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SUMMARY OF A PAPER ON  
THE NUTRITIVE STATUS OF PAMPAS GRASS.

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Pampas grass has been grown as a supplementary feed for dairy cattle for a number of years and interest in it appears to be increasing. There is, however, little or no information available as to its nutritive status. A series of digestion trials using dry Jersey cows has been commenced to remedy this situation. Some twelve trials with two different strains of the plant grown on land of high and low fertility at 6 months' growth in both summer and winter, at 12 months' growth in winter and at 3 months' growth in spring and autumn have been carried out to date.

Three months' pampas gives Organic Matter digestibilities up to 65% but such grazings would not be economic possibilities as the plants are seriously stunted thereby. No strain difference has been apparent so far. Other results fall into two significantly different groups with O.M. digestibilities about 42 and 52% respectively, representing (a) pampas grown on low fertility land at 6 months' growth under poor rainfall conditions and pampas grown on low fertility soil at 12 months' growth, and (b) pampas grown on high fertility land and at 6 months' growth on low fertility land where good rainfall conditions prevail.

The poorer quality pampas is a feed of about the same value as poor quality hay, while the better quality pampas is intermediate in food value between poor and good hay. Assuming cattle to eat their Dry Matter appetite when grazing pampas grass, poor quality pampas is not a maintenance feed in either energy or protein. Better quality pampas will provide a maintenance ration in terms of energy though not of protein for dry pregnant stock, but for milking cows there is energy only for 6 lb. of milk per day, while the amount of protein available for production is negligible. Under good fertility conditions pampas at 12 months' differs little in digestibility from the same pampas at 6 months' growth. This is an important result in urgent need of confirmation, as it relieves the dairy farmer of the necessity of using his dairy herd to graze his pampas at the summer six-monthly grazing with detrimental consequences to production. Probably the most urgent requirement is, however, for a series of intake trials to ascertain whether dairy cattle will eat their theoretical D.M. appetite when grazing pampas grass as calculations of feeding value are based on this figure and as in stall-digestion work, animals consumed very much less than this amount. Tentative conclusions may be drawn as follows: The plant should be grown under the best fertility conditions available and as far as possible under conditions of high and well distributed rainfall. It should be grazed at 6 monthly intervals (late summer - early autumn and late winter - early spring), where the food position requires it, and under low fertility conditions, this management should always be adopted when it will probably ensure an improved feed value in the winter though not necessarily in the summer. The summer grazing will not be necessary under good fertility and rainfall conditions. For dairy stock pampas should be supplemented at all times with some highly digestible protein rich foodstuff such as very good quality silage or autumn saved pasture. When intake trials are carried out to show the amounts actually eaten these supplements may be proved unnecessary from an energy viewpoint or on the other hand low intakes may prove pampas to be an even poorer food in actual practice than it would appear from these results.

DISCUSSION ON MESSRS COUP & DUNLOP'S PAPER:

MR. GRIMMETT: I would first of all like to congratulate Messrs. Coup and Dunlop on this excellent work and the way it was presented. They have given us factual data, and that is what is wanted. I have been shot at, and justifiably so, added Mr. Grimmett. The passage referred to was written in 1935, before there was very much in the way of facilities or equipment for digestion trials in New Zealand. It referred to observations made by one of the field officers on the farm of Mr. McLean, under conditions in the autumn when there was a shortage of feed. There was a partial drought, and the farm was fairly heavily stocked. In other years, under similar conditions, the farmer's milk yield had gone down, and so had that of his neighbour's cows, but this year, when he used pampas grass as a supplement, the milk yield of his cows increased. Data was collected from the factory, and it looked as if there was a case that had to be answered. I admit freely that I made a mistake in accepting data that I could not verify myself, and I think that it has been brought home that no research worker should accept data that he cannot verify himself. I was at fault in attempting to find an explanation, and, furthermore, I had the temerity to publish an attempted one. Nevertheless, I still think that the following explanation may have a certain amount of truth in it.

Mr. Grimmett then read a passage from his article on Pampas Grass in the Journal of Science and Technology (vol. 17) as under:-

"Pampas contains a large proportion of 'crude fibre', and it is this, together with the small amounts of sugars, that make it chiefly a carbohydrate food. It is well known that crude fibre, according to its constituents and physical nature, may vary all the way from practically complete digestibility to almost indigestibility. In ruminants the digestion of fibre is carried out by bacteria, in the rumen and other parts of the alimentary canal, which break it down into sugars, organic acids, and gases. The gases escape, but the sugars and organic acids are assimilated in varying degree. Of the fibre constituents cellulose is readily attacked and has a feeding-value equal to starch; lignin, on the other hand, is not attacked at all, or very slightly, and is considered to have no feeding-value. Lignin also reduces the digestibility of fibre by encrusting and so protecting from bacterial attack the cellulose and other constituents, such as hemicellulose and pectin, which could be broken down if accessible. Woodman and Stewart (Jour. Agric. Sci., 1932, 22, p. 527) found that for pasture-grass a slight increase in lignin-content at flowering and maturity coincided with a considerable decrease in digestibility of the fibre, and concluded that it was not so much the lignin-content as its method of deposition in the fibre that determined this result. Pampas-grass has 50 per cent. to 100 per cent. more cellulose than other grasses commonly used for pasture, but only about the same content of lignin. This, combined with the way in which the fibre is spread out in the leaf as fine parallel strands and not collected into tough ribs, and the ease with which it is broken and pulverised, evidently account for its apparent great digestibility. Preparations of crude fibre made from average-quality hay and from pampas showed the pampas-fibre to be very soft and fine compared with that from the hay, which contained many harsh lignified fragments."

I would point out, Mr. Grimmett went on, that the digestibility of crude fibre is complicated by the bacterial fermentation in the rumen. In an article on "The Digestion and Utilisation of Crude Fibre", published in the "Nutrition Abstracts and Review" (vol. 3, 1934, p. 636), this statement is made:-

"The variability of results for fibre digestion is probably also affected to a significant degree by the nature of the rest of the food and of the total diet fed. This will have an effect on the intestinal flora, altering the culture medium of the bacteria."

It would be worth while, added, Mr. Grimmett, having another trial in which pampas would not be fed as straight fodder. It was never intended that it should be so fed, but as a supplementary fodder for cows on pastures drying up in the autumn which still have a great deal of a very low growing type of clover herbage. I think the digestibility of pampas when supplemented with a high-protein type of grass might be different from what it is when fed as straight fodder. When making a compost heap, if you put in all fibrous types of materials, with nothing like clover or ammonium sulphate to add nitrogen, the decomposition is slow indeed, but if material high in nitrogen is added there is rapid decomposition. It would be worth while carrying out a trial in which you have pure pampas and pure clover respectively, and in the third case a mixture of the two. When the digestibility of the fibre in each trial is added up, I have a strong suspicion that increased digestibility of fibre will be found in the mixed fodder.

MR. DUNLOP: I am not entirely happy about the lack of coincidence between our results and the fairly widely made reports of farmers that their milk yields have been maintained when their herds were grazing pampas grass. I think Mr. Grimmett's suggestion of further work in which pampas would be fed with some protein rich pasture grass merits attention and should his suggestion of higher digestibility in combination prove to be true it would help to explain this disparity.

DR. HAMILTON: Is anything known of the relative yields in terms of starch equivalent per acre of pampas grass and other supplementary fodder crops?

MR. DUNLOP: That is a point worth considering. We have a certain amount of data on that point not entirely collated. I am sorry that I do not have it with me.

MR. GERRING: Has the use of pampas for feeding in springtime been considered as a preventive of metabolic diseases? In the Waikato farmers consider that when the young grass comes away cows refuse to eat hay and begin to lose condition soon after calving, most of our troubles occurring at this stage. The hay in most cases is of very poor quality and some farmers are finding pampas of use at this time of year, that is before the grass is mature. Further when there is a danger of bloat farmers find it a useful practice to give the cows about a quarter of an hour on the pampas before turning them on to potentially dangerous paddocks. Since pampas is primarily a maintenance foodstuff, would not the gross digestible energy be more suitable as a measure of nutritive value than starch equivalent?

MR. DUNLOP: We have not considered pampas fed at this time as a possible means of controlling metabolic diseases. It seems probable that were sufficient effort expended in providing good quality silage and autumn saved pasture which would contain more protein than pampas, better results could be expected. Where only unpalatable hay is available pampas might offer a partial solution. Again if Mr. Grimmett's suggestion that pampas may have a higher digestibility when fed with protein rich food such as spring pasture should be borne out there would be less likelihood of milk yields being depressed by this apparently low grade food. We have not considered pampas specifically in relation to bloat, but I imagine it could be helpful. If bloat is not a factor, however, it must be obvious that in the spring, perhaps not in the first growth but a little later on, there is so much grass about that the farmer if he is at all keen on pas-

ture control will be kept exceedingly busy conserving silage, etc., and both from a production and from a pasture control viewpoint will wish his herd to consume as much grass as possible. Under such conditions there will be very little room left inside his cows for pampas.

It is only under very low temperature conditions that the normal heat increment is insufficient to cover heat requirements for maintenance of body temperature. Though low temperatures may be aggravated by wind and rain, such conditions probably do not exist for more than short non-continuous periods under our climatic conditions. In addition, pampas is used by some farmers as a feed for the dairy herd in the summer and autumn when temperatures are always fairly high.

MR. CANDY: In the spring months we are embarrassed with feed. If the pampas were to be used in the spring, it would not be used in the winter. My experience this year was that yearling heifers broke through a fence to two months' growth pampas in the spring, preferring it to grass and clover and quickly cleaned up the fresh growth. This, however, resulted in the total growth for the year being reduced by half. Any grazing in the spring will seriously affect the total growth for the year. Last winter, I fenced off a plot, together with a small patch of swedes, and ran yearling heifers on it, and they ate the pampas out before they tackled the swedes. There is no suggestion of the practical farmer using it exclusively, but only in combination with something else. However, it is intriguing from a farming point of view, and I would be particularly interested if some work could be done of a practical nature to show what is likely to be the return per acre rather than the percentage of digestibility.

DR. CAMPBELL: An interesting point brought out by Mr. Dunlop was the capacity of the dry, pregnant animal to consume a certain definite amount of dry matter. Mr. Dunlop admitted that his figure of 20.5 lbs. was intelligent guesswork, but he put his finger on a weak spot in the knowledge of cow nutrition, in that there is only a vague idea of the capacity of dairy cows to consume certain given amounts of the commonly used foods, such as hay, ensilage and pasture. Not only is it important to consider the per acre yields, but also the capacity of our animals to eat given amounts of pampas fed alone or in combination with definite amounts of pasture. Enquiries are being undertaken at Ruakura, but surely there will be available from members of the Society here today some observations on the change in the condition of cows grazed on pampas or pampas-plus-grass during the winter to give a guide to the ability of the cows to consume enough pampas, plus whatever pasture is available in winter, to supply their needs for maintenance and the production of calves.

MR. DUNLOP: I think that Ruakura experience can give one small addition to the facts in that direction. In earlier work at Ruakura, bullocks were grazed in two seasons on our low fertility plantation of pampas at 12 months' growth; in the late winter, and in both seasons they consistently lost weight though in one season it is true that the weather conditions were very rough at the time. Such results are, of course, in line with the values given for 12 months' low fertility pampas by digestion trials.

MR. EWER, after congratulating Mr. Dunlop on the paper and the work he was doing, said: We have had quite a lot of digestibility trials at Kirwee in Canterbury, and have been able to do intake work as well. In commenting on the low intake that was all that Mr. Dunlop could persuade his stalled animals to eat, and his wonder whether such animals would not eat approximately three times as much in the paddock, I want to say that we have found such a relation fairly frequently with

sheep. Sheep in the paddock were calculated by their output to have eaten about three times as much as similar sheep in pens.

DR. FILMER: Although Mr. Dunlop has gone out of his way to emphasise the limitations of the results, I should not be at all surprised if the results do not prove to be rather better than he has suggested. My own guess would be that the suggestion in the paper that pampas is about equivalent to hay would not be very far wrong. While I agree that the digestibility of pampas will probably go up if it is supplemented with something higher in protein, surely that will also apply to hay. Thus, it would not invalidate the suggestion that pampas is about equivalent to hay, and it may build down to this: that it may suit one man to grow pampas and another to shut up pasture for hay. It may turn out to be a question of convenience. We are accumulating data about these things of practical interest to farmers, and a lot of the work at Ruakura will be along those lines.

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