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An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

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PRESIDENTIAL ADDRESS

EIGHT years ago a small group of animal breeding enthusiasts met in Wellington to discuss the formation of a Genetics Society. But Genetics proved too restrictive a sphere for their energies and out of that initial meeting emerged a broader, less specialised, and more dynamic body—the N.Z. Society of Animal Production. For obscure reasons, known only to the first committee I was appointed secretary-treasurer and continued in that capacity for the next six years. Having followed the tradition of most great industrial magnates in rising from the position of office boy to head of the show, I shall further follow tradition by recalling the origins of our humble beginning. So far as I can recollect this is the only time since the first meeting that the Objects of the Society have been quoted to an Annual Conference and they will only be known to a small minority of our membership. These Objects are:—

- (a) To provide an organisation to bring about active collaboration of all workers in the field of animal production.
- (b) To provide an annual meeting of members at which papers will be read and discussed.
- (c) To take such action as may be deemed necessary to foster improvement in animal production.

These Charter provisions are I think important to quote at this period in our activities. Without indulging in the politically dangerous analogy of the seven lean or the seven fat years it is fitting that the progress of the Society should be reviewed—and we can claim to have progressed. Membership has increased as follows:—

1941-42	....	....	....	66	Members
1942-43	....	....	....	80	”
1943-44	....	....	....	95	”
1944-45	....	....	....	114	”
1945-46	....	....	....	142	Members
1946-47	....	....	....	162	”
1947-48	....	....	....	223	”
1948-49	....	....	....	260	”

The various Proceedings of our Conferences contain many first-class papers on research, extension, and practice, and the considerable overseas interest in, and demand for these Proceedings are evidence of their standing. All Conferences have been notable for a high level of constructive and destructive criticism—so much so that it is rumoured only the most hardened and more veteran, or more aggressive members of our Society dare submit a paper for reading. That is no doubt exaggerated but it speaks well for the vigour and character of the organisation—young as it is—and we would do well to remember that the drive and purpose of the Society is based on its essentially practical outlook, and its determination to succeed in fostering the application of better methods in animal husbandry.

It is unfortunate in my opinion that in recent years some of the papers submitted to the Conference have only been available in abstract form in our Proceedings. Hence the material does not effectively reach more than about half our members and the authors do not secure the widest possible practical use of their findings. Admittedly this is due to some extent to the difficulty of publication at a later stage in the appropriate technical journal, and perhaps also to the fact that all authors are not prepared to re-write technical papers in suitable form for full inclusion in the Proceedings. Nevertheless, I feel this is not a healthy sign in the growing infant and this is my opportunity for a diagnostic opinion.

More than half our members are sufficiently keen on the work of the Society to pay a membership fee even though they cannot attend the Conference, and I think we should recognise their importance in giving effect to the objects of this Society and make our full Proceedings available to them. New Zealand workers have established a healthy atmosphere of unconcern with personal reputation and an ambition for practical achievement.

Unless that is maintained there is a danger of losing touch with realities, particularly if practical objectives are overshadowed by a desire to establish priorities, or to demand recognition for origins, in particular fields of research. It reminds me of the remark of the man who had just seen the film "Hamlet." "Curious how the author of that play used so many quotations in the dialogue."

In the development of modern methods of grass production the pasture expert is far in advance of our knowledge of the needs of the grazing animal. Two blades of grass can now grow where one grew before, and we may be close to converting one blade of grass into twice as much produce as before, but a very considerable gap exists between that knowledge and its successful adoption in commercial practice.

The failure to bridge this gap cannot be lightly shrugged off by research workers on the grounds that the task is purely one for the extension officer. But extension workers and farmers should also recognise with equal force that the research worker must be fully informed on the practical difficulties encountered and be co-opted into the attempt to bridge them. And finally, and unfortunately, in this connection we cannot overlook the attitude and motives which prompt a farmer to say, "Why should I go to hear that speaker when I already know enough to farm better than I'm farming now?"

In drawing up the programme for this year's Conference the committee has been fully alive to these problems and to the fact that increased production in the immediate future can best be achieved by the application of improved methods already demonstrated as commercially possible by both scientist and farmer. The committee also fully realises that failure to take advantage of improved techniques is not alone responsible for the present low level of actual, in terms of potential, production. The programme is therefore a challenge to administrators, to research and field workers, and to practising farmers to meet on common ground in order that there might be a full discussion on the reasons for, and the implications of, our present failure to realise full-scale continued expansion in the production of agricultural produce. The discussion particularly, and to some extent the papers, may therefore include economic, sociologic, and political aspects of agriculture to a much greater extent than has been true of any previous conference.

The original intention of the committee was to invite papers on the seven-year production targets for both Meat and Dairy products, but lack of papers offering on dairying subjects decided the committee in using Meat as the main theme. Furthermore, it is true that dairying has received emphasis in most of our previous meetings.

A brief word on production trends in primary produce may be appropriate at this stage. Total world food production is still slightly below the pre-war level. Since pre-war there has been an estimated increase of 10% in total world population and this serves to indicate a general and significant failure to maintain overall nutritional standards. No room for optimism exists that any substantial relief is possible through expansion of the area at present under cultivation, and indeed several authorities consider that this is actually declining. In the dairy industry there has definitely been a worsening of the overall

position. Cow numbers for the principal dairying areas, North America, Europe (excluding U.S.S.R.) and Australasia, are below pre-war and the following table sets out the cow population and production position:

TRENDS IN PRINCIPAL DAIRYING COUNTRIES

Country	Dairy Cows in Milk Thousands		Gross Milk Production (Million Gallons)	
	1934-38	1948	1934-38	1948
New Zealand	1,807	1,734	974	899
Australia	2,545	2,267	1,143	1,168
Canada	3,816	3,701	1,458	1,614
U.S.A.	23,933	23,200	9,960	11,293
*Europe	51,409	43,405	22,021	14,699
Totals	83,510	74,307	35,556	29,673
% Change	-11.0%		-16.5%	

* Europe excludes U.S.S.R. Total cattle numbers in the Soviet have been reduced from 63.2m head pre-war to 52m head in 1948, a decline of 17.7%.

N.B.—Cow numbers are now showing an upward trend in all countries except the United States.

Important exporting countries such as New Zealand will therefore be called upon to do more than meet a normal share in the increase of exports. Are we likely to be in a position to do that?

In last year's Presidential address, Hamilton adequately covered the conditions and trends in production for the two major primary industries—the sheep and the dairy industries. This is the important background against which our estimates, forecasts, hopes and illusions concerning future production must be projected.

Using standard values throughout, so as to preserve continuity in volume trends and to ensure a reasonable basis of comparison between various commodities, Hamilton shows the decade averages since 1901 as follows:—

Decade	Mutton	Lamb	Wool	Total Sheep	Butter-fat	Pigs	Beef	Calves	Total Pastoral units
1901-10	301	265	839	1405	408	19	81	1	1914
1911-20	442	366	996	1804	708	54	166	1	2733
1921-30	396	532	1112	2040	1506	97	203	7	3853
1931-40	411	937	1457	2805	2538	212	247	44	5846
1941-48	473	1161	1757	3391	2609	191	338	53	6582

A levelling off in the rate of increase of total agricultural production is manifest during the last decade. Total workers engaged in agriculture have declined during the same period and this is symptomatic of the present greater attractiveness of urban life and industries.

Limiting factors of high labour costs, difficulty in attracting suitable farm workers, and high capital costs of land development, make it clear that further immediate major increases in production in New Zealand will be dependent upon increased output per labour unit, and greater production per acre from existing areas. To what extent does the evidence indicate that this is possible? In regard to meat and wool production there are several speakers on the programme who should be dealing adequately with our capacity and potential for increased production on existing areas, as well as with the practical

possibility of achieving such increase. On the dairying side, Hamilton has stated, ("The Dairy Industry in New Zealand," 1944), "An improvement of 25 per cent. to 30 per cent. in the average production per cow is not an impossible objective for the dairy industry in New Zealand in the ten years after the war, requiring mainly the vigorous application of already existing knowledge of feeding and breeding." I would also like to quote from McMeekan's address to the Seventh Pacific Science Congress where he stated that an increase of 120 lbs. of butterfat per cow was practicable during the next 20 years.

This potential increase he sub-divided into: Better feeding, 50 lbs.; better breeding, 50 lbs.; better management, 10 lbs.; disease control, 10 lbs. I give you these opinions on what are practical objectives but leave the authors to defend their statistics.

Extensive analysis of data from tested herds indicates that within geographically compact areas it has been found that if the herds in the lower two-thirds production range could be improved to the standard of those in upper third, an overall increase for the district of approximately 50 lbs. of butterfat per cow would be achieved—a clear gain of approximately 20 per cent. In practical terms it should not be an unduly optimistic objective to raise the lower two-thirds to the level of the top third.

Hamilton, working with detailed county surveys in New Zealand, and after analysing the production results for all herds on similar soil types within a county, has obtained a similar result. But this is only part of the gain to be achieved. The measures taken to increase per cow production are usually accompanied by an increase in carrying capacity so that in addition to higher production per cow there are more cows carried per hundred acres. Calculating per acre production for the same herds in Hamilton's survey quoted earlier, the total gain in butterfat production per acre is found to be of the order of 34 per cent. This indicates what increase is possible by the more widespread adoption of those husbandry methods already practised by the better farmers, and is of course a challenge to existing extension services.

How is the problem of fully applying existing scientific knowledge to be accomplished? The answer I suggest lies in a thorough study, and discussion, of avenues and methods for extension.

Hitherto, there has been a comparative failure to treat extension work in the same experimental, critical or practical manner as has been extended to research projects. Yet this must be done if there is to be a speeding up of research into practice, and the problems of practice into research. The two-way traffic must be developed, adequately controlled, and the highway maintained in good working order—and we should cease paying mere lip service to this conception of extension!

This Conference will not be dealing with dairying so much as with meat and wool, and I shall take this opportunity of discussing some of the progress made and to be made in improvement in the technique of dairy production. Average butterfat production per acre for typical dairy herds in the Dominion is approximately 130 lbs. of butterfat whilst in a few of our best herds it ranges between 300 and 400 lbs. of fat per acre. In perhaps to three per cent. of our herds the production per acre might be over 250 lbs. of fat, but our grassland experts speak of potential production of approximately 500 lbs. per acre as being capable of immediate achievement. This leaves far too big a gap between research and practice. It has been said that the paradox of prophecy is that it cannot do much good until it has come true—in this case (and mixing metaphors to some purpose) Mahomet must show us how to move the mountain that will bridge the gap.

In recent years some progress has been made in the reporting, study, and use of methods employed in the feeding and management of our best producing herds, and the application—according to district conditions—of those methods to the poorer producing herds. Nothing is more convincing to the farmer than the practical appeal of successful methods followed in his own district and under conditions capable of achievement on his own farm.

Two important and reciprocal issues immediately arise—and I doubt whether they have yet received the study by scientific workers that they merit. The first is that the greatest measure of improvement in technique of production lies in the extension of methods already in successful practice. The second is that the results of research should first be demonstrated on a commercial scale in practice before complete release by research workers and before farmers are asked to accept those methods in full.

On the question of improvement through breeding it is natural that I should wish to say a few words. Cunningham once said (idly enough for so important and profound a statement!) that the production of the highest cow in the herd—under New Zealand grassland farming—should be a measure of the potential level of feeding in that herd. In other words if the highest cow in the herd is producing 450 lbs. of fat then the feed available should be sufficient to sustain a herd production of 450 lbs. butterfat—provided, of course, that the herd can be built up of cows with the same genetic ability as the top cow quoted. This is a most provocative and theory-shattering hypothesis; but what information do we have to prove or disprove it? How much more—if any—do high producing cows consume than low producers under New Zealand outdoor grazing conditions? Ruakura research workers are, I know, very concerned with this problem and work is in progress which should go far to supplying an answer. Hamilton is presenting a paper by Mitchell which also has an important bearing on this problem.

But the hypothesis leads to a bigger and even more difficult issue. Why cannot we rapidly breed more of these outstanding cows that will produce over 450 lbs. of fat under existing grassland conditions and so build up herds of that standard? After all there are several thousand cows in the industry at present producing over 450 lbs. of butterfat under good grassland farming conditions. Why are there so few herds of that standard? Why can't we reproduce cows of this quality uniformly and at will? Unfortunately we have to admit that although we know that heredity has contributed largely to this 450 lbs. level of production we have not yet been able to devise methods of selection that can quickly and effectively reproduce the fortuitous genetic combination responsible for that level of production. The actual production records of an animal (its phenotype) represent the interaction of the animal's environment with the particular combination of hereditary units (genotype) received from its parents. This combination is broken up when the genes are reshuffled into the animal's reproductive cells. This reshuffling process is such that the gene combinations of the progeny will in general be more typical of the average of the breed than those of its parents. This is why for most commercial characteristics the progeny regress to the breed average, and resemble the breed average more than the actual records of their parents.

Kelley has aptly described this elusive association of phenotype and genotype as follows:—

“Phenotype is an ephemeral thing, a character of the individual more often than not tied to the environment of the moment. A fleeting thing which dies with the animal and is lost for all time. But the genotype is an accidental combination of units that have their origin in antiquity and their future in eternity.”

The trouble is that these genes, or units, do not behave in an orderly or as yet, controllable manner. Carried in pairs, some may be dominant, some recessive, and other ranged in their effect between these two extremes. They do not operate in a simple arithmetic manner, whereby having secured one unit it is merely a question of securing more and adding them to it. Not only do they vary in the intensity of their expression but they vary according to the particular combination of other genes associated with them. Because of these polygenic, dominant, or epistatic effects or if you prefer a somewhat loose but perhaps more descriptive term—community behaviour of the genes, it is not possible to take full advantage of selection based on phenotype.

Like an outstanding hand at bridge or poker, you can rarely preserve the fortunate combination—even though you may still have several of the same cards—once the cards (or genes in our breeding example) have been reshuffled.

For this reason emphasis in breeding work is gradually swinging from selection based on the animal's own records to selection based on the progeny test—which is as near as we have yet been able to get towards a test of genotype. Where a character is strongly inherited then the phenotype closely resembles the genotype and selection can safely be practised on the animal's own records; but where a character is weakly inherited then environment contributes largely to the variance between animals, and the animal's own record—or phenotype—will not be a good guide to the qualities it will transmit to its progeny. The progeny test seeks to measure selection advantage on the basis of those animals which transmit the more fortunate combination of genes, and thus avoids the danger of selection from animals with good phenotypes but which do not pass on good gene combinations.

In this respect the question of the use and definition of the term "Heritability" and its confusion with the term "Intensity of Inheritance" needs clarification. When the definition is based on results of dam-offspring correlations, intrasire regressions, or similar statistics, it does not measure Intensity of Inheritance. This is an important distinction. Where such correlations or regressions are studied over one generation only, then the results are simply an expression of the advantage of selective breeding over that one generation.

If particular gene combination effects (e.g. due to epistasis or dominance) are of fairly common occurrence, and Hancock's work at Ruakura and Bonnier's at Wiad are strongly suggestive that they are, then it is probable that only through the study of identical twins will we be able to definite the extent to which inheritance influences a character. And only then will we know the upper limit imposed by inheritance on improvement through breeding.

This somewhat tedious excursion into the realm of genetic and biometric speculation and argument comes back to a relatively simple fundamental. In the case of sheep, cattle, and the larger farm animals it has not been possible to do much more than demonstrate the basic principles that underlie the methods developed by successful practical breeders after many generations of empirical breeding. Much more can be done, however, by helping to extend the application of these principles. The really important and indeed urgent practical issue of the moment is the education of farmer opinion in the basic principles of animal breeding. Two important vehicles for formation of this opinion have been and still remain the Show and the Sale Ring. They must be assisted in fostering better methods of demonstrating breed improvement, and encouraged to use their very considerable influence in helping speed the departure of the arch witch doctors of mumbo-

jumbo in livestock breeding. Half-truths must be rigorously attacked and Leacock's adage to this point is apt. "Half-truths are like half-bricks—you can throw them much further than whole bricks."

Improvement in animal breeding will continue to depend on the work of the commercially successful breeders and our main task is to recognise in time the Bakewells, the Collins, and the Bates of this age, confirm their methods and extend their influence. Stevens in his treatise on "The Merit Sire Test of the Corriedale Sheep Society" draws a useful illustration of this point:

"Such is the background of the Corriedale, a breed born of necessity and nurtured by sheepmen who refused to be defeated or even dismayed by the vagaries of inheritance. They had the wisdom to realise the sort of sheep which fitted economically into their environment, and the courage to brave the odds and evolve the sheep."

And to Stevens as a practising geneticist goes much of the credit of persuading, for the first time in the history of British livestock, the controlling body of a breed to apply officially to sires of the breed, a critical breeding test.

In conclusion I would like to welcome on behalf of the Society the presence, at least during the latter part of the proceedings, of members of the veterinary profession. Since the inception of the N.Z. Society of Animal Production, veterinarians have formed an important segment of its membership and we welcome this further collaboration because it is clear that in devising, debating and extending better techniques of animal husbandry the veterinarian can give very considerable assistance. They have a professional responsibility to be outspoken in condemning breeding and husbandry practices which they know to be harmful to the future welfare of our commercial flocks and herds. With the establishment of a National Veterinary Scheme and Dominion-wide organisation it should now be possible to collect and collate accurate detailed observations on the incidence and conditions of our worst disease scourges. Such a service is vitally necessary in the proper understanding of the full conditions for animal health and to give reality to prevention of disease rather than concern merely with its cure.

But the problem of animal health is far wider than the confines of animal disease and the increasing co-operation of veterinarians in our conferences should go far towards achieving the complete teamwork so vital in translating the best of our scientific knowledge into the best of commercial practice.

I sincerely hope that your deliberations and discussions will prove equal to the committee's ambition in drawing up a programme based on the achievement of targets for increased production, and I trust you will all recognise your responsibility as members in leading these proceedings to a successful conclusion.