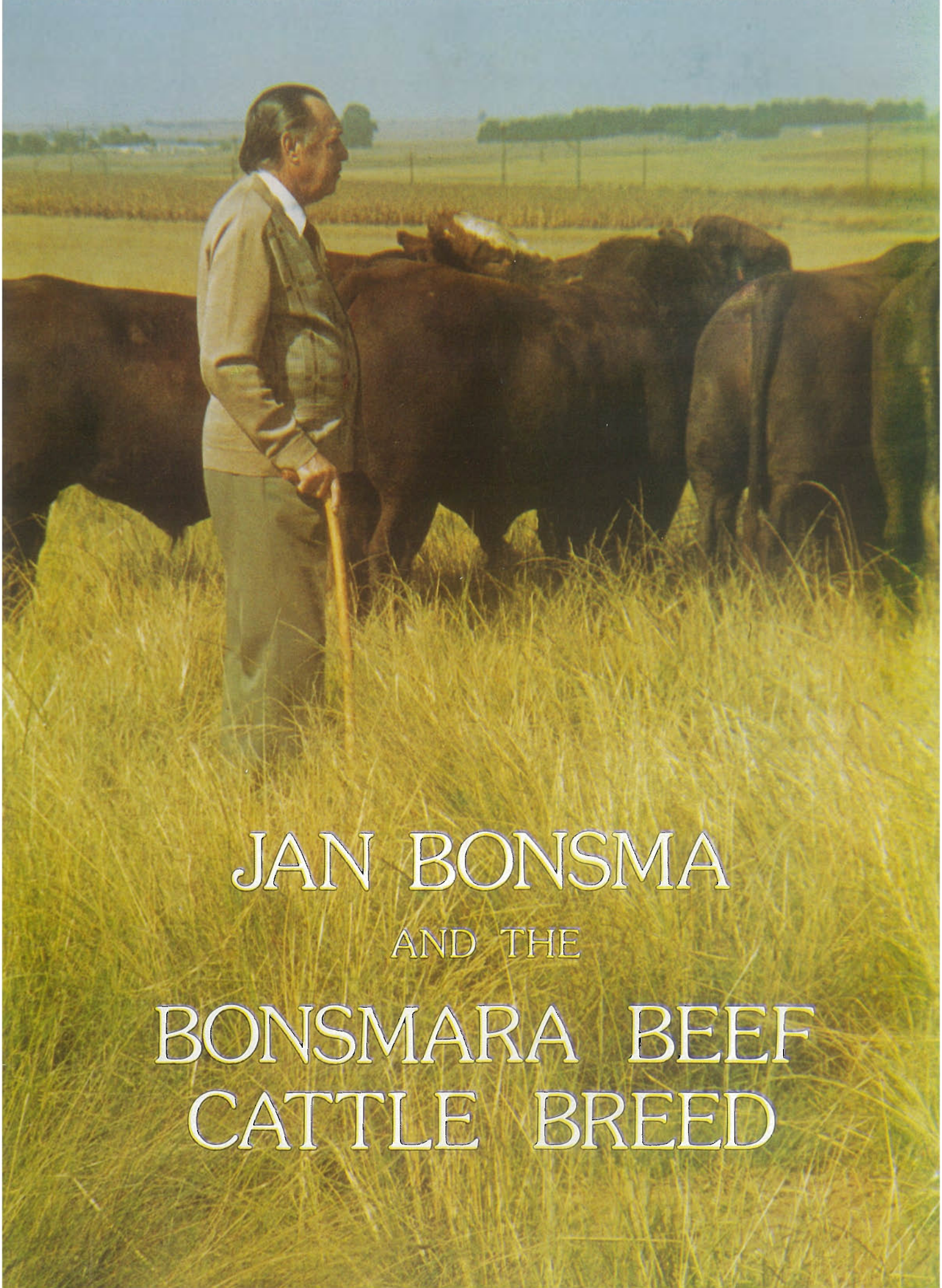

JAN BONSMA

AND THE

BONSMARA BEEF CATTLE BREED

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BONSMARA BEEF CATTLE BREED

(Bonsmara Cattle Breeders Society's 21st Anniversary Publication)

BY JAN BONSMA

Dedicated to my wife Cila
for her inspiration and devotion
and for undertaking the proof-reading of the manuscript.

I also dedicate this book to the University of Pretoria
for the continued interest shown in my animal breeding research
and for making audio visual facilities available to me.

Finally this book is dedicated to the past and present cattle breeders
of South Africa, without whom it could never have been written.

FOREWORD

In 1985, Prof. Jan Bonsma (born March 1909) prepared a review of his work for a special anniversary of the Bonsmara Cattle Breeders' Association. By the time it becomes available as a publication, he will have been involved as an animal scientist and a practical breeder for a half century, since January 1937. It revolves around the creation of functionally efficient beef cattle. In the beginning he was confronted by the challenge to solve a regional problem. His discoveries evolved to become of global significance. He covers in breadth and depth the interplay of heredity and environment, the role of genetic and ecological factors. This paper culminates in a brief but succinct glance into the future, is forward looking. Throughout he remains a very human and humane scientist.

His publication provides powerful proof that truth can, properly handled, be stranger than fiction. It is an account of scientific detection and its effective application and it rivals excellent science fiction in grasping and holding the reader's attention and interest. A master teacher, whose knowledge and insight became wisdom, addresses us. A devoted researcher, endowed with outstanding powers of observation, creative imagination and the convincing hard logic of established facts enthralls us. He provides visual evidence to illuminate his conclusions.

It is noteworthy that the word 'visual' comes from the oldest Indo-European language, Sanskrit, and is still retained in Hindi. The term travelled to the West from the steppes of Trans-Himalaya via the Greeks, the founders of empirical science. The perfect tense of that most irregular verb in Greek, literally meaning 'to see' is eidon; which is reflected in the word 'evident'. Bonsma supports what is visually evident, by measuring, weighing and correlating. These are forms of the specific and universal innate human capacity to be able to learn to count, to enumerate, to quantify as an instrument for gathering and advancing real knowledge. Remarkable, but as true, is another universal human endowment, namely, at times to argue logically. This makes communication possible and actual in its supreme form by means of figures. That is why Prof. Bonsma can communicate, because he counts.

At the outset he sketches persons as seekers of truth and at the climax as providers of food for today, tomorrow and days to come. The basis and precondition of human *existence,* mentally and spiritually, remains *subsistance.* What began in January 1937 as a challenge to a wilful young man to seek a solution of a regional problem, resulted in discoveries of global applicability through that very wilfulness.

We thank you, Jan Bonsma, for your great services to your alma mater, the University of Pretoria, your speciality, your country and humanity at large. Besides, there is also your, at times unconventional, nevertheless successful, contribution to inculcate and improve a sense of responsibility in younger and some not so young fellow travellers on the human highway. This is the third dimension of the complete academic, the others being teaching and research. Man, embracing woman, must measure (count) and bear responsibility. It has been good to experience the lasting friendship of this man and his marriage partner!

Prof C H Rautenbach
Rector, Principal or President (1948 – 1970)
University of Pretoria, South Africa.
(Republic of South Africa)

JAN BONSMA AND THE BONSMARA BEEF CATTLE BREED

(Bonsmara Cattle Breeders Society's 21st Anniversary Publication)

BY JAN BONSMA

It is my privilege to participate in this jubilee by way of the paper which follows. This essay brings to mind my five decades of research, that consistently provided the guide lines to my breeding experience. The result was the breeding of a new synthetic cattle breed: the BONSMARA. Its biography is part of my autobiography. Through this research and breeding based thereon I came to realise clearly the nature and mental attitude of a researcher. Besides a survey of my involvement since 1937, I comment on the present status of the breed and also venture a prognosis of its future.

In my approach I compare research to events surrounding the effort of climbing a mountain.

On one of my trips to Canada, I had the good fortune of staying at Lake Waterton where one of the high peaks of the Rocky Mountains was reflected in a mirror clear lake. That picture is, from a research point of view, of the utmost importance to me. Climbing the mountain is very similar to doing research and, as in all research, one so often meets obstacles which you cannot master. How often when one climbs a mountain do you reach a ledge which is unsurmountable and the only way to overcome this is to climb down and move away from the mountain. Distancing oneself from the mountain allows one to see the whole mountain range. This enables you to view it in perspective, that is objectivity in research – seeing the problem from the right viewpoint. It is even better when moving away from the mountain if you are in the company of associates, other scientists, not necessarily in the same field of endeavour as you are. Discuss your mountain climbing problems with these people. Seeing the whole mountain range from a distance, provides the opportunity to observe the whole research project objectively. Returning to the mountain one approaches the problem from a slightly different angle. As we approach the mountain a few important aspects of research are worth noting. The inverted mountain is clearly defined in the water. The higher the mountain, the deeper is the summit of the mountain submerged. What is this mirror image of the mountain in the clear lake? It is a reflection and reflection in research is meditation, thinking quietly, thinking seriously, contemplating, pondering, deliberating and collecting the thoughts one dwells upon. As a result of this reflection, we have got to study and read. Hence reflection must be purposeful and serious when a high mountain is to be mastered. How do we get this mountain to be clearly reflected in the clear lake? We have to focus so that all the outlines of this mountain in the water are clearly defined, and so our research project must be clearly defined.

There are no blurs in the image. The mountain was in such a position during the process of focussing that every outline was clear and well-defined. The reflection in the mirror clear lake can only take place when the lake surface is unruffled. The same concept is true with regards to doing research in any institution. No objective reflection in research can take place in a discontented department where nervous tension amongst workers is caused by lack of equanimity. Imperturbability means coolness and presence of mind under all circumstances and clearness of judgement in moments of uncertainty. The Oxford Dictionary defines focussing as concentrating light rays to a focal point so that ignition takes place. A research worker must possess as one of his attributes a fiery enthusiasm for his task. All energy is focussed on the research project. Hence, in doing research we have three major considerations. First, objectivity, which means seeing a problem from many points of view, being impartial, unprejudiced and open-minded. Second, reflection, when we have to study and meditate to clearly understand our research objectives. Third, focussing, putting all our devotion and energy zealously into our research.

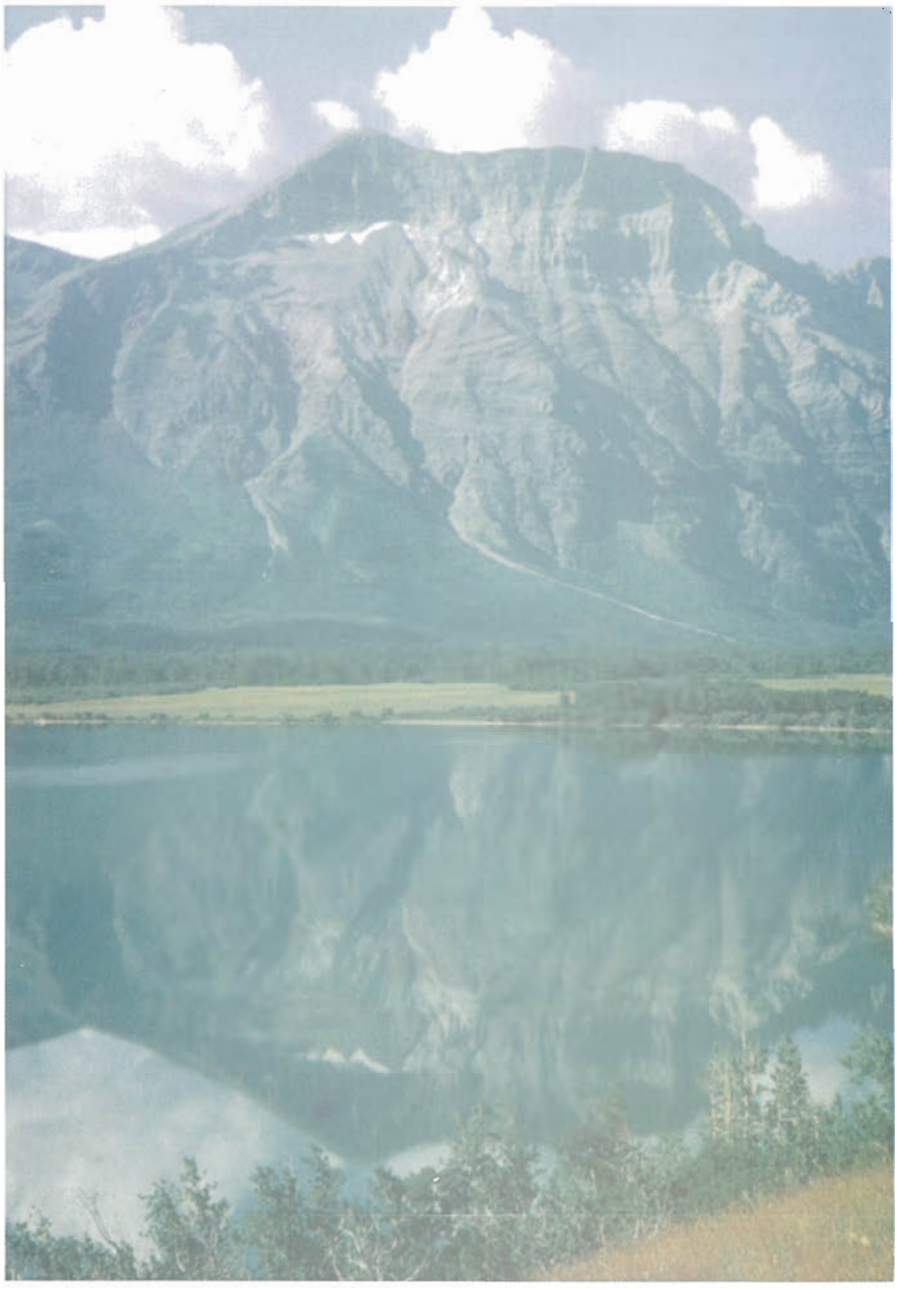

Figure 1: *Reflection: Rocky mountain peak reflected in the mirror clear Lake – Waterton.*

When I was doing post-graduate work at the Iowa State University, there was a slogan in the post-graduate corridor: "Research is the honest, persistent, intelligently directed effort to a better understanding of a selected problem. The spirit of research is devotion to truth and an insistent longing to better understanding." When I was instructed in 1937 to carry out the research work necessary for the development of a new breed and how to overcome tropical degeneration in cattle, my whole attitude was devotion to truth and an insistent longing for better understanding of the problems involved. As previously indicated, the difference between the Bonsmara cattle breed and all the other synthetic livestock breeds, is research.

When I returned from the U.S.A. in 1937 after post-graduate work at Iowa State University with Dr J L Lush and his associates, the late Prof A M Bosman and Dr D J Schutte gave me instructions to simulate the breeding programme of the Santa Gertrudis, the synthetic breed bred at the King Ranch with an approximate blood ratio of 5/8 Shorthorn and 3/8 Zebu. At the commencement of my research work at Mara and Messina in January 1937, there were 400 Afrikaner cows divided into eight equal groups of 50 cows, two of which were mated into single-sire herds with bulls of the Red Aberdeen Angus, Red Poll, Shorthorn and Sussex breeds. A further herd of 50 Afrikaner cows were mated to an Afrikaner bull. On my recommendation, having seen the success of Hereford cattle in the American ranching set-up, a further group of 100 Afrikaner cows were brought into the breed development project and mated to Hereford bulls.

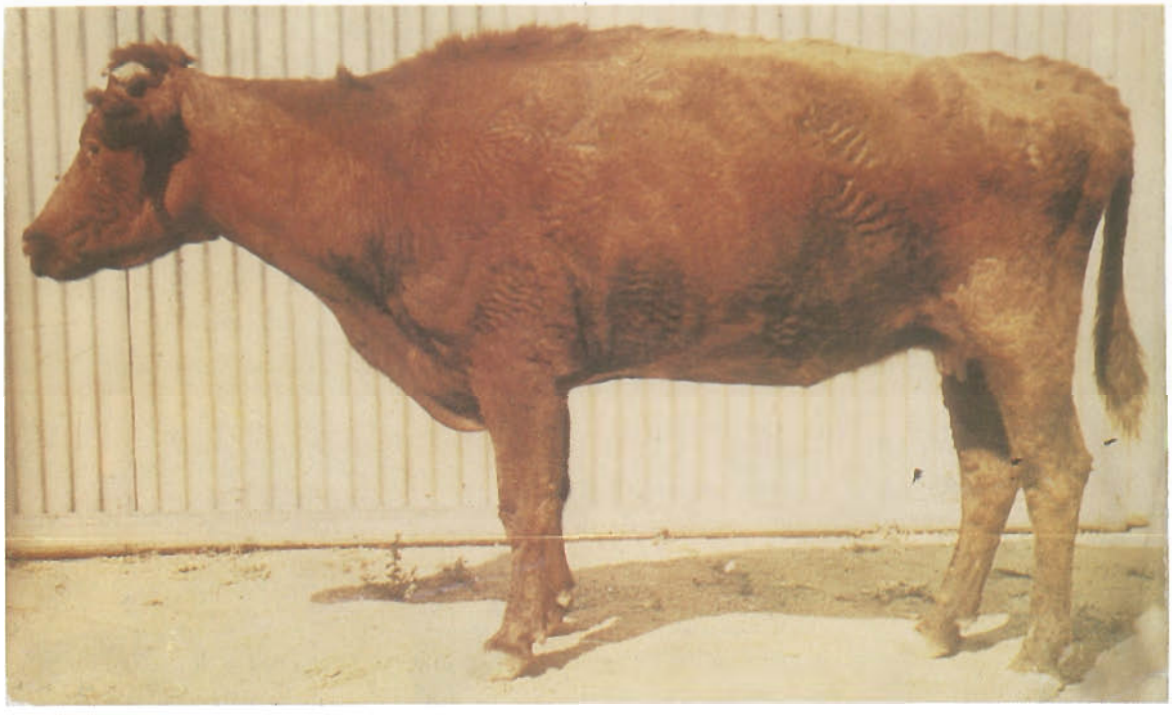

Figure 2: *A tropical degenerate Shorthorn cow – the problem of tropical degeneration of the European and British breeds of livestock in the tropics and sub-tropics had to be solved by research.*

At that time, 1937, the biggest problem confronting ranchers in the tropics and sub-tropics, was the tropical degeneration and the very high mortality amongst the British and European beef breeds (*Bos taurus* cattle). It was thought at that time that tropical degeneration was caused by malnutrition due to the severe winter depression in the nutritional status of the natural grazing. Due to the fact that the appreciably lower protein values of the local pastures and supplementary bone-meal feeding at Messina Research Station had no positive effect on cattle with regard to tropical degeneration, I was requested by Prof Bosman and Dr Schutte to plan a nutrition experiment. In this British beef breed heifers were maintained on two levels of protein supplement and a control group received no supplement. The H Group of 28 heifers received a maintenance ration of 24% crude protein. The L Group received a maintenance ration of 12% crude protein. Both rations were so formulated that they had the same energy value. The C Group received no supplementary feed at all. All three groups were confined to the same camp during daytime and in the early morning the H and L Groups received their supplementary rations in small individual pens. Fortnightly weights and fourteen body measurements were taken every three months. In December 1937 the supplementary feeding was discontinued. All the heifers were weighed and measured and put out to pasture.

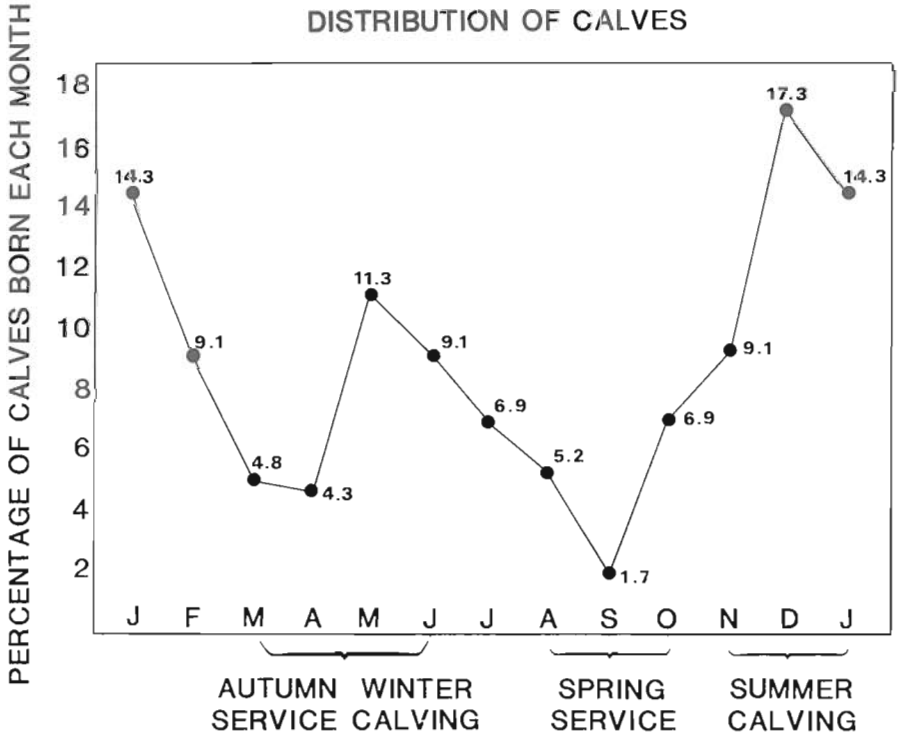

Figure 3: *Distribution curve of calf births in herds where bulls were run with the cows throughout the year.*

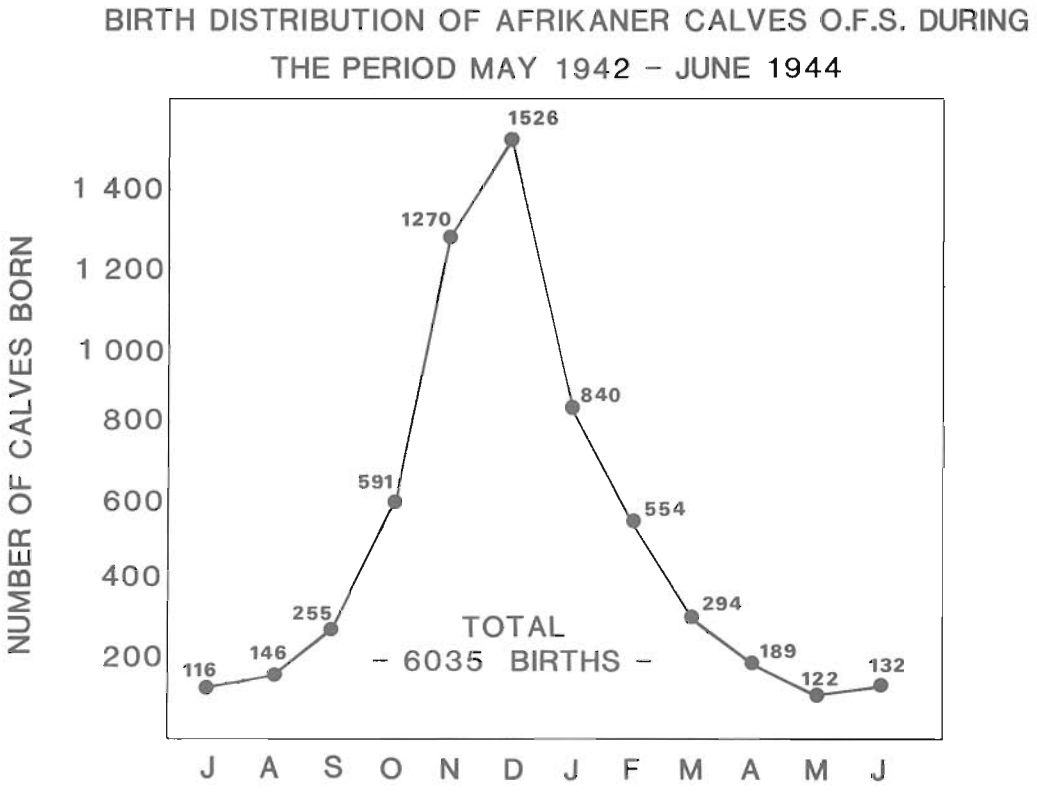

Figure 4: *Distribution curve of 6035 Afrikaner calves born in herds where the bulls were run with cows throughout the year. Afrikaner cows have the highest sexual activity during the autumn equinoxial breeding season.*

The most remarkable aspect of this experiment was that there was no statistical difference in the average weights and measurements of the three groups. All heifers were kept under close daily observation and oestrus periods were carefully recorded. From the data concerning oestrus activity it was apparent that the heifers showed greater sexual activity during equinox, that is during March and again during September. As a result the one long breeding season, from October 1 to March 31, which had been universally adopted in this country and many other ranching areas in the southern hemisphere, was stopped. This was replaced by two equinoxial breeding seasons, namely, an autumn equinoxial breeding season from 15th February to 15th April; and a spring equinoxial breeding season from 15th August to the end of September. The change in timing of the breeding season improved the calving percentages at Mara and Messina Research Stations dramatically and resulted in the virtual universal adoption of this strategy in our ranching areas. With time, some minor adjustments to the mating regime took place.

In addition to the conclusions derived from the nutrition experiment, it was also apparant that each group comprised heifers that could withstand the tropical and sub-tropical climatological conditions fairly well, while other heifers in contrast, showed symptoms of severe stress. The heifers that showed distress were those typifying tropical degenerates and consequently climatological research was commenced during December 1937.

Body temperatures, respiration counts per minute and pulse rate data were taken on the various groups of cattle from 06h00 until 18h00 every two hours once every week. On very hot days the observations were recorded from 06h00 through to 06h00 the following day.

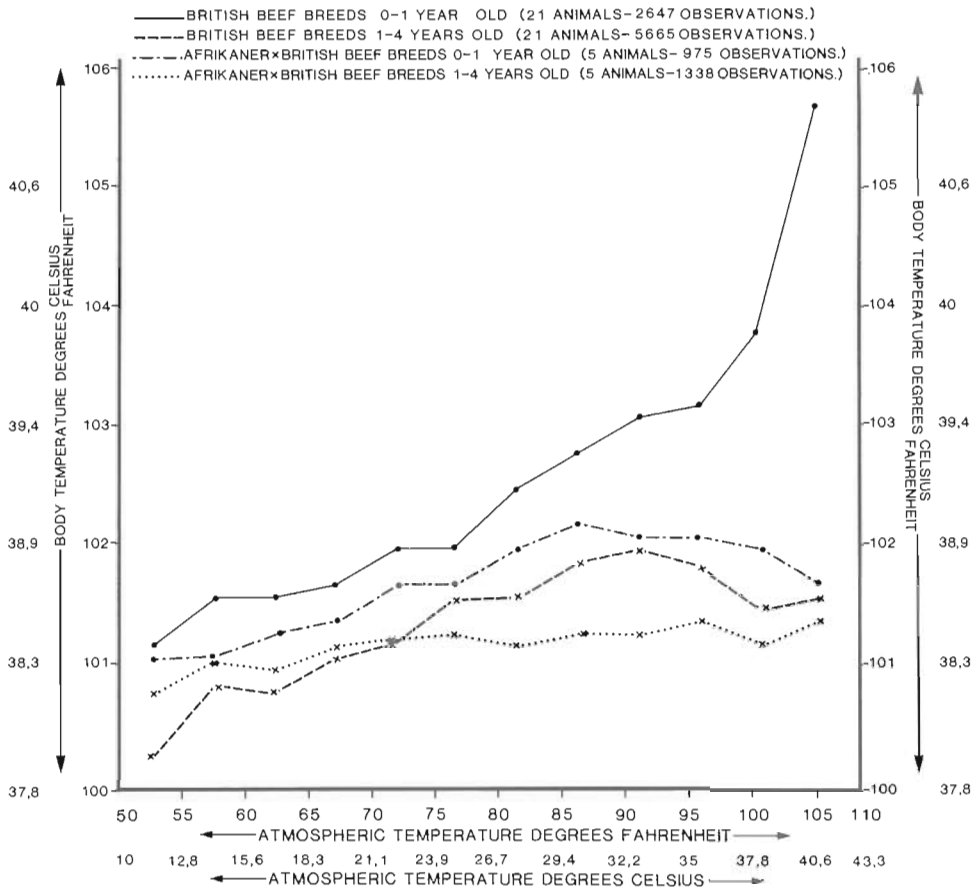

Figure 5: *Illustrates how physiological reactions change with a rise in atmospheric temperature (a) and age (b). The young animal cannot withstand heat and cold as well as older animals. Age related changes in body temperature.*

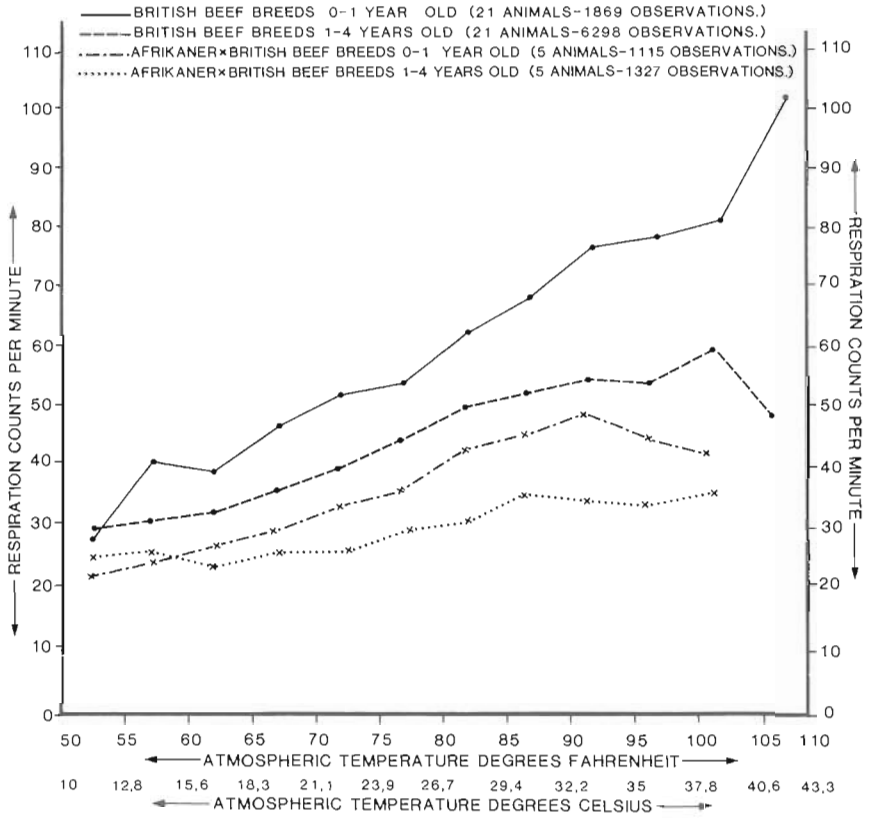

Figure 6: *Illustrates how physiological reactions change with a rise in atomospheric temperature (a) and age (b). The young animal cannot withstand heat and cold as well as older animals. Age related changes in respiration rate.*

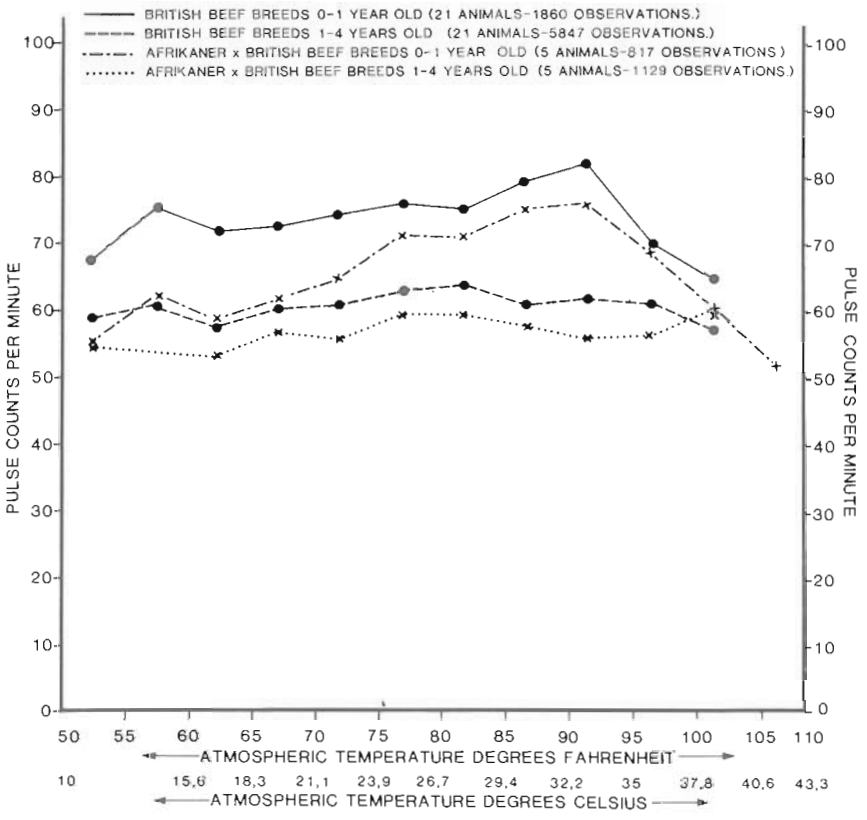

Figure 7: *Illustrates how physiological reactions change with a rise in atmospheric temperature (a) and age (b). The young animals cannot withstand heat and cold as well as older animals. Age related changes in pulse rate.*

At that stage, there were heifers at Messina Research Station in various stages of upgrading from pure Afrikaner to pure *Bos taurus*. *From the data on these beasts, it was apparent that as soon as the breed percentage exceeded 50% Bos taurus, the cattle showed symptoms of distress, respiration rates increased and animals became hyperthermic. Eventually this diligent record-keeping revealed that the heifers with smooth haircoats maintained lower temperatures and respiration counts on hot days, and that they were much better adapted to the environment than their woolly-coated counterparts.* Thus began the climatological work relating coat and skin character to productivity of cattle in tropical and sub-tropical environments. That tropical degeneration was invariably associated with woolly-coatedness, was clearly manifested by these observations.

During the early years of climatological work, data were accumulated concerning the weights of entire haircoats from numerous cattle which were clipped from the animal's body with a number 0 hairclipper. Thousands of hair fibre diameters from different types of animals were measured with a lana-meter. The average diameter of hairs from woolly-coated animals is much less than that of hairs from smooth-coated cattle. Entire coats clipped from the different types of animals were put through a felting machine at a hat factory in Johannesburg. The coats of the woolly-coated animals felted into a tight mass which could not be pulled apart easily and which required a force of 13,5 kg to pull the felted pieces apart. In contrast, a force of only 1,81 kg was required in the case of smooth-coated cattle. The straight, medullated hair of the *Bos indicus* type cattle did not felt at all. A practical hair felting test subsequently evolved from these tests. A small sample of hair was clipped from the mid-rib region of an animal, and placed in the palm of the left hand. It was slightly moistened and then rubbed between the hands. If the hair of a specific animal felts into a tight mass, it is certain that such an animal is not tropically adapted. If the hair of a calf felts into a tight mass, it can be predicted that such an animal will not shed its hair during the first spring after birth – the result being that the animal will become hyperthermic on

hot days, it will show symptoms of severe stress, chronic malnutrition and will not ovulate for at least the first two years of its life. On the other hand, hair which fails to matt together indicates that such an animal's coat is made up of straight, medullated hair. Such animals shed their hair early in spring, ovulate at an early age and are generally deemed suitable for the tropical and sub-tropical regions of the world. The most conclusive evidence for the importance of the hair-felting on a tropical and sub-tropical adapted animal was obtained by the results provided by tests on the progeny of a mutant woolly-coated Afrikaner bull. On a hot day, with an ambient temperature of 30°C and higher, the respiration rate of the woolly-coated Afrikaner bulls progeny was on an average 148 counts per minute with a body temperature of over 40°C, while his smooth-coated progeny had an average respiration rate of 47 counts per minute and a body temperature of 39°C.

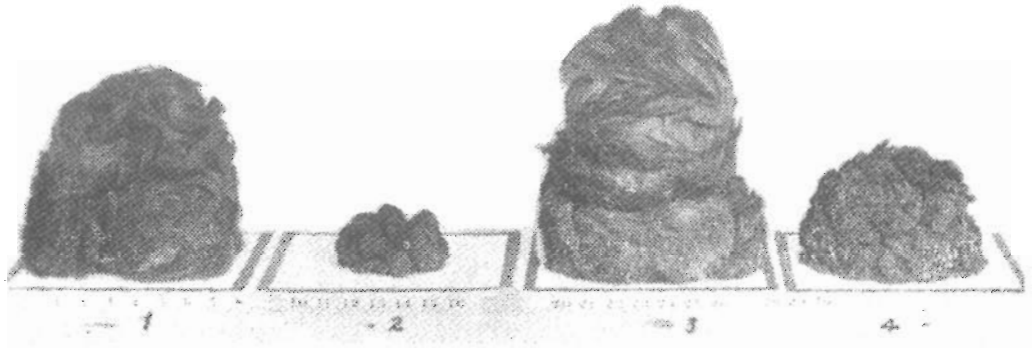

Figure 8: *Seasonal changes in mean coat mass (n = 6) of Shorthorn and Afrikaner heifers with a mean body mass of 272kg (600lb).*

Shorthorn cattle	–	*Summer hair coat*	*(1)*	*x = 303g*
	–	*Winter hair coat*	*(3)*	*x = 505g*
Afrikaner cattle	–	*Summer hair coat*	*(2)*	*x = 30g*
	–	*Winter hair coat*	*(4)*	*x = 129g*

During the period 1938 – 1943 intensive research was carried out on the hair characteristics and hide-thickness evaluations on various breeds and crosses and these data correlated with climatological data. Consequently, it was concluded that animals with thick hides, a high vascularity and sleek coats were much better adjusted to extreme atmospheric temperatures and also survived tick infestations much more readily than thin-skinned, woolly-coated animals. These observations gave rise to the research on tick counts on various types of cattle. However, first it is essential to report on the research on the influence of infra-red and ultra-violet rays on animals of different colours and hair-types.

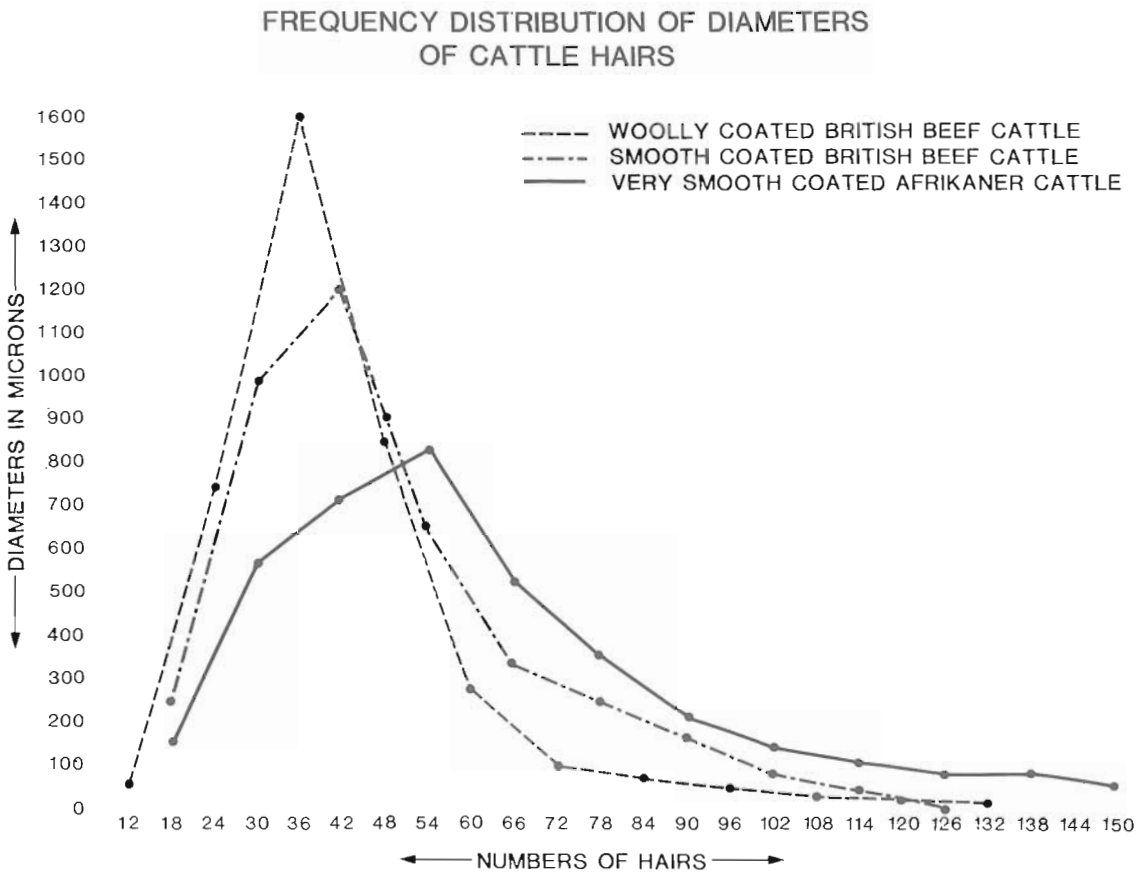

Figure 9: *Illustrates the difference in hair diameter of woolly and smooth-coated British beef cattle and Afrikaner cattle.*

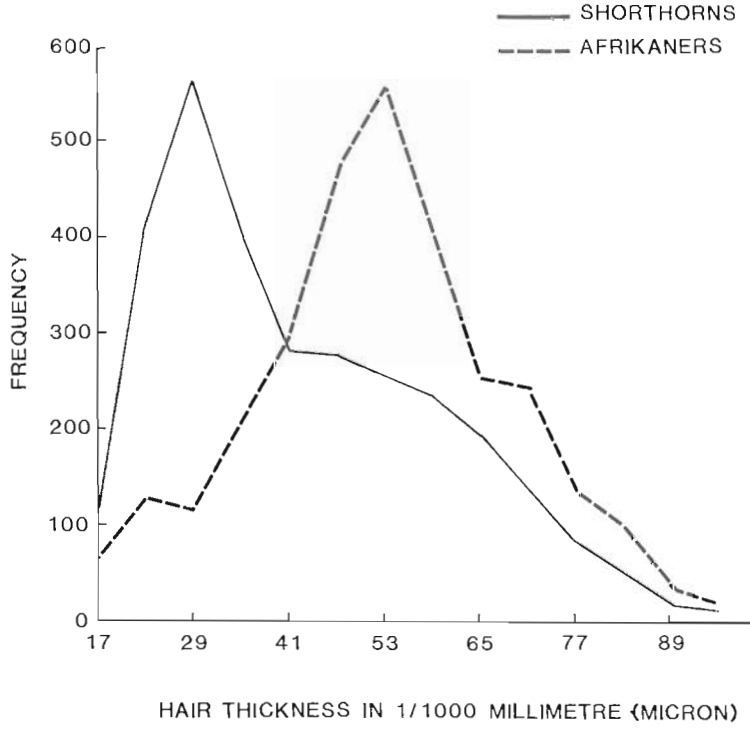

Figure 10: *Frequency distribution of hair diameters found on Shorthorn and Afrikaner cattle.*

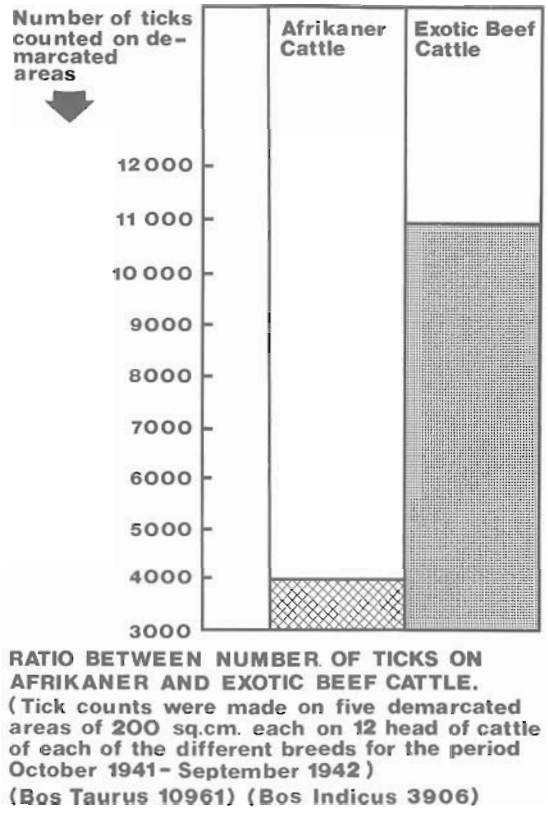

Figure 11: *Histogram indicating the difference between the total number of ticks counted on Afrikaner and British breeds for one year. (Oct. 1941 – Sept. 1942).*

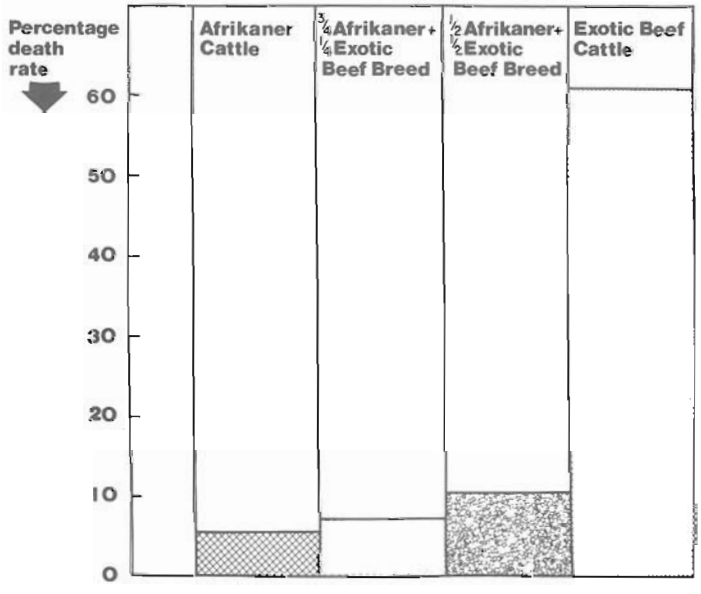

Figure 12: *Histogram illustrating the percentage death rate due to Heartwater amongst cattle. It is obvious that the characteristics which enhance tick-repellency also cause a decline in the occurence of Heartwater.*

Experiments dealing with colour and types of hair were undertaken. Afrikaner cattle of various colours in similar physical condition and stage of coat-shedding, were tested and data recorded throughout summer and winter with the aid of a Weston photometer, a special device to measure light reflection at a constant distance from an animal while it is in direct sunlight. This soon proved that smooth-coated animals reflected more light than did the woolly-coated individuals, and that both infra-red and light rays were effectively reflected by white, yellow or red-brown hair but not by black hair. Short-wave ultra-violet rays were found to be effectively resisted by yellow, brown and black hide colours, therefore it was concluded that white, yellow or red-brown coats with a dark hide, were the ideal combination to render an animal resistant to intensive radiation of both short-wave and heat rays. *At that point in my career as an animal geneticist, when I was immersed in the hair, hide and tick research, I actually became an animal ecologist because I realised that the most important aspect of livestock production was breeding cattle that are adapted to a specific environment. This research had shown that the adapted animal was in thermal equilibrium or harmony with its surroundings, which allowed maximum utilization of all natural resources, while the unadapted animal inevitably suffered malnutrition and finally degeneration. Adaptability was clearly the key to survival.* The early walking tests on cattle of different breeds showed that adapted animals were able to graze and move with ease in areas where water facilities were spaced at greater intervals. This in turn, boosted their feed consumption, growth rate and calving percentages.

The unadapted animal in the tropics and sub-tropics, such as cattle of the British breeds that are woolly-coated, walk only 6,4 km per day, before reaching a body temperature of 41,1°C or higher, while the smooth-coated British animal could walk up to 25,6 km per day without showing serious signs of stress. However, the indigenous smooth-coated Afrikaner cattle were able to walk up to 64 km per day without showing any signs of stress.

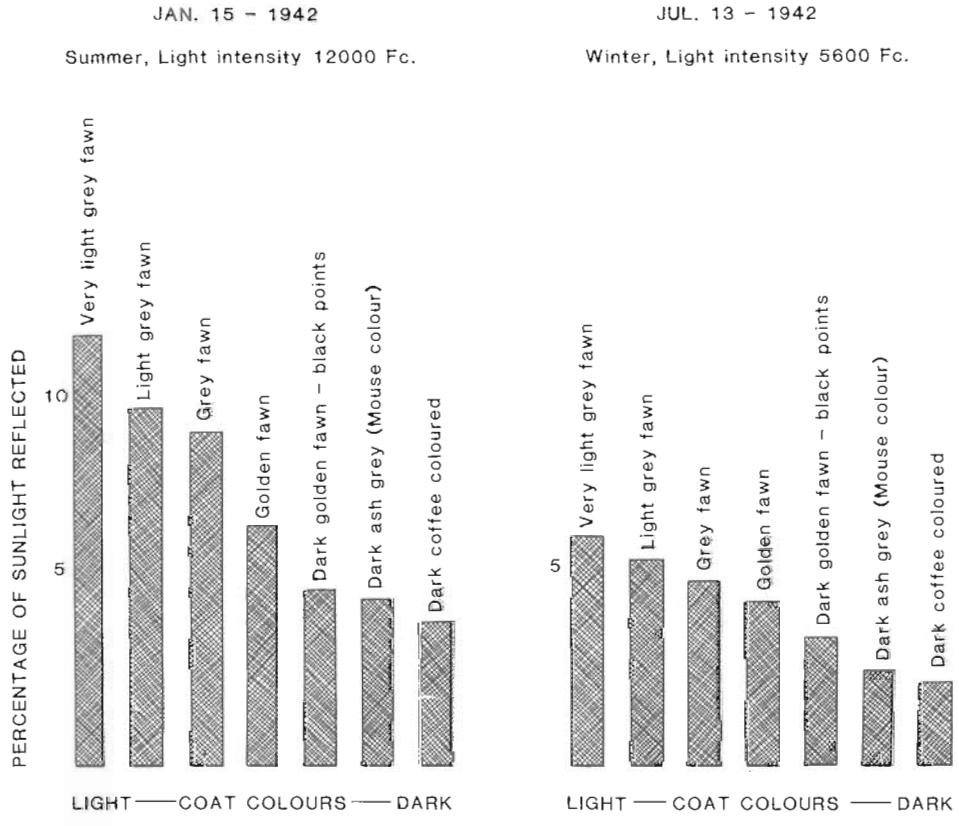

Figure 13: *Histogram illustrating the differences in light reflected off different coloured animals of the same breed, and the differences in the reflection of sunlight during summer and winter.*

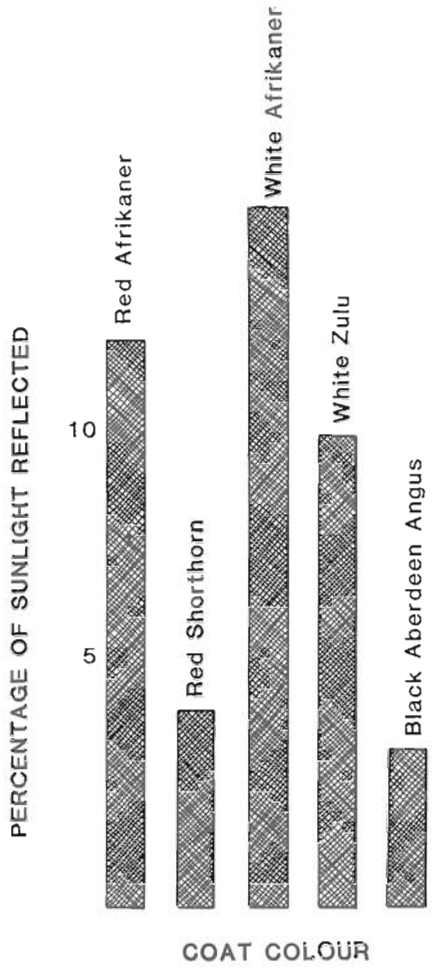

Figure 14: *Histogram illustrating the differences in light reflection between different breeds of cattle.*

Exploration into the fields of livestock ecology and climatology, stressed the importance of the fact that many environmental factors affect production, both individually and through interaction. This realisation led to the development of the livestock ecology wheel. The whole philosophy of livestock production is based on the fact that man is the axle of the wheel, that the domestic animal is the hub of this wheel and that the total environment is its running surface. A cattleman must know each of the 15 environmental spokes such as nutrition, temperature, light, etc., in his own area since each has a direct influence on man and beast. If these spokes are not equidistant and of the same length, the wheel will not be perfectly round and therefore man and animal will suffer. Finally, the lubricant which allows this entire complex to evolve around the axle is proper management and breed selection. While the climatological and ecological research was making tremendous headway at the Messina Station, the breed creation work was progressing well at the Mara Research Station with concrete data accumulating from cattle in all stages of up-grading. These animals all underwent strict climatological tests at the Messina Station to determine which cross would be the most suitable under those environmental conditions. As a result of the data collected on these various types of animals, the original task of producing cattle similar to the Santa-Gertrudis breed, was altered due to the fact that the 5/8's *Bos taurus* 3/8's *Bos indicus* blood ratio could not stand up to high ambient temperatures as well as the 5/8's Afrikaner (*Bos indicus*) and 3/8's British Beef Breed (*Bos taurus*) proportion.

It was decided that the percentage of Afrikaner blood should predominate and the breed evolved as 5/8's *Bos indicus* and 3/8's *Bos taurus*. It was called Bonsmara by Mr E.A. (Jim) Galpin as a tribute to myself and the Mara Station, and today it is the only breed in the world which can boast a complete pictorial geneology of 7 generations. All the characteristics which were identified as making animals better adapted to the sub-tropics such as sleek-coatedness, walking ability, tick-repellency, colour, etc., were adopted as selection criteria in the fixing of the newly created breed.

THE LIVESTOCK ECOLOGY WHEEL

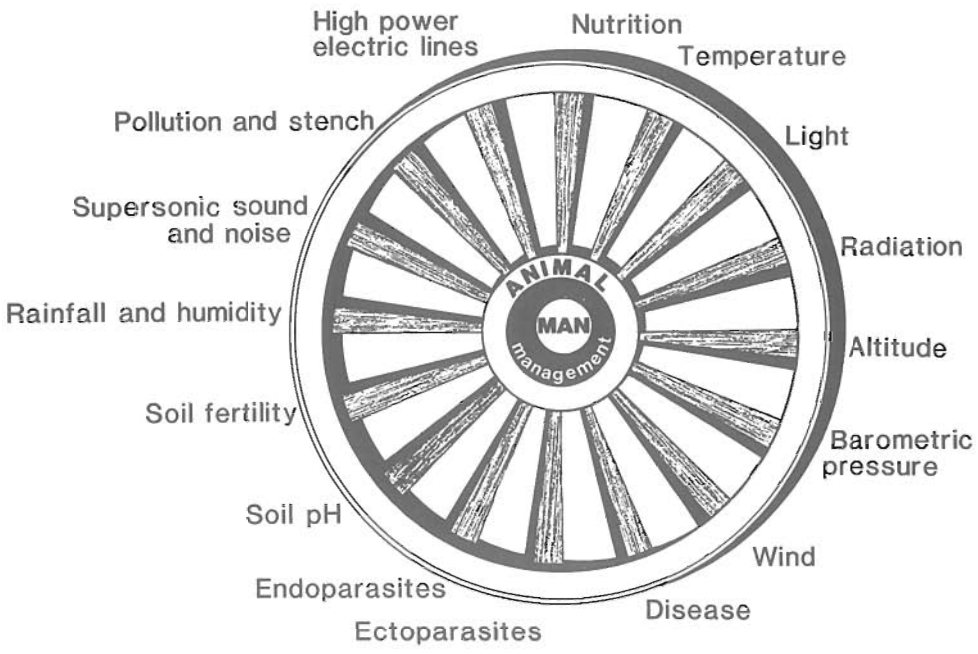

Figure 15: *The livestock ecology wheel. The sixteen environmental variables depicted in this wheel have a direct influence on man and beast. The recently added sixteenth spoke represents "highpower electric wires". Conclusive results on the effect of this variable are still required.*

In creating the Bonsmara breed, adaptability was measured and no inheritable defects were tolerated in the selection process. In fact, only one bull out of every six bulls kept, was selected for further breeding purposes, and only after extensive testing. In addition, all Bonsmara foundation sires were carefully selected to eliminate prolapse of the prepuce or pendulous sheaths. This was accomplished by using *Bos taurus* bulls on *Bos indicus* cows exclusively. Dr Nat Kieffer, a cytogeneticist at Texas A & M University, was the first man, as far as I know, who indicated that the sex chromosomes of *Bos indicus* and *Bos taurus* males differ. He found that the *Bos indicus* bulls carry an acrocentric Y chromosome, while the *Bos taurus* bulls carry what is known as a sub-metacentric Y chromosome. After extensive research over a number of years and much trial and error, we have come to the conclusion that the Y chromosome carried by *Bos indicus* bulls, is responsible for the prolapse of the prepuce. By using *Bos taurus* sires the cross-bred male will inherit the sub-metacentric Y chromosome. It is considered that *Bos indicus* blood is absolutely essential in all cattle suitable for the sub-tropics, however, this breeding should come from the Brahman female and not the bull.

The next step in the Bonsmara selection process involved monitoring birth rates on a monthly basis. Milk production was determined by measuring the off-spring's growth and weaning weights and by recording the actual milk intake of calves by weighing before and after suckling. In order to keep an accurate account of fertility within the herd, record sheets were kept on all females and any cow that skipped two calves within an 8 year period, was slaughtered. Longevity played an important role in selection. The animal or cow that can grow old without ever showing symptoms of disease or damage to organs, is most sought after. Such animals have no organs showing what Julius Bauer calls "a locus minorous resistentia". The biological worth of any particular anatomic structure may be diminished by a constitutional weakness.

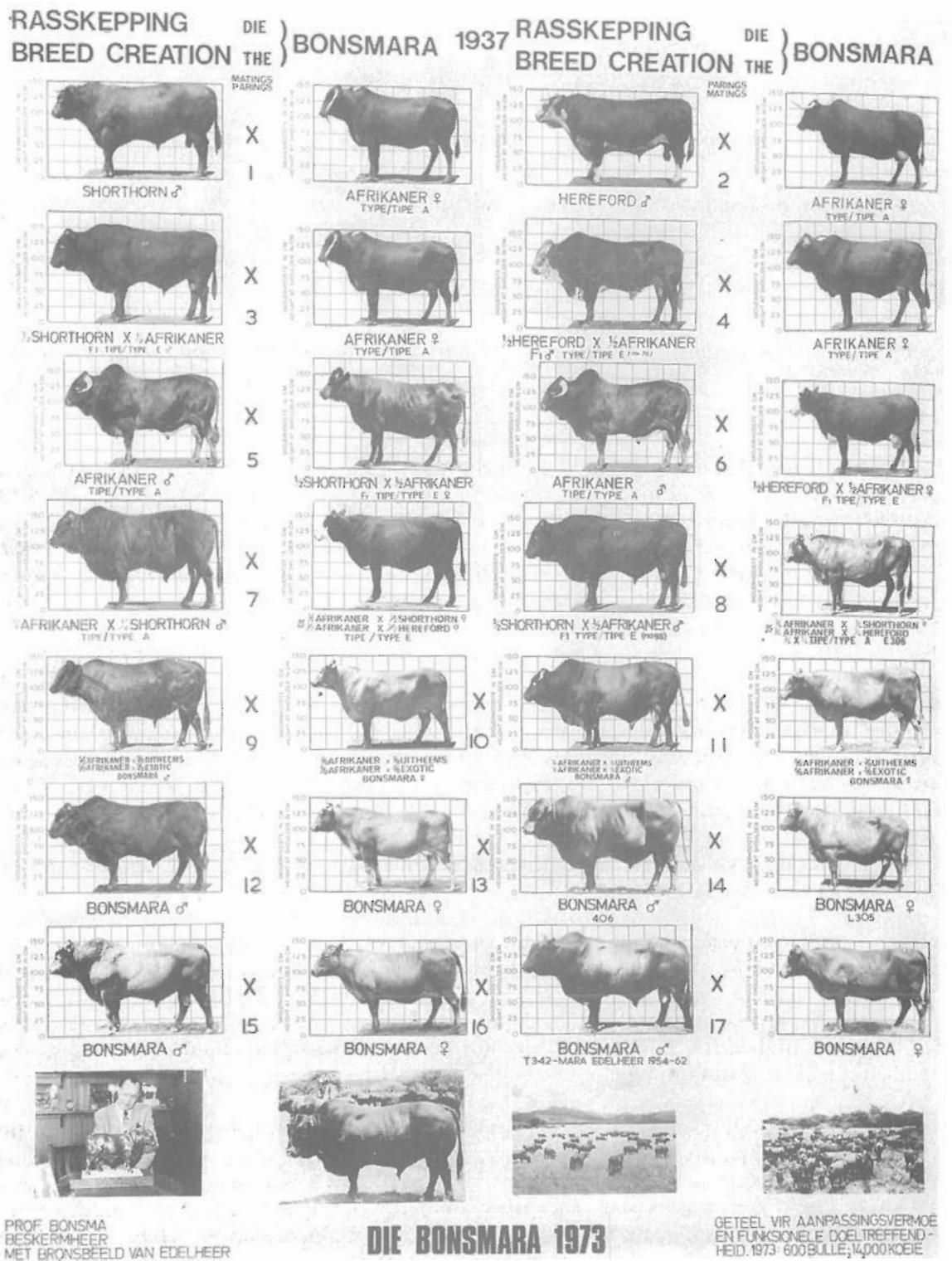

Figure 16: A seven generation illustration of the Bonsmara breed creation project.

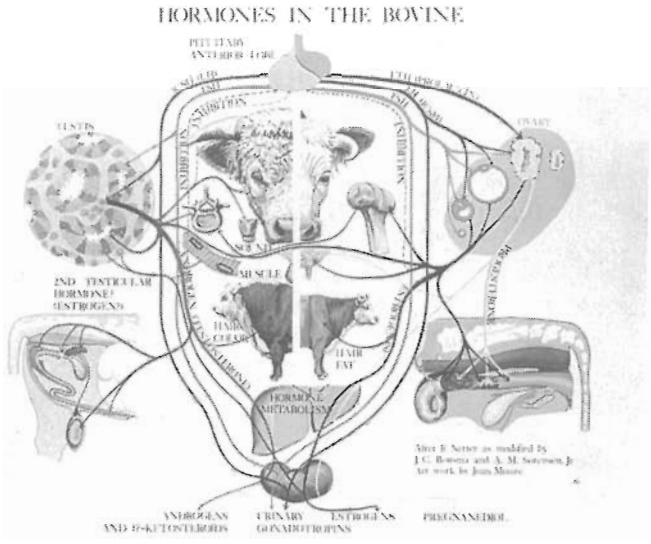

Figure 17: The action of the pituitary in determining the physiological status of the animal.

Longevity played an important role in selection. While most commercial producers cull breeding cows at 8 – 10 years of age, Bonsmara cows were kept in the herd for as long as they could produce a live calf annually and did not lose more than 20% of their mass by the time the calf was weaned. If a cow can grow to the age of 14 or 16 years and still has a good set of teeth, then she has what I term, no point of lower resistance or "locus minorous resistentia", and the result is that you still have a healthy productive cow.

Studies were also conducted into the selection process used on free-grazing cattle in the field. *These tests were called tractability tests. Temperament was also measured when animals were handled at close quarters while being measured. Perhaps the most important selection criterion I tumbled to during the early 1940's was the concept of judging cattle for functional efficiency. This selection criterion was evolved from the fact that 14 body measurements were taken every 3 months on all the cattle, which comprised some 2000 animals on both research stations at that stage. Every animal measured had a record sheet. By studying the animal, after it had been measured, it became clear that there was a close correlation between both the physiological and endocrinological functions of the animal and its morphology or structure.*

The inter-action between the physiology, endocrinology and the morphology of the animal is very important. In judging livestock for functional efficiency, the first consideration is adaptability. Once a cattleman has selected for that, he can increase numbers and hence selection pressure, then selection for fertility, the most vital of all economic traits, can take place. But in doing so, it must be realised that a close correlation exists between both the endocrinological and hormonal functions and the morphology or structure of an animal. The interaction between genes and the phenotype is of the utmost importance in livestock evaluation or in creating a new breed. At the moment of conception, the complete genetic complex of the animal is laid down, and thus determines whether the animal will be a Santa-Gertrudis, Brahman, Hereford, a Bonsmara, or what ever. Proper functioning of the endocrine glands is essential to body conformation because each gland strongly influences bone growth, muscular development, fat deposition and the development of various organs. As long as the hypothalamus, which includes the thermal regulatory mechanism of the body, and the pituitary gland are functioning properly, an animal should be able to control its body temperature and is thus unlikely to become a tropical degenerate. The functioning of the central nervous system is inherited. All the sensory organs in an animal including hearing,

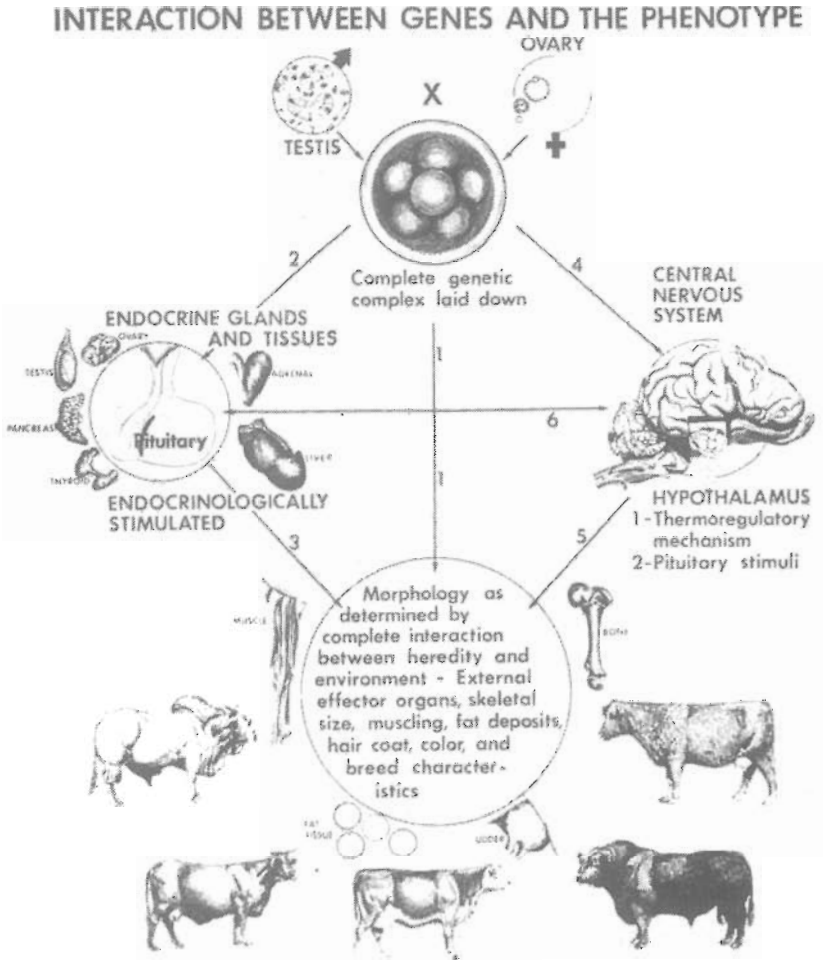

Figure 18: The interaction between the genotype and the phenotype.

smell and sight, have a direct influence on the animal's sensory tracts, which in turn stimulate or inhibit the endocrine glands. The latter then influences the functioning of the central nervous system and thereby controls the way in which an animal reacts to sexual stimulation. The pituitary gland of a young bull which has not yet reached sexual maturity starts secreting hormones which stimulate the maturation of the testes; when the bull reaches puberty, the testes secrete testosterone which has a direct influence on the animal's masculine development. When the animal becomes sexually mature the hair becomes coarser, protein synthesis is stimulated (i.e. muscle tissue develops) and long bones grow. After puberty, growth is eventually retarded and ultimately stopped as a result of ossification. The inter-actions between the male sex hormones are responsible for the development of the total reproductive tract of the male. In the female the pituitary interacts with the ovaries, stimulates them and when puberty is reached, this inter-action has a direct influence on various organs of the body. Hair-growth becomes finer and bone-growth is retarded and ultimately stopped. The udder then develops followed by the reproductive tract. In short, all the endocrine glands of the male and female must function normally to result in a functionally efficient animal. When all these inter-actions are properly understood, it is possible to evaluate an animal as if it is a living book of five chapters: skeleton, hair and hide, fat deposits on the body, muscular development and behaviour.

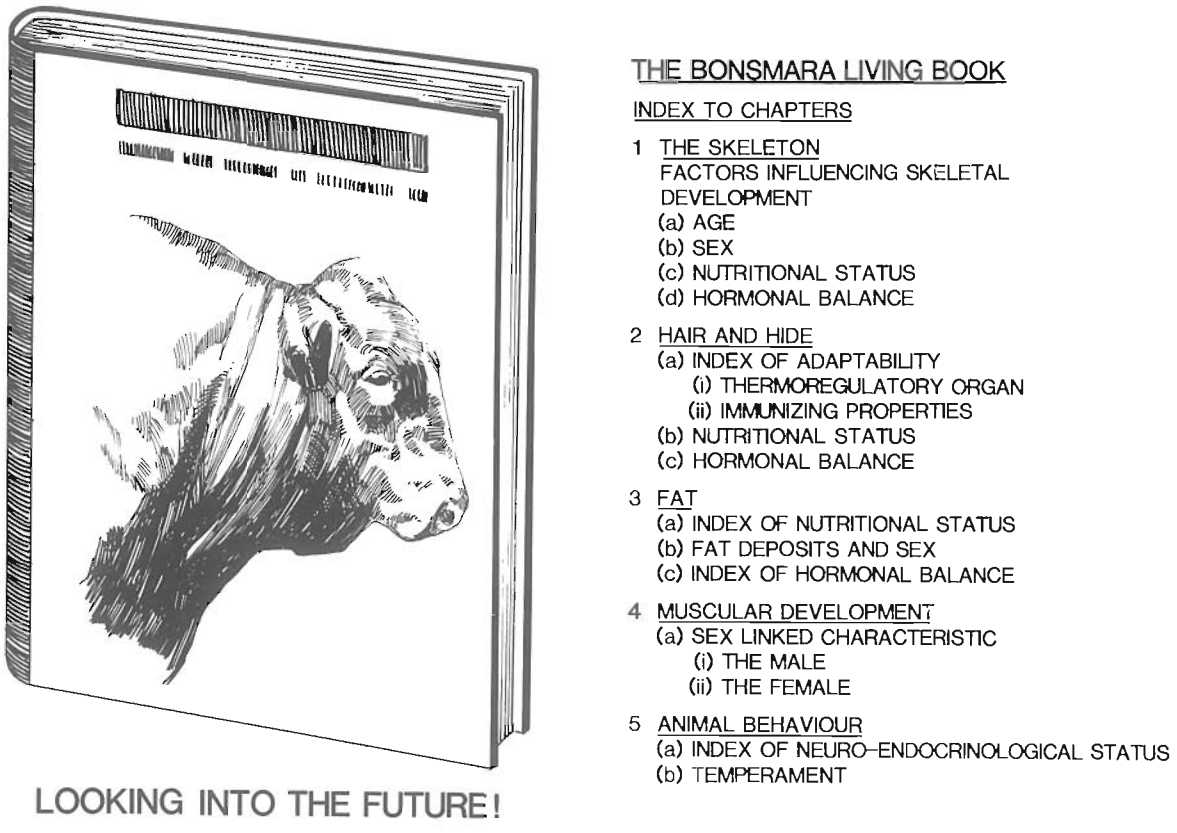

Figure 19: The living book of livestock production.

The first chapter, skeletal growth, is mainly influenced by hormones and serves as an index of an animal's age and sex, nutritional status and hormonal balance. Bone-growth is also an index of the nutritional status of the animal and its hormonal balance, and that is why an animal is always viewed from the side or profile when being judged for functional efficiency. This is of the utmost importance in evaluating the endocrine balance with regard to skeletal growth. The body profile of a highly fertile female is feminine and of slender build with relative shallowness and neatness through the shoulders and chest, along with a slim neck and forequarters. The fertile animal's brisket is not full and the fold of skin takes the dewlap backwards all along the brisket. The hindquarters must have ample depth and width so there is sufficient room for the intake of a large amount of feed and adequate space for the developing foetus. When viewed from the rear, a highly fertile female should appear largest in the mid-rib region. She will have a large stomach capacity and will be big from the hip to the pin and the hipbone region to the stifle joint and the patella. Her shoulder blades should be lean and loose and the cartilagenous edge of the scapula will move freely above the highest points of the thoracic vertebrae.

In selecting females for calving ease, the sacral-ileal angle should be estimated. It should be approximately 30^{o} in easy calvers and less than 20^{o} in dystocia-prone cattle. When an animal moves, a hollow point or indentation at the hip joint may be seen from the side view. If this point is relatively low on the cow, then you can be sure that she will calve with ease.

When selecting for fertility traits in the female, great emphasis should be placed on the importance of a sound, efficient udder. Conformational features such as teat shape, size, placement and udder attachment are also crucial in judging cows for functional efficiency. A ranch cow's udder must not be too big because size has very little to do with her milk-

ability. A cow must not give on average in excess of 5 kg of milk per day over the seven months suckling period. More than that is expensive milk which does not produce extra growth in the calf. In direct contrast to the body profile of the fertile female, is that of a sub-fertile counterpart. A sub-fertile female's profile has more depth through the chest with a full, heavy brisket, which slopes downwards and forward. She generally has an overall masculine appearance, with a coarse head, a heavy lower jaw and ill-defined shoulder blades. A sub-fertile female will have, when viewed from the rear, a smooth, fat-infiltrated udder and will never be a good milker because this extra fat and connective tissue often obscures the glandular content of the udder. The heifer or cow with good milk potential has an udder that looks deflated with skin folds running posteriorly when viewed from the rear.

The present trend used in selecting heifers of all breeds in America, perturbs me. The selection on the basis of heightened hip causes post-leggedness or weak hocks and this tilts the sacral-ileal angle so that calving difficulty will result. The present day heifers lack capacity in the hindquarters and resemble young steers. There is very little sexual dimorphism between the modern heifer and steer. All the selection is based on the concept of increasing cutability rate. The heifer should not be the meat producer, she should ultimately be the calf producer.

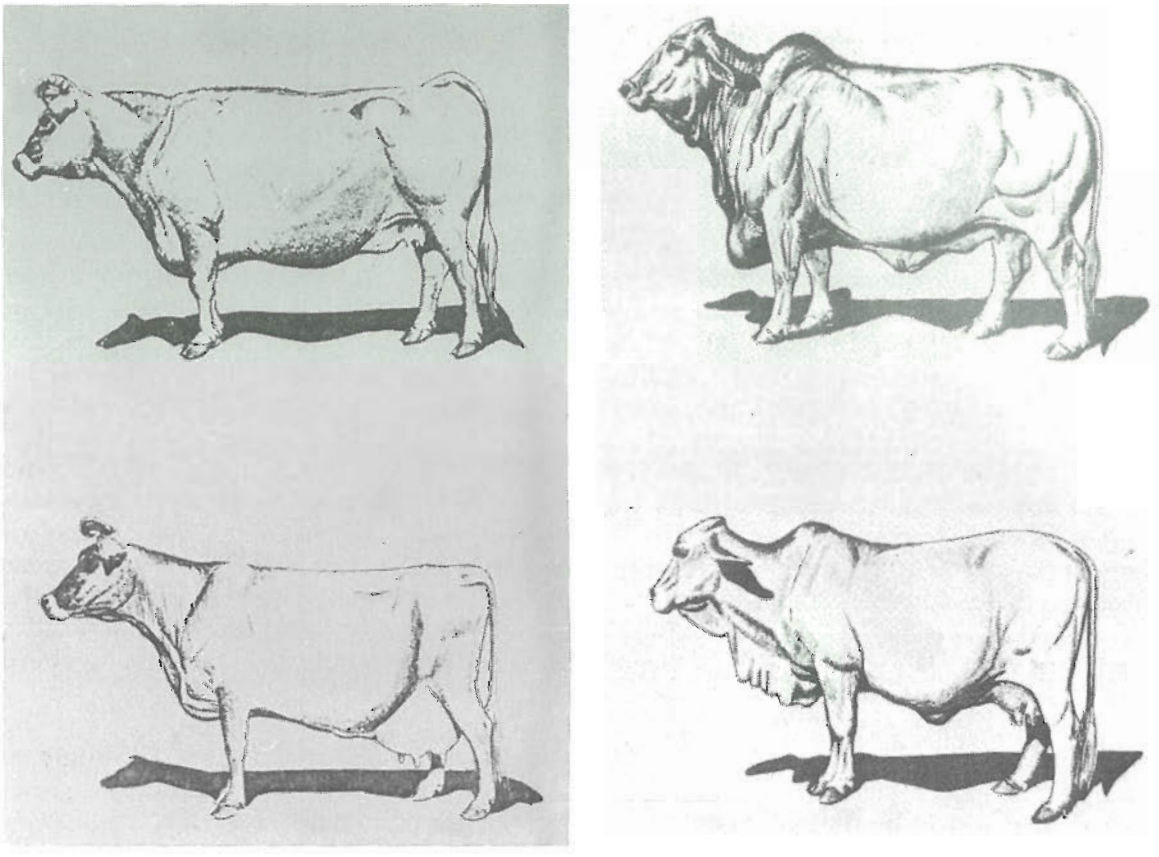

Figure 20 & 21: The relative difference between the body conformation or profile of a (a) a sub-fertile and (b) a fertile cow.

The functional efficient bull with high fertility and sex drive has a well developed forequarter and a masculine head and neck. Heaviness or coarseness of the forequarter which constitutes the shoulder blades, spine and related tissues are indicative of the desirable bull. The bull should not be too wide and heavy in the shoulders. The first essential of a bull is that he be absolutely sound, especially in the feet and the legs. He must be alert and immediately cock his ears when a cow passes. It is of the utmost importance that the bull must have well developed testes with a circumference of 34 to 40 cm and a good neck to the scrotum which allows proper temperature control.

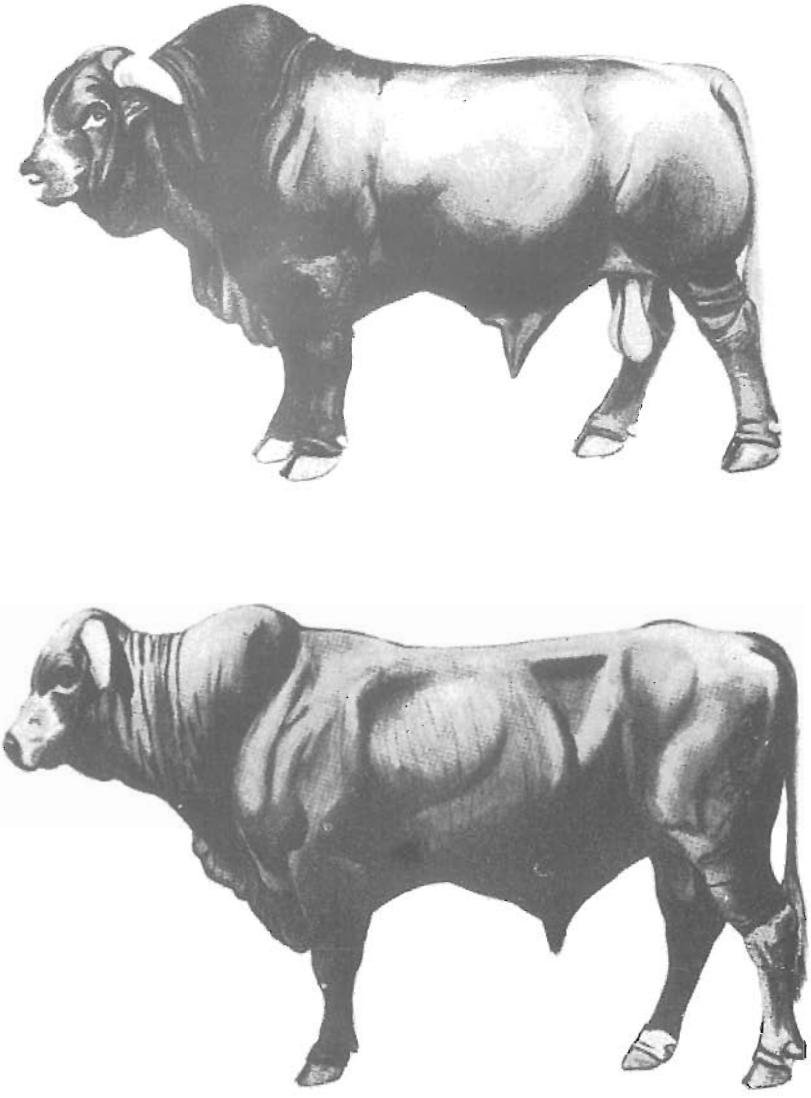

Figure 22: The difference in body conformation or profile between (a) a functional efficient bull and (b) a functional inefficient bull.

(a) Fertile. (b) Eunochoidal or sub-fertile.

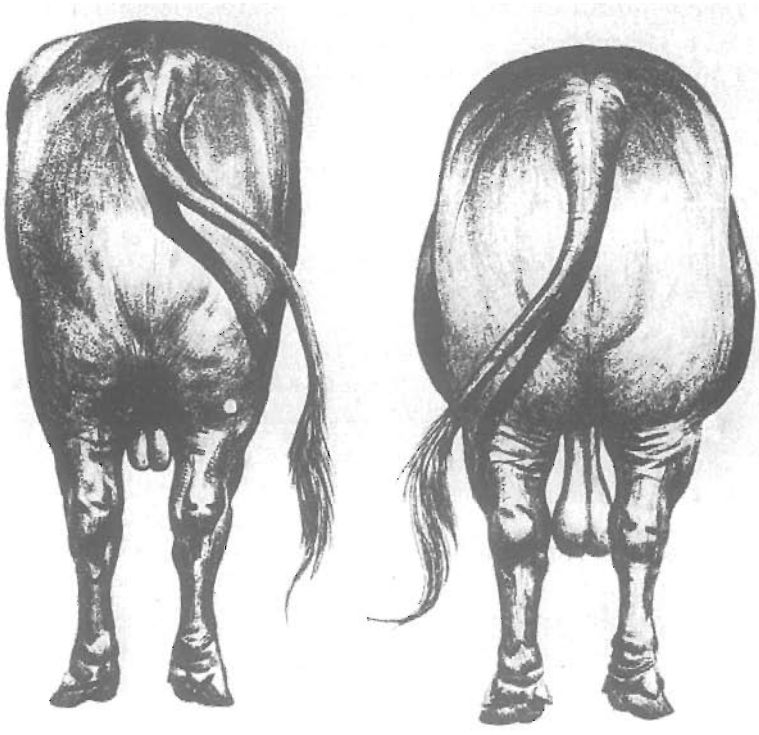

Figure 23: Rear view of a sub-fertile and a virile fertile bull.

The second chapter of the Living Book deals with the hide of an animal which serves as an index of its adaptability and nutritional status. Hair growth is actually dependant on two main factors: light and temperature. The difference between summer and winter daylight and darkness is what is called the photoperiod and it varies in different locations around the globe. The closer to the Equator, the shorter the hair growth becomes and likewise the further from the Equator the hair growth increases. In essence the hair and the hide is truly the heaviest single organ in the body and it is responsible for maintaining an animal's thermo-equilibrium. In addition, the hide and hair serves as an index of the female's hormonal balance. The animal which sheds its hair in early spring, is in good nutritional status and is cycling normally. A heifer will not cycle or come on heat regularly if she is in poor nutritional condition, which means her ovaries will not give off ova at regular intervals. Hence, the most important selection criterion for cattlemen in choosing heifers, is selecting those heifers which are early hair shedders in spring. These females will have an efficient digestive system which enables them to come through the winter in good nutritional status and with ample vitamin A stored in the liver; they are then sexually normal since they cycle normally.

Variation in hair colour is also a good indicator of virility in bulls. In selecting for bulls with good libido or sex drive, a coarse hair growth, which is dark coloured in certain regions of the body, especially on the head and neck, in the lower regions of the shoulders and thighs is essential. Keep in mind, however, that sex drive and fertility are two different concepts. Fertility is a function of gonadotrophic (i.e. LH and FSH) action on the testes. The libido or sex drive is produced by the secretion of testosterone, the male sex hormone secreted by the testes, which causes a variation in hair colour. For instance, a Zebu bull is naturally light coloured but should it also be dark in certain regions, then generally, the animal has a tremendous sex drive. Bulls with a very even colouring, frequently lack libido.

Fat deposits constitute the third chapter in the Living Book. A well-nourished animal will have an even fat deposit while the over-fed animal will have excess fat throughout the body. These deposits are sex-linked and differ greatly in the male and female. For instance, the female fattens much more readily than the male due to the actions of especially the female hormones. Obesity is linked with low fertility and vice-versa, since the cow that does not reproduce, requires no energy for milk production. She increases in mass, due to the fact that she is usually on a higher plane of nutrition because she does not feed a calf. Over-fed cows are less profitable and their fertile life-span is reduced significantly. The same goes for the bull. A functionally efficient bull must be physically fit, which is impossible if the animal is obese. It is the tendency with most showmen to overfeed their cattle for show purposes. This is one of the reasons why the Bonsmara breeders do not show their cattle. Bonsmara cattle are exhibited at shows with a complete set of performance data.

Muscular development, the fourth chapter in the Living Book, is also a sex-linked characteristic. The male's development differs greatly from the female's due to testosterone stimulation of protein synthesis. While strong muscular features are characteristic of sex drive and fertility in the bull, smooth muscling is most desirable in the female.

Animal behaviour, the final chapter of the Living Book, is an index of the animal's neuro-endocrinological status. Temperament is of the utmost importance in judging an animal for functional efficiency since animals with a bad disposition can make management difficult and often hazardous. Thus the inter-action of all the above-mentioned factors form the basis for the philosophy of functional efficiency which shaped the development of the Bonsmara as well as several American breeds.

In the mid to late sixties, thousands of Bonsmara cattle had taken the place of animals that were not adapted to the sub-tropics. In 1966 the principles of functional efficiency were first adopted in the United States by the American Hereford Breeders Association. Through Bonsma's guidance, the breed's standards of excellence changed from what is called a typical over-fat, sub-fertile animal to a well-muscled beast with a high cutability rate.

The functional efficiency concept totally changed the appearance of the American Hereford seen almost 20 years ago. The concept of judging livestock for functional efficiency, as was adopted by the Bonsmara breeders almost 20 years ago, was subsequently adopted by the American Hereford Breeders Association. Hereford breeders across the United States changed their show standards soon after 1966 and were producing functionally efficient animals whose calving percentages had increased appreciably. At present, the American Hereford breeders and many breeders of other breeds are basing their selection standards on heightened hips, to my mind an absolutely unsound selection criterion. Females selected on this basis completely lack femininity. They are post-legged and I am convinced that they will produce over-sized, dystocia-prone females.

During the late 1940's and early 1950's, compactness was stressed resulting in severe dwarfism problems. Now, due to the selection criteria applied in the early 1980's, I foresee problems of a different nature. Nature does not tolerate extremes. So many females of the different American breeds lack sexual dimorphism. They lack stomach capacity and depth through the flank. A straight rump or a rump which rises from the hip to pinbones, will cause the pelvic rim to rise which will result in a reduced pelvic opening causing dystocia or difficult calving.

Coinciding with the time when the Bonsmara breed was established as a functionally efficient and adaptable type of animal, the periodic chart of animal science (which measures adaptability, functional efficiency and feed conversion into meat) was adopted. The animal that can convert 5 – 6 kg of feed into 1 kg of good beef, is an efficient feed utilizer and converter, and these are the important traits. If we are to compete with the poultry industry world-wide, the livestock producers will have to improve the efficiency of food utilization by cattle to such an extent that they will produce 1 kg gain on appoximately 4 – 5 kg of feed. Feed efficiency is determined by measuring the total ration intake as it passes

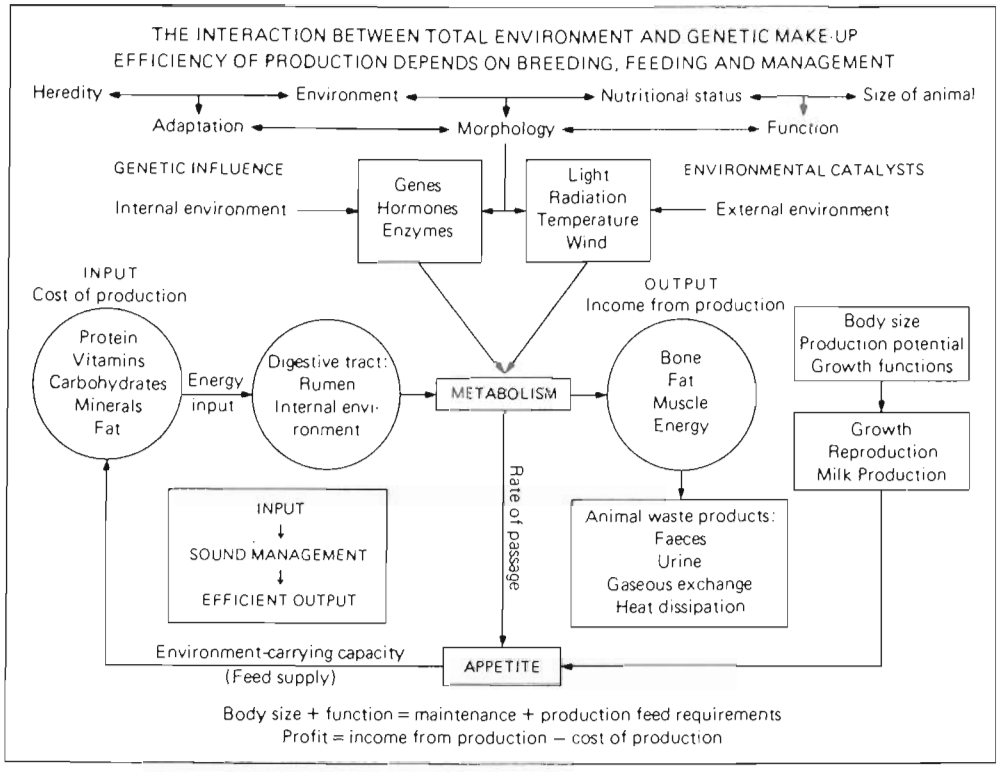

Figure 24: *Size in cattle is a function of nutrition and time. In other words nutritional status of the environment determines how large cattle can grow.*

DIAGRAM ILLUSTRATING THE BALANCE BETWEEN THE ANIMAL AND ITS ENVIRONMENT. CONSERVATION FARMING DEPENDS ON THIS BALANCE.

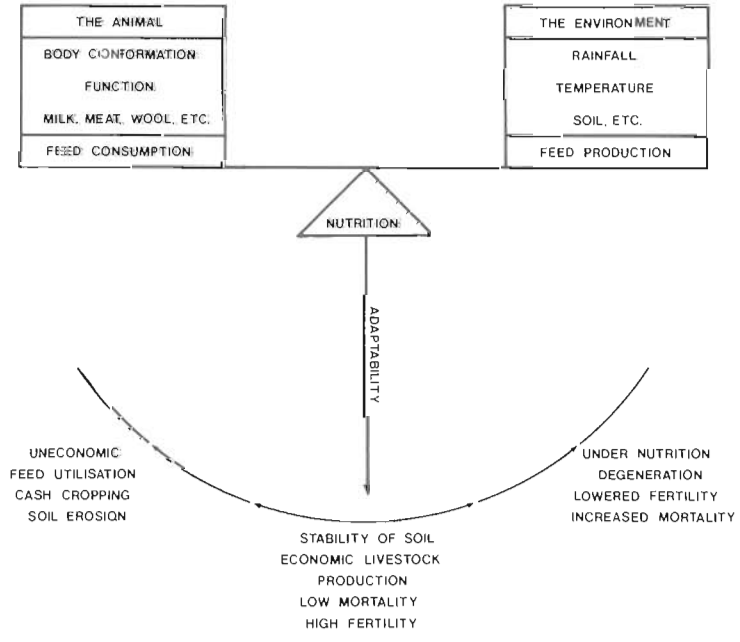

Figure 25: *The pivot on which this balance rests is nutrition. Its sensitivity is a function of the adaptability of the animal to a particular environment. The success of animal production depends on the management of the interaction between animal breeding and feeding.*

through the digestive tract and undergoes the process of metabolism to produce end products such as bone, fat, muscle and energy, which in turn determine the size of the animal. Growth, reproduction and milk production determine the animal's appetite which will be satisfied according to the carrying capacity of the environment or the amount of feed that is available. The efficiency of food utilization or conversion into end products which man can use, is solely dependant upon an animal's metabolism. Factors influencing this are: temperature, light, radiation and wind as well as the intensity of an animal's reaction to these factors. This in turn depends on genes, hormones and enzymes. The inter-action with the total environment determines body conformation or morphology of an animal and the expression of total genetic potential in terms of production. Once these concepts are taken into consideration, it is essential that the industry performance tests animals because this is a direct index of productivity.

In selecting cattle for the Bonsmara breed, every animal that had completed a performance test, was subsequently evaluated and cattle that showed signs of hereditary weakness or defects, were immediately culled. This is the only way to eliminate defects within a breed. In addition, the sub-fertile animal has a tremendous growth potential, thus the overall performance of each animal must be carefully scrutinized.

Livestock shows are an integral part of the livestock breeders profession. Cattle are exhibited to give the prospective buyer or breeder an indication of what these animals will look like. The only objection to the judging of livestock in shows is that so few judges are familiar with endocrinology and physiology, or know how to correlate these to body conformation. In many cases decisions are based on what is pleasing to the eye and not what is functionally efficient.

When Bonsmara breeders sell cattle, they provide the buyer with a detailed history including an animal's index at weaning, as a yearling, at 18 months old, as well as information on how many calves the mother cow had before a particular bullcalf was born; thus, providing the buyer with a better chance of choosing the correct cattle for his particular operation.

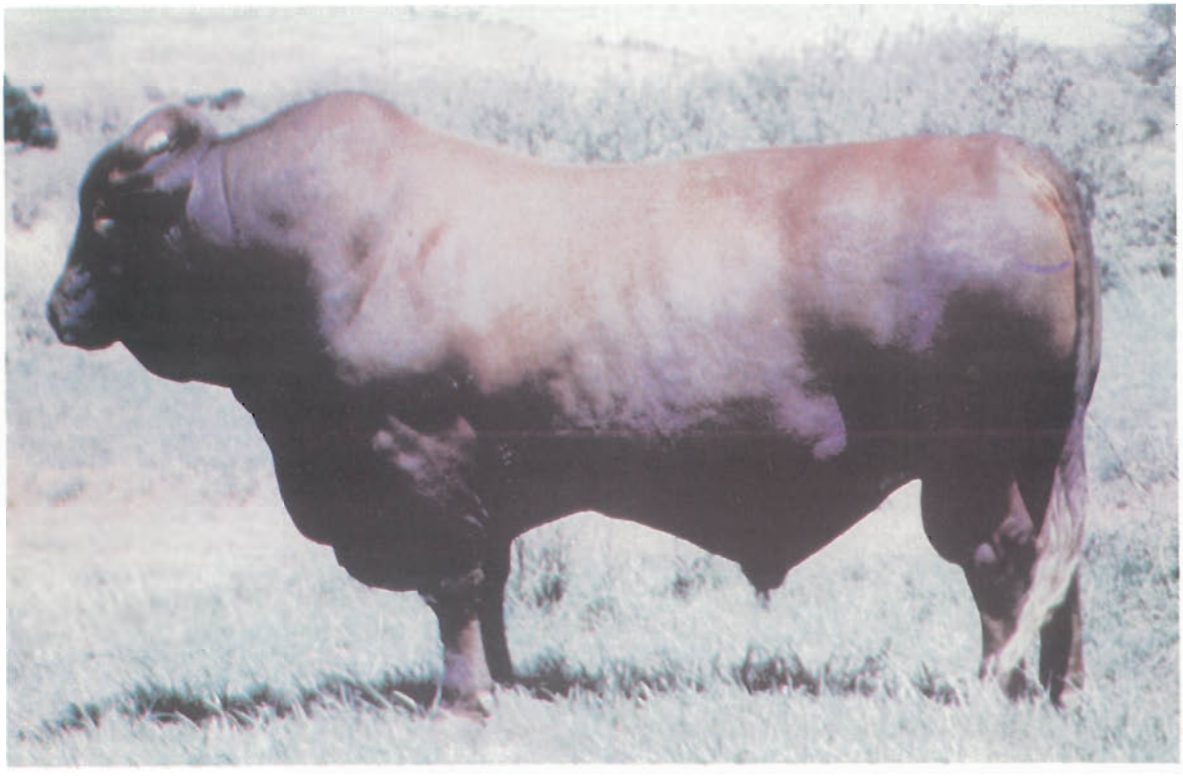

Figure 26: *It is our ideal as Bonsmara breeders to have a bull of the calibre of Mara Edelheer (Noble Gentleman) – the foundation sire of the breed, in every Bonsmara herd. An ideal for the future of 700 Bonsmara breeders.*

Figure 27: *Bonsmara cows. These cattle replaced the sub-tropical and tropical degenerates. Research gave us the answer of how to overcome this problem.*

It is difficult to be a successful livestock producer in the modern cattle business. A producer must breed animals to be adaptable, fertile, functionally efficient and efficient converters of feed in order to produce end products valuable to man. In other words, every concept of livestock production must be measured in terms of efficiency and this is what I have tried to do over five decades of research. My approach to livestock production would not be possible without research which is the earnest, purposeful, persistent, intelligently directed effort to gain knowledge on a selected subject. The spirit of research is devotion to truth and an insistant longing for better understanding.

This is my story. It supplies full evidence to substantiate a special claim. More sustained research has guided the breeding of the Bonsmara than that of any other synthetic beef breed. The whole animal with its whole genetic potential interacting with its whole environment was the subject of research and reflection.

THE BONSMARA AND THE FUTURE

During a period of almost 50 years, while establishing the Bonsmara breed, every conceivable measurable adaptability characteristic has been bred into these cattle through the application of strict selection criteria. The subsequent adaptability of these cattle to varying climatological conditions and the fact that they had been bred to be tick- and insect-repellent made them more resistent to tick-borne and other endemic diseases of the sub-tropics. Mortality rate in the herds was thereby reduced, hence larger numbers of cattle were available to select for desirable characteristics.

Once the objective of breeding the cattle for adaptability had been achieved, attention was centred on the most important economic consideration in livestock production, namely high fertility, which was then introduced and established. This, in turn, was dependent on the acceptance of the principle of judging livestock for functional efficiency which enabled the breeder to select cattle at a young age for increased fertility.

From as early as 1940 selection of sires used in the breeding herds was based on performance testing and since 1946 cows were selected on the basis of regular calving and their ability to wean heavy calves.

What steps can be advocated for the further improvement of Bonsmara cattle?

The beef industry's biggest competitor is the poultry industry. The reason for this is that poultry producers have succeeded through selection and breeding in improving the feed utilization of fowls to such an extent that today the ratio of liveweight gain to feed consumption in broiler chickens is of the order of 1:2. It is essential for Bonsmara breeders to advance this ratio in cattle to approximately 1:5, or lower.

As early as 1953, at a symposium held to celebrate the King Ranch centennial, I stressed the importance of selecting only cows which are efficient food utilizers as dams for bulls to be used in the future. "It is apparent that within any breed there are tremendous differences in weight loss during periods of drought and of feed scarcity. The variation for cows with calves ranged from 5,8 to 35 percent for Afrikaners; from 1 to 31 percent for cross-breds."

From these figures it is apparent that there is much variability in weight loss amongst lactating cows. Consequently, there is still much scope for the selection of superior animals. Cows which wean heavy calves and loose very little weight are superior dams. In addition, such cows are invariably early calvers, and herd fertility will therefore improve. Moreover, cows which wean heavy calves and loose little weight during the suckling period are also efficient milk producers.

Using these selection criteria we automatically select for enhanced fertility, milk production, growth rate of calves and efficient food utilization.

Another factor which should receive serious consideration is the individual performance testing of young bulls by the bigger Bonsmara breeders, so that individual feed intake and gain is measured, consequently enabling the breeder to select the bulls with the best gain: feed ration.

At the time I left Mara Research Station in 1960 it was my intention to determine which bulls were the superior meat producing sires through slaughter tests on their steer progeny. This is a facet which requires research on a large scale.

Future inbreeding problems can be anticipated and countered by the introduction of used sire sales. Superior sires from different herds should be sold at superior used sire sales. Through these sales, superior sires can be rotated in different herds and bulls with the greatest degree of prepotency can be identified and used as superior A.I. sires.

It is my considered opinion that bulls that perform outstandingly well in a few of the better herds can bring about large scale breed improvement more cheaply and on a much larger scale than can be accomplished by ova-transplantation. The latter technique still has limitations as an instrument of large scale genetic improvement in livestock herds.

Although the technology of ova-transplantation has almost been perfected, research on the interaction between the embryo and the uterine environment and the influence of hormones on super-ovulated ova has been neglected. Whether hormonal injections influence the cytoplasm of the ova or whether these influence the nucleus, the polar body, the RNA or DNA has not been clarified. At the moment, each progeny begotten via ova-transplantation costs a thousand rands more than a calf produced by an artificially inseminated cow.

The transplanted fertilized ova in recipient cows are in the uterus of the recipients for a period of approximately 283 days. During that period the developing foetus is exposed to the hormonal status of the surrogate dam. The recipient cow has an influence on the neurophysiological status of the foetus until birth. Brahman embryos transplanted to large Holstein Friesian cows to enable the birth of larger calves, developed into shade-loving animals on hot days. In contrast, counterparts out of Brahman cows lay in the sun.

Julius Bauer in his book "Constitution and disease" writes as follows: "Without genetic basis there is no individual, and without suitably arranged complexity of environment the complete genetic basis is unable to produce the normal individual. The interaction between the individual and the environment is continuous from the germinal beginning to the end of life, and is mutual; each modifies and affects the other. The individual and the environment are not separate; they are parts of a larger arrangement."

The whole object of genetic improvement should be to produce cheaper meat. In other words, the superior genotype should give a superior phenotype at the lowest cost possible. In a large scale ova-transplant exercise, the genetic pool of any breed will be very greatly reduced and problems associated with inbreeding will arise more frequently.

At the present time, as a result of the world-wide economic recession and the severe drought in this country, good Bonsmara cows with an F-rating can be bought for less than what a calf from an ova-transplant costs. Such cows can be inseminated with semen from the most outstanding Bonsmara bulls in the breed, broadening the whole genetic base of the breed.

The F-rating cows take the place of the surrogate cows, hence there are no more cows at pasture than would have been the case if surrogate cows had to be kept. The greatest drawback associated with present day ova-transplanting procedures is therefore an economic one.

To summarize, the following factors connected with livestock production need to be mastered.

Knowing the environment is the first essential to the livestock breeder. Climatological conditions such as rainfall, soil-pH and soil-fertility are particularly important. This is paramount for the application of sound management for pastures and livestock. Management is the most neglected aspect of livestock production in the southern hemisphere.

It is furthermore essential to fully comprehend the interaction between environmental factors, as illustrated in the livestock ecology wheel, and the physiological and endocrinological responses in the animal.

The next consideration is to understand the interactions between total environment, total genetic make-up and the organism. By understanding this concept, it is possible to breed cattle thoroughly adapted to a specific environment.

Mortality rate in a well-adapted properly managed herd is also low, hence it is possible to apply greater selection pressure using parameters influencing body conformation.

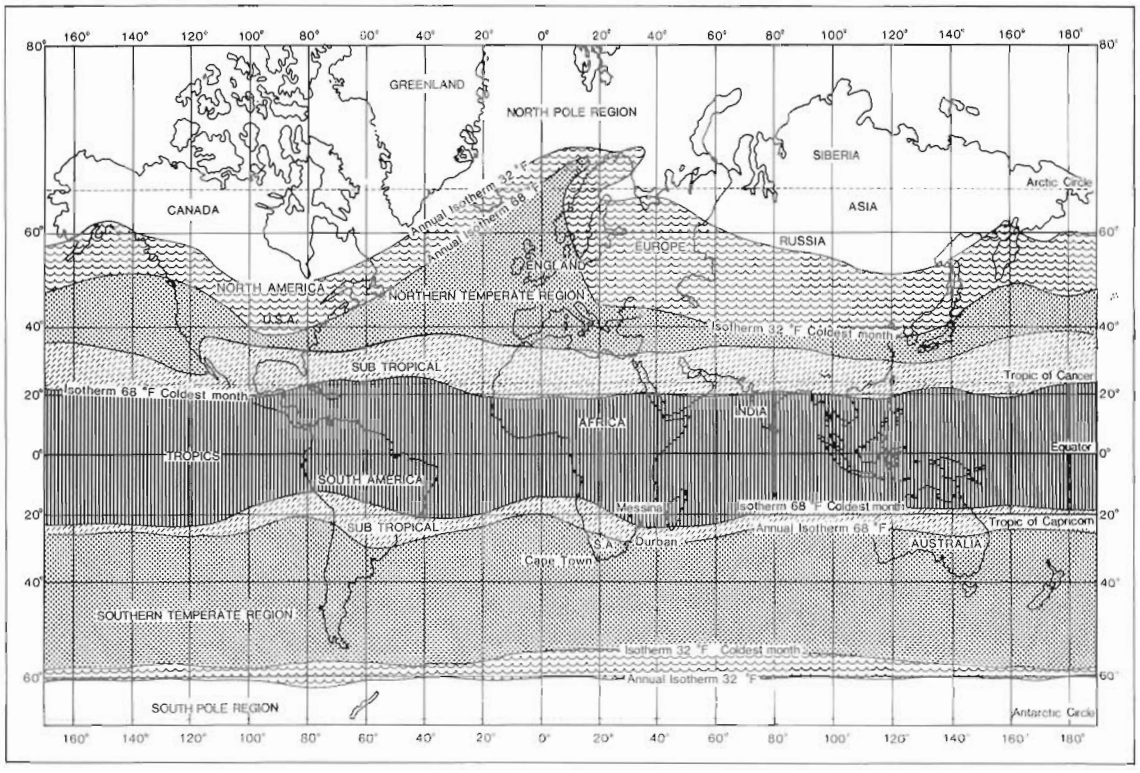

Figure 28: *The world-wide regionalisation map for livestock production. Bos taurus and Bos indicus types of cattle should be placed accordingly. In this regionalisation of livestock world-wide, temperature, altitude, rainfall, etc. are considered. Climate and geography are the crucial factors determining where cattle types will adapt and thrive.*

The most important economic consideration in livestock production is fertility. Promotion of this criterion was greatly enhanced when the concept of judging livestock for functional efficiency was fully mastered.

The next step in the programme of breeding better Bonsmara cattle was the enforced total performance testing in all the Bonsmara herds in the country.

The basis of Bonsmara livestock breeding is "Man must measure."

ADDENDUM

It is important to pay homage to many individuals who have in various ways assisted me with this project. I remember my parents, some of my past South African professors, and colleagues and my past students.

This is probably the most formidable task ever undertaken by me in my long career as an animal scientist. How does one note down your impressions and emotions after being actively involved for a period of forty-eight years in a project so dear to me – that of developing a new breed of cattle for the sub-tropics.

It is with a sense of deep gratitude and humility that by the kind grace of God, I can report on half-a-century's progress in this project while still enjoying good health and with a clear mind.

One appreciates that one cannot accomplish such a long term project on one's own. Due credit should be given to many individuals who in one way or another have enabled me, by education, encouragement or constructive criticism and guidance to carry through this long term assignment.

During my early youth my parents played a tremendous role in my education. Genetically I come from parents that on the one side were academics and the other side Friesian cattle breeders. At a very young age through wisdom, empathy, love, kindness and encouragement my late father made a "livestock" man out of me.

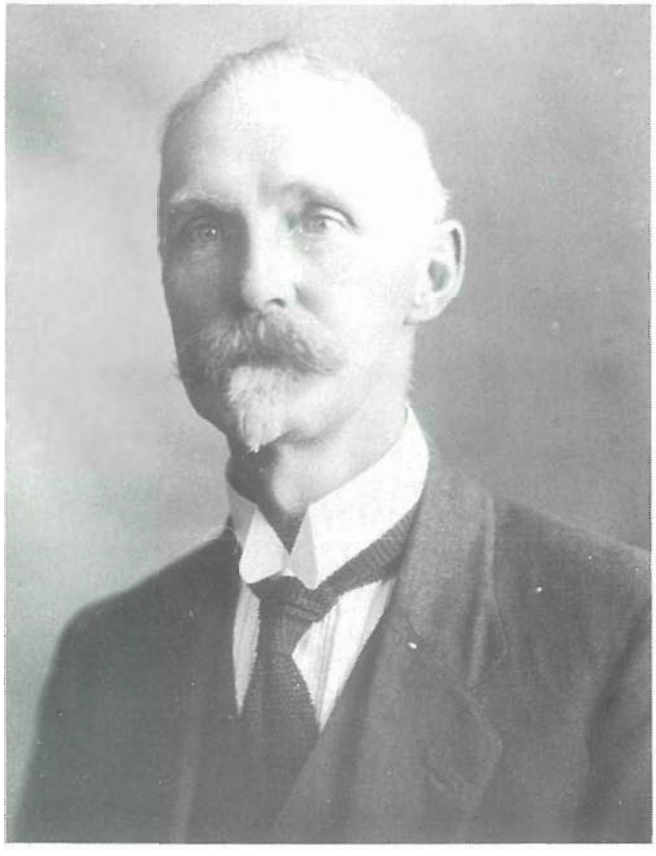

Figure 29: *My late father – K Bonsma 4.1.1871 – 13.5.1958 made a livestock man out of me. He was an educator and scholar par excellence.*

On my tenth birthday I received our first dairy cow "Moffie" as a birthday present. By the time I was thirteen we had four pure-bred Jersey cows, which I milked and cared for.

My farming operations further included rabbits, guineapigs, white rats, fowls, pigeons and canaries and my faithful and loyal friend "Tip", a wire-haired mongrel.

"Tip" got his name as a result of the fact that the soldiers drafted for World War I sang "It's a long way to Tipperary, it's a long way to go". The long name "Tipperary" was too difficult for a boy of almost five to pronounce, so the pup I got from the neighbours across the road was christened "Tip". This dog "Tip" was for a period of almost fifteen years a loyal and devoted friend. "Tip" taught me what loyalty means, his tenacity and his purposefulness made a lasting impression on me.

As a child I had a full life and I owe much gratitude to my parents for loving care, sacrifices and encouragement made during long years of education. My father set an example of what a scholar should be like, he always referred us to specific books when questioned about scientific matters. He was an educator and scholar par excellence.

Figure 30: *This dog "Tip" was for a period of almost fifteen years a loyal and devoted friend.*

During my early formative years as a student at the old T.U.C., the late Prof A.M. Bosman, my Professor, chief, much appreciated friend and mentor played a tremendous role. How could a student disappoint such a gracious, noble gentleman? The honour of shaping the destiny as animal scientists of the three Bonsma brothers must be given to Prof A.M. Bosman.

My brother Dr F.N. Bonsma also contributed much to my development as an animal scientist. His devotion to his work, his vision and integrity set an example worthy of following.

During the formative years as a student at the old T.U.C., only three of my tutors really had a lasting influence on my animal science career, namely, Proff A.M. Bosman, J.C. Faure and my brother Dr F.N. Bonsma.

Two of my class-mates who had a lasting influence on my approach to life and my work were: the late Louis Pepler, a gracious gentleman, a loyal and kind friend with a tremendous sense of fairness; and George Laurence, a man of exceptional intelligence, integrity, fairness and vision. What a pity the authorities in our Department of Agriculture never acknowledged this man's greatness and ability more fully.

One of my colleagues who had during the early years of my animal science career a tremendous influence on me is Ralph Hirzel, my friend of over half a century standing. Ralph's friendship, encouragement and loyalty contributed so much to stimulate me in my research work.

During my career as an animal science research worker in the Department of Agriculture I received very little guidance and encouragement from my supervisors after Prof Bosman's retirement. Of my colleagues only two people really contributed towards broadening my knowledge on animal science and climatology, namely, the late Dr Lucien Roux and Miss Joan Whitmore, two devoted scientists.

I owe sincere gratitude to several members of the staff of the Mara and Messina research stations who assisted me in my research work at these stations during the period 1937 – 1960.

I want to pay special homage to the late Fred Badenhorst (19.7.1916 – 25.2.1982). He was a devoted, loyal and self-sacrificing technical assistant. On many occasions on very hot days at the Messina research station we worked from 06h00 one day until 06h00 the following day. Such a day was Nov. 25, 1941 when the atmospheric temperature went up to 112°F (44°C)!

Of the officers in charge at Mara research station who worked with me on our research projects, my past student and good friend Dr Koos van Marle was outstanding. It was a joy to work with such a devoted and intelligent man. It became very obvious during the early 1950's that he was a man destined to play an influential role in the development of the livestock industry of this country. My sincerest best wishes accompany him on the task he is carrying on his shoulders. Koos is a "man" spelt with capital letters.

I also want to express my sincere gratitude to one of my younger past students Mr Danie Bosman who during the past decade made an invaluable contribution to improving the breeding programmes in Bonsmara herds and in the State owned herds.

Special mention should be made of a few friends and past students who became outstanding academics, men such as Prof Danie Joubert, present principal of our University of Pretoria, Prof Gideon Louw, professor of Zoology at Cape Town University who with Prof John Skinner, professor of Zoology at Pretoria University, I regard as my present-day mentors. What a joy and privilege it is to be befriended by such intellectual elite.

Figure 31: *The late Prof A M Bosman (29.9.1888 – 13.6.1955). How could a student disappoint such a gracious, noble gentleman? The honour of shaping the destiny as animal scientists of the three Bonsma brothers must be given to Prof A.M. Bosman.*

Figure 32: *The three brothers Bonsma photographed 3.7.1965. All three were animal scientists.*

J C	*H C*	*F N*
22.3.1909 –	*22.1.1911 – 28.6.1971*	*4.4.1904 –*

H C (Harry) – The best and most loyal friend I have ever had.

These men overloaded me with friendship and love and always stimulated and encouraged me in my work. So often they discussed my overseas lectures with me, which contributed much to making these lectures stimulating and rewarding to the audience that attended them.

It gives me great pleasure to express my sincere gratitude to the top-management of the University of Pretoria, namely, Prof D.M. Joubert, Principal of the University and his two vice-principals Proff H P van der Schijff and P Oosthuizen for facilities put at my disposal for many years since my retirement. The educational media, audio-visual section of the technical services of the University helped me considerably in illustrating my publications and lectures, this contributed so much to ensuring the appeal of my lectures to my audiences in South Africa and in overseas countries.

Now I want to pay special homage to an old Tukkie of fame, namely my old principal, good friend and mentor Prof C.H. Rautenbach. He was a principal and friend who encouraged me at all times and who taught me so much. During my tenure as professor of animal science, he regularly attended some of my public lectures. His interest in my work and his constructive criticism was at all times stimulating. What a privilege and joy it was to work under such a person.

It is also necessary to express my gratitude to a few friends out of different fields of endeavour who added to the pleasure of my research work – Mr Bertie Redelinghuys was the chief accountant in the Department of Agriculture during the 1950's and 1960's. This man was always most considerate in facilitating the provision of funds for my research. I often wondered if it would have been possible to fix a Bonsmara breed of cattle if it were not for Bert Redelinghuys' financial assistance. Prof Chris Derksen, professor of Surgery at the University of Pretoria was a very dear friend for a period of two decades before he passed away during October 1971. Chris had a pronounced influence on me, he was a scholarly man, a wonderful teacher and a cattle breeder with vision. My association with him enriched me in my teaching profession as well as in my research work.

My dear friend of more than sixty years standing Dr Boet Kloppers, incidentally also my neighbour for almost forty years, has contributed so much to my good health. It gives one considerable security if your neighbour is an outstanding physician. Boet is a special friend, a young "brother" whose humanity and compassion for his fellowmen, devotion to his work, enthusiasm for his work and hobbies, his whole attitude toward life, is an inspiration to everybody who associates with him.

Now a special word of thanks and a special tribute to the ladies at the Bonsmara offices. Mrs Isabel Venter is an extra-ordinary woman, highly intelligent, able, with a rare business insight. All these attributes enabled her to assemble a number of very able staff around her. I owe the ladies at the Bonsmara offices much gratitude for chores such as typing, filing, etc., done for me, indeed a group of very capable workers.

I also wish to express my sincere gratitude to the Presidents, past and present and their Councils for the great work they are doing in administering such a fast growing breed-society. A special word of thanks to Dr Lou Badenhorst, our present President, who has sacrificed so much time to run this society effectively.

I want to reserve my best thanks for my dear wife Cila, for loving care, she is my personal physician, my inspiration, my commentator and my proof-reader, such a fine lady and a loving mother to our children and grand-children.

I also want to thank my children who sacrificed so much as a result of my often being away from home carrying out research projects at Mara and Messina which deprived them of much time I could have spent with them. I thank you from the bottom of my heart for the encouragement, patience and love, this so often pre-occupied father received from you. You were indeed an inspiration to me and how could I disappoint such wonderful children?

Figure 33: *Mr Rex Ball. His vision and tenacity contributed much to establish a Bonsmara Breed Society.*

I would also like to pay homage to Mr Rex Ball; if it were not for his tenacity and devotion to a task he set, we would not have been able to celebrate this 21st anniversary of the Bonsmara Cattle Breeders Society of South Africa's affiliation to the South African Stud Book and Livestock Improvement Association. All of us salute you, we thank you and say "well done, Rex". We are grateful to you and your family. A friend that meant so much to me during the years I worked at Mara was E A (Jim) Galpin who passed away a few years ago. This man was an inspiration and counsellor at all times, our friendship of forty years gave me a knowledge of plants, trees, wildlife and geology, all of which gave me a fuller life. He also named the breed. Thank you Jim, your memory will live on.

Several of my professors, colleagues and friends in several foreign countries have contributed to shape my destiny. During my post-graduate period at Iowa State University, 1935 and 1936, nobody contributed more to my education and training than the late Dr Jay L Lush, probably the world's greatest animal geneticist, a gracious gentleman and a great teacher who, for forty-seven years, was a loyal and wise friend and counsellor. I am greatly indebted to him and Mrs Lush for what they have meant to me.

So many overseas animal scientists have contributed to my development as an animal scientist. During my visit to Australia and New Zealand 1949 as South Africa's delegate to the British Commonwealth Scientific Conference dealing with "Plant and Animal Nutrition in Relation to Soil and Climatic factors", I learnt so much by observing scientists such as the late Sir Ian Clunies Ross, Director of the Australian CSIRO. He was the most gracious host, most eloquent speaker, best dressed and most modest head of a large organization I have ever had the pleasure of associating with. He had a profound influence on me and set an example in every respect worth following.

Figure 34: *The late E A (Jim) Galpin (11.8.1898 – 23.7.1983). He was an inspiration and counsellor at all times over a period of forty years. He named the breed – Bonsmara.*

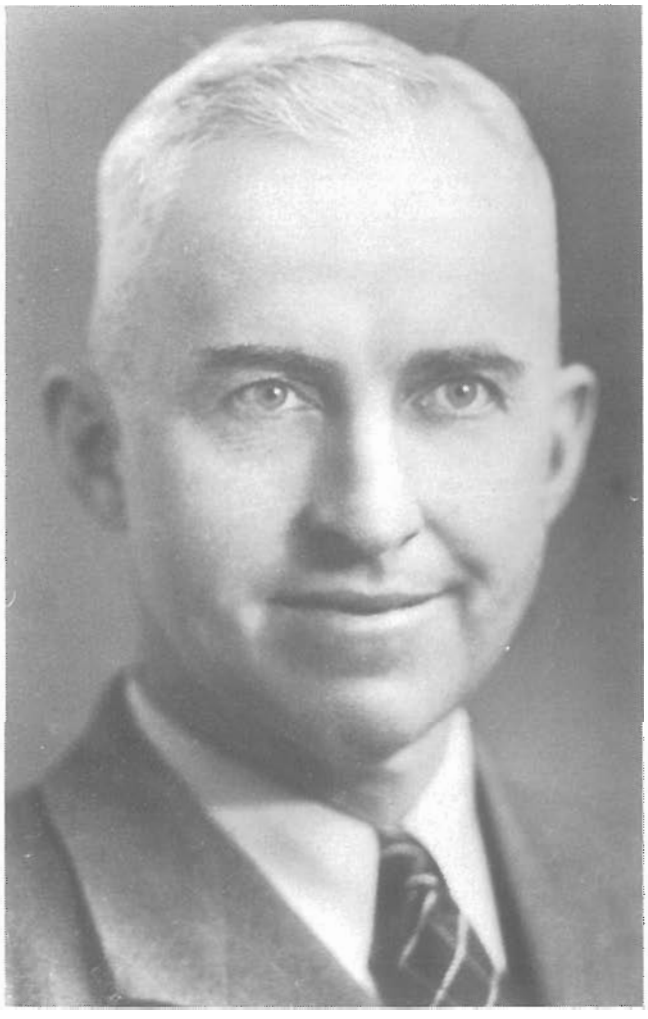

Figure 35: *The late Dr Jay L Lush (3.1.1896 – 1982). For forty-seven years he was a loyal wise friend and counsellor to me. In 1942 when I was busy with climatological livestock research, I was offered promotion in another field of research. I consulted him, and he wrote back:- "Forget the promotion, you have opened a fertile field of research, cultivate it".*

For a period of over fifty years I visted America regularly, first as a student at Iowa State University (1935 & 1936). During the period 1964 – 1965 I was distinguished guest Professor at Texas A & M University and again during 1972 at the University of Georgia at Athens, Georgia. From 1953 – 1985 I visited the U.S.A. on 36 different occasions. It is therefore very obvious that many American animal scientists and cattlemen had a pronounced influence on my animal science future. It is a heartfelt desire to pay homage to a few people who had a tremendous impact on my animal science destiny.

Dr Raymond Berry, one of America's greatest animal physiologists, former professor of Animal Physiology at Texas A & M University and Director of the Wortham Symposium 1963, which resulted in Mr Gus Wortham sponsoring my distinguished guest professorship at Texas A & M 1964 – 1965. Raymond Berry, an outstanding scientist, a wonderful tutor, a loyal friend and still an inspiration at 83.
Raymond Berry 28.10.1902.

Forrest Bassford a friend of long standing, Executive Director of Livestock Publications. The most knowledgeable animal science journalist, widely travelled, who knows more animal science professors and ranchers than any man I know. Forrest Bassford taught me much about public relations and communication. A loyal friend, communicator, organiser ,and mentor. Forrest Bassford – 1905.

Mr L F McCollum 30.3.1902.
This man who has inspired and encouraged me more than any man in my later years as an animal scientist. Mr McCollum is beyond doubt the sharpest mind at 83 I have encountered in my long career as an animal scientist. I owe Mr Mc much gratitude for friendship, inspiration and setting an example for everyone who associates with him.

Dr L S Pope. This knowledgeable animal scientist is a friend who sets an example to any individual that associates with him. I know of no animal scientist whose meticulously prepared lectures are more professionally delivered than Bill Pope's. This man is always neatly dressed and is a most eloquent speaker, who sets an example in every respect worthy of emulation.

My close friend and colleague during my tenure at Texas A & M University 1964 – 65, Dr Tom Cartwright. My close association with this outstanding geneticist is still a rewarding and stimulating experience.

Dr M E Ensminger. An outstanding Animal Scientist and Teacher. He greatly contributed much to my animal science career by inviting me five times 1964 – 1981 to lecture at the Stockmens' School. This enabled me to promulgate my ideas on functional efficiency and livestock ecology to livestockmen, world-wide.

During later years several American Scientists and business men have done much to promulgate my ideas on the judging of livestock for functional efficiency. Nobody has done more for my later development than the late Mr Gus Wortham and Mr Sterling Evans of the Wortham Research Foundation. These gentlemen were instrumental in arranging my distinguished guest-professorship to Texas A & M University and for sponsoring my research there from 1964 – 1965. The year spent at Texas A & M University was probably the most rewarding and stimulating for me as an animal scientist. Dr O D Butler and that great friend and fine scientist, Dr Tom Cartwright, provided unprecedented facilities which enabled me to express my ideas on judging livestock for functional efficiency and ecology. They provided an artist, Miss Jo-Anne Moore, and a most able secretary. My association during that year with so many outstanding Animal Scientists not only enriched my life, but it also contributed much to my subsequent approach in teaching and research. My close association with the outstanding geneticist Dr Tom Cartwright is still a very rewarding and stimulating experience. So many American Animal Scientists became my close friends and associates and contributed much to my education. I will name a few in chronological order, Drs Sam Brody, Laurence Winters, Charles Turner, Frank B Morrison, Dean George Hart and many more. Of my contemporaries and younger associates some had a pronounced influence on me, for example: Drs Raymond Berry, Tony Cunha, James Forgason, Jack Loosli, Bill Pope, Ken Turk and Richard Willham.

One of my contemporaries who taught me very much about communication with cattlemen and animal scientists is my friend Forrest Bassford, former editor of the Western Livestock Journal, and the present executive director of the Livestock Publications Council, who accompanied me as master of ceremonies on many of my lecture tours of the U.S.A. This man knows more cattlemen and animal scientists in the U.S.A. than any man I know. Forrest's general knowledge of animal husbandry, his journalistic and organising ability was for a period of more than 20 years an inspiration to me. I cherish my friendship with Forrest Bassford.

From 1968 – 1984 Dr M E Ensminger of the Agri-Services Foundation enabled me to contribute world-wide in promoting my ideas amongst stockmen. I am indebted to him for the way he assisted in establishing me in my livestock career, by instilling so much confidence, by inviting me to lecture at the Stockmen's School on five different occasions and for awarding me with the "All Time Great Award" in 1979. On November 17, 1985, a singular honour was bestowed on Dr Ensminger. The highest honour that can befall an Animal Scientist in the U.S.A. is the presentation of the portrait of Dr Ensminger to the Saddle and Sirloin Club Portrait Gallery. I salute that great teacher and untiring scientist, a Christian who entered into covenant with his Lord – "to use my talents for the benefit of mankind".

During the past few years no man has inspired me more than my old friend Mr L F McCollum, his vision and enthusiasm has made me realise that no man is too old to make a contribution to better livestock production world-wide if you are devoted to your task. Thank you Mr "Mc"!

Finally, I want to again express my sincere gratitude to the Claude Harris Leon Foundation for bestowing the R10,000 award of merit for scientific achievement on me in 1982. This was a wonderful recognition to receive eight years after my retirement.

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