet market demand but not at the same ages or weights. By and large continental breeds such as the Charolais, Simmentaler, Brown Swiss and Pinzgauer are lean and heavily muscled. The beef breeds originating in Britain and those developed locally fatten more readily do so at the expense of red meat. In some of these breeds or types within a breed, the subcutaneous fat is inclined to be patchy. There may be something to be said for this in physiological adaptation but in the carcass of any meat animal it is highly undesirable. The Friesland, until recently regarded purely as a dairy breed, offers a vast potential particularly in a crossbreeding program. As a purebred it does not readily lay down subcutaneous fat, but develops a massive kidney knob. This is possibly because man, in his selection for milk, has not confined himself to the volume of the primary product but has attached virtue also to a lean exterior whilst nature insists that somewhere in the beast it shall be capable of storing a reserve of energy when in the dry state. The Africander, on the other hand, selected for its capacity to hold condition (subcutaneous fat) under hard conditions, has a small kidney knob and lays down its fat on the exterior of the carcass where it has economic value. Through the years the Department of Agriculture has experimented widely with crossbreeding and recently a most interesting cross has been that between the Jersey cow and the Charolais. Many years ago Hammond showed that in crossing animals of widely different weights, the size of the foetus is largely controlled by the dam. With little difficulty the Jerseys have given crossbred calves which at six months of age already averaged three quarters of the weights of their dams and, after stallfeeding, yielded most acceptable light carcasses with finely grained flesh, but again with pronounced kidney knobs.

Carcass weight is of little importance to the trade in this country. In the U.S.A., however, the market calls for carcasses of approximately 300 kg and I have seen cattle grossly overfatted in order to obtain this weight. American farmers are now initiating a crossbreeding program to introduce heavier, leaner breeds with a rapid growth potential to improve economy of production. They too must satisfy a market demand which is moving towards reduction in waste. Red meat must replace the excess fat which has to be trimmed from the joint and sold at a low price. In this country it is fortunate that the trade does not discriminate against light carcasses. In the Super grade, carcasses with an average weight of 140 kg realise the same price per kg as those averaging 200 kg. Therefore any breed or type will meet demand provided it is well-fleshed and has the correct thickness of subcutaneous fat which is

a constant, be it for a light or heavy carcass. It is not the proportion of fat in a carcass with which the buying public is concerned but the visible amount and thickness of fat covering a joint. This vastly simplifies production for once the producer has learned how to assess the correct degree of finish he can market irrespective of weight immediately the animal is fat enough. Those breeds which fatten readily will be marketed light, the larger lean breeds or their crosses at more advanced weights. Even with less fat than the ideal the latter find a ready market because of the wealth of flesh they are capable of carrying. This same principle applies to lambs and porkers. While butchers are known to discriminate against the excess fat which frequently accompanies advanced weight in these species, there is no bias light carcasses with the requisite finish. Lamb carcasses weighing less than 15 kg and porkers of 35 kg and under find a ready sale. The small family joint is popular.

Another fortunate point is that, although marbled beef is desirable, the buyer does not insist on it. Good marbling or intra muscular fat is expensive to produce. It is deposited at rather a late stage in the fattening process and subcutaneous fat is often in excess by the time a good degree of marbling becomes evident. A recent survey in this country revealed that 5 mm of subcutaneous fat or less over the eye muscle of a beef carcass satisfied 70% of consumers. Marbling is practically non-existent with so little fat. In lamb or mutton nearly 85% of housewives chose chops with 4 mm of fat or less and in pork the same percentage chose to have 10 mm or less. In bacon no less than 65% chose the rasher with as little as 10 mm over the eye muscle. In short, the public demands fairly lean meat. This benefits the beef producer as fat is expensive to obtain, particularly in cattle which seldom attain sufficient finish at a young age on the veld. This is not true of lamb and mutton however as both frequently come off natural grazing with too much fat.

Apart from the aversion to excess fat, a good colour in meat and, above all, tenderness are widely sought after. Flavour and succulence play a lesser role. Colour, other than in PSE pork, is no problem. Black cutters are rare in this country. In beef, within any one breed there is considerable variation in tenderness between individuals. It would be extremely valuable if selection for tenderness could be included with other fairly highly heritable characteristics of fundamental importance such as muscularity and growth rate. Unfortunately no sufficiently simple method of identifying tenderness in the live beast has yet been devised. This subject offers a field for rewarding research. Variability in tenderness is no problem in the production of lamb or pork as both are marketed so young.

In all fields of research we must avoid dissipating our limited resources and man-power on problems which are not of practical importance. Shape, composition and structural soundness are in the hands of the breeder. We must co-operate with him wherever he will allow it, guide him and provide the knowledge of how to test and select for characteristics of commercial importance. We must be in a position to provide the knowledge of how best to utilise our feed resources for high production herds. Data on carcass quality are an essential adjunct to studies at production level, but research on meat as such

other than to enhance tenderness and retain a fresh natural appearance, is something which should be avoided until more important aspects have been dealt with. What we already know is far in advance of commercial application and a special effort is needed to get existing know-how established in breeding and farming practice.

The future for meat producers is bright. The rate at which the world population is increasing may not be maintained at its present frightening rate but it is unlikely that it will decrease radically in short term. There are already signs that red meat, particularly beef, is not as readily available in the world as it used to be. Large meat-exporting countries such as the Argentine now need much of their product for internal consumption. Enquiries from business men from meat importing countries are becoming more frequent. In South Africa the cattle population has remained nearly constant at about 12 million for the last quarter of a century whilst slaughterings since the war have more than doubled. In the years of the pre-war depression we sold surpluses on overseas markets at about 10 c/kg for our best beef. In 1971 producers realised an average of 44 c/kg and 54 c/kg for the best at auction on our controlled markets. There are no longer locally produced surpluses. Nearly 10% of the beef available to us in the country is imported from adjoining territories leaving some 6% of available supplies for export. (For purposes of this analysis South West African production is included with that of the Republic.) The sheep population has declined; but in the last decade consumption has doubled and the average producer-price for lamb and mutton combined has risen on the free market to the phenomenal level of nearly 70 c/kg this year. Pig slaughterings have wellnigh doubled in the last decade and still we have no surplus. In short the demand for meat is strong and supplies limited. As the population grows and as the purchasing power of the less affluent increases, so will the demand for meat increase.

Enhanced and efficient production of the red meats is of primary importance if supply is to keep pace with demand. What can be achieved by the scientific approach has been well illustrated by the broiler chicken industry where a combination of advanced selection and nutrition has yielded such outstanding results. Whilst grain production still outstrips human requirements, our maize surplus and intensive feeding can contribute enormously to increase meat production. As more cattle come to feedlots at an early age breeding herds and turnover will increase. For ruminants the carrying capacity in parts of the country can be pushed up by well-tried methods and by the fertilisation of pastures, a practice which is beginning to show great promise. While our fishmeal and maize resources hold out, pork production need know no limit in short term. In the long run when human needs may compete with the animal for grain concentrates, mankind's requirements for protein of high biological value will be met by simulated meats and other protein substances obtained from processes still in development.

In the meantime we must make the best of what we have. Present and increased animal feed resources will provide by far the most dramatic increase in meat

supplies. As animal scientists we must do what we can to ensure that the genetic makeup of our livestock, the feed converters, contributes its share to progress. Improvement by means of breeding may be a long, slow grind but it has a great contribution to make. The first phase in livestock improvement many years ago was commercially sound. Phase two appears to me as a plateau in which

superficial characteristics associated with breed purity predominated. This stultifying phase is making way for the new era when productive performance and suitable commercial type will be the major factors in selection or breed stock. In this country we are endowed with a vast genetic pool which can be used to great advantage. We must be fearless and determined in making use of it.