

SOME ASPECTS OF THE' EXTREME SIMPLIFICATION OF PASTURE SEED-MIXTURES.

J. M. SMITH, Department of Agriculture, Dunedin.

A STUDY of grass-seed mixtures used during the past two hundred years reveals that there is relatively little new in the present-day trend towards the extreme simplification of such mixtures, and that during this period the pendulum has swung backwards and forwards. It is an accepted theory that extremes in anything are not desirable.

As an indication of how history repeats itself in this matter might 'be cited the advice tendered by various eminent authorities at different periods during the past 200 years. Mr. Arthur Young(r) about the year 1760 stated: " I may safely assert that a judicious farmer will by means of clover and rye-grass maintain nearly as many sheep on 300 acres as before were kept on a thousand."

The mixture recommended by Young was 10 lb. red clover, 8 lb. white clover, 6 lb. yellow clover, and 1 bushel of rye-grass, and incidentally the composition of this mixture would lead one to suppose that the importance of clovers to the pasture sward was fully appreciated at that early period. A little over a hundred years later mixtures containing up to twenty species were advocated, and as an instance of a mixture of the times might be quoted Elliot(z), who recommended for general pasture purposes-cocksfoot, 10 lb. ; tall fescue, 3 lb. ; crested dogstail, 2 lb. ; hard fescue, 3 lb. ; *Poa pratensis*, 2 lb. ; golden oat grass, 3 lb. ; burnet, 3 lb. ; chicory, 1 lb. ; parsley, 1 lb. ; rib-grass, 1 lb. ; yellow clover, 1 lb. ; kidney vetch, 1 lb. ; lucerne, 2 lb. ; red clover, 2 lb. ; white clover, 3 lb. ; alsike clover, 1 lb. ; yarrow, 1 lb. ; and birdsfoot trefoil, 1 lb. ; making a total of 39 lb. per acre. To-day, some sixty years later, we have grassland authorities recommending the sowing of one or at most two species. Stapleton(3) states that " A man starting on the poorest' of poor soils would be doing nothing outrageous if he sowed wild white clover and nothing else. A man starting on fairly good soil, and where he expected white clover to volunteer freely, would be doing quite a sensible thing to put all his money into leafy perennial rye-grass and sow nothing else."

While apparently none of our New Zealand grassland workers have gone to such an extreme as Stapleton in the simplification of mixtures, there is nevertheless an indication that some are trending this way, and that species other than perennial rye-grass and white clover are regarded merely as incidentals to rather than necessary and desirable component parts of pastures. Such workers realize the shortcomings of a pure rye-grass + white-clover sward (although they do not realize them to the full) , and to set off these weaknesses advocate the sowing of other paddocks with other pure sowings or selected species, such. as cocksfoot, &c., dominant in a simple mixture. The theory behind this procedure is to provide variety and prolonged growth by having on the farm a series of paddocks practically of a one grass and clover association, each designed to cater for a particular season and a particular purpose.

If in the light of experience it has been found advisable to have dominant rye-grass, or dominant cocksfoot, or dominant any "other grass " paddocks, this objective surely. can be achieved by merely

increasing the quantity of the 'required species in the mixture, and there would appear to be no real reason for the use of almost pure sowings on this account. It is contended by some, that undue competition in a mixed pasture results in some species being entirely smothered,' but it 'is suggested that this smothering is not nearly as great or serious as some would have us believe. Frequently one sees a pasture **at** a certain season of the year dominant with a certain grass, while at another period some other grass or grasses are dominant. Then again the following, season conditions may be such that some individual grass that was thought not to have survived in the sward makes its presence felt on account of the peculiar conditions suiting its nature. It is quite conceivable, therefore, that in a mixed pasture certain grasses may be lying more or less dormant for long periods, 'merely waiting' for a suitable opportunity, through unusual conditions, to become prominent. Thus a mixed pasture provides a measure of insurance against abnormal conditions that cannot be provided for in pure or nearly pure sowings. The variation that a mixed pasture provides for stock is perhaps a more important factor than it is generally, given credit for. Levy(4) has stated, "Palatability, therefore, must be looked upon as a variable thing, and the palatability of a food will depend very largely on its relative mass in comparison to other foods." How then can we expect the palatability factor to be anything but unsatisfactory in a pasture 80 per cent. to 90 per cent. of which is composed of one variety of pasture-plant? The very unfavourable reports that are fairly common in Otago and Southland with regard to lack of palatability where certified rye-grass has been used can in most cases be traced back to pastures composed principally of rye-grass with 'very little of other grasses and perhaps clovers. This is only too obvious in those paddocks that have been sown down for seed-production where a pure sowing of rye-grass has been made. This may be an extreme illustration of the present-day simple mixtures, but nevertheless in these cases the degree of trouble lessens as grasses other than rye-grass and clover increase in the sward. On account of this lack of palatability in a pasture where rye-grass (or any other one grass) is dominant to a very marked degree, it is considered that in all probability 10 lb. to 15 lb. of certified rye-grass rather than 20 lb. to 25 lb. in a pasture mixture will develop into a general practice in the future, with other species being slightly increased to give the necessary seeding per acre. Probably if farmers in the far South sowed less certified rye-grass in the mixture than they have been encouraged to hitherto, much of the opposition to this class of seed would disappear. That there are authorities 'at Home holding this viewpoint is indicated, by Cruickshank(5), who states: "Wild white clover along with a suitable mixture of perennial rye-grass and natural grasses makes a pasture beyond comparison of those of fifty years ago. The seeds sown **were** generally 30 lb. to 40 lb., perennial rye-grass, only occasionally a few natural grasses; and 4 lb. to 6 lb. of clover. Now, by reducing the perennial rye-grass to, 14 lb. to 16 lb. and adding a proportion of natural grasses and 1 lb. of wild white clover, a marvellous change has been brought about." The greatest drawback, however, to the

sowing of simple mixtures in various paddocks for various purposes, 'and one that to my mind rules the system right out' as far as its practical application is concerned, is in the high efficiency of pasture-management that is necessary to obtain successful results. Farming efficiency on even our best-managed farms does not stand at a very high figure. Wilkins(6) in a recent book stated that, "American agriculture is only 11 per cent. efficient judged on the scale of most efficient methods, while the co-efficient of most European countries would be below 30 per cent." Granted that our most efficient grassland farmers have no peer in any other part of the world, their standard of efficiency would possibly be well below 50 per cent. This knowledge, that farming efficiency throughout the world is relatively low is no reflection on the ability of the individual farmer, but is rather an indication of the many and varied adverse factors of Nature that he has to contend with in his farming practice. For instance, seasons are by no means constant: if they were farming efficiency would possibly be brought to a very high standard. If spring definitely started on a certain date with a certain temperature, and this was followed at regular intervals by regular rainfall, with certain known temperatures, all of which in turn would produce a known quantity of grass, grassland farming could be worked out to a very fine art, and it would be within the 'reach of' every farmer to provide stock when and where it was required to deal with the growth, or conversely to grow the grass at certain times to suit the stock. In practice, however, growth and stock numbers frequently fail to bear the desired relationship, one with another:

Throughout Otago and Southland, as well as in many other parts of New Zealand, there are on certain farms pastures resulting from more or less pure sowings, as well as pastures put down with very general mixtures, and during the past autumn a fairly extensive survey was made of such pastures to see just what the position was with regard to production. Unfortunately, no farms working on the "one paddock one pasture type" system are known to be in existence, so that no fair comparison could be made; nevertheless the following data in connection with some of the pastures rather prove the value of the mixed pasture under efficient pasture-management methods.

Titipua Pastures.-These pastures are recognized as some of the finest pastures in Southland, and definitely come under the heading of 'mixed pastures. The mixture sown is somewhat as follows, quantities per acre being varied in some of the minor details at times: Certified perennial rye-grass, 25 lb.; Italian rye-grass, 10 lb.; timothy, 3 lb.; cocksfoot, 5 lb.; *Poa pratensis*, 1 lb.; *Poa trivialis*, $\frac{1}{4}$ lb.; white clover, 3 lb.; Montgomery clover, 1 lb.; yarrow, 1 oz.: total, 48 $\frac{1}{4}$ lb.

Most of the paddocks are dominantly rye-grass and white clover; but there exists in the sward, in varying quantities cocksfoot, *Poa pratensis*, timothy, brown-top, red clover, dogtail, fog, yarrow, *Poa trivialis*, and hydrocotyle. Incidentally, it is intended to increase the timothy sown in this mixture. These pastures are mixed pastures, they have a high carrying capacity, and fat lambs are got away with despatch. After seeing these pastures one is tempted to suggest that a

small quantity of brown-top should be included in all mixtures where sheep are grazed and where fat-lamb production is practised. It would be surprising to learn that Mr. Phillips's pastures at Marton, where over nine ewes to the acre are carried, are free of brown-top.

Winton Experimental Farm.-A five-year-old paddock that fattened nine lambs per acre off their mothers this season is principally a rye-grass-white-clover sward, but has also dogstail, timothy, cocksfoot, and red clover present in fair quantities.

Bowmar Bros., Gore, who are recognized in the district as very good farmers and whose production-figures are high, sow (in pounds per acre) : certified perennial rye-grass, 30 ; Italian rye-grass, 5 ; certified cocksfoot, 10 ; dogstail, 2 ; white clover, 2 ; Montgomery red clover, 2 : total, 51. The existing sward is roughly 50 per cent. rye-grass, 30 per cent. white clover, 15 per cent. cocksfoot, 2 per cent. timothy, 3 per cent. fog, dogstail, and weeds.

D. Gunn, Winton, is considered to be a progressive farmer whose pastures as a whole are very mixed and whose production-figures are high. One of his best pastures is dominantly brown-top, rye-grass, white clover, and dogstail, with a fair amount of *Poa trivialis*.

W. J. Cowie, Centre Bush, sows only rye-grass 33 lb., white clover 3 lb. per acre. Pastures are dominantly rye-grass, white clover, but contain a good deal of dogstail and brown-top and traces of fog.

W. Young, Drummond, considers his best paddock to be dominantly rye-grass, white clover, and cocksfoot, with some timothy and brown-top. On this paddock the cocksfoot is outstandingly good. This farmer sows (in pounds per acre) : perennial rye-grass, 15 ; Italian rye-grass, 5 ; meadow fescue, 10 ; timothy, 4 ; cocksfoot, 4 ; white clover, 2 ; alsike, 2 ; dogstail, 1 ; red clover, 2 : total, 45.

The position with regard to North Island pastures generally is known to be somewhat the same, production (and general satisfaction) being greater where a mixed pasture of good grasses exists. The one outstanding farm in Taranaki, where during the past season the production was almost 350 lb. of butterfat per acre, has pastures of a very mixed nature. In 1930, when production on this farm stood at 300 lb. per acre, the best paddock, when point-analysed, gave the following results (figures being hits recorded) : perennial rye-grass, 26.00 ; white clover, 17.25 ; cocksfoot, 5.50 ; dogstail, 2.50 ; *Poa trivialis*, 1.50 ; red clover, 0.25 ; *Poa pratensis*, 25.00 ; suckling clover, 0.25 ; *Lotus major*, 0.25 ; Yorkshire fog, 4.75 ; foxtail, 6.25 ; sweet vernal, 15.50. In the case of this pasture rye-grass and white clover represented 36 per cent. of the sward; and it is quite an open question whether any great increase in this figure would be any advantage.

All the pastures quoted, and they are just typical of hundreds of others, can be safely said to be mixed in character, and have been evolved under systems of management of a practical nature apparently suiting the conditions as they exist, and returning to the farmers concerned profitable and apparently satisfactory returns. Are these farmers to throw away the very real "substance" of the mixed pasture for the "shadow" of a system of grassland farming that is far from convincing, has not yet been proved, and, to the minds of many, lacks practical application.

In conclusion it should be made clear that the statements herein do not cover country where, owing to various factors, the establishment of a mixed pasture may prove difficult and unsatisfactory. It is recognized that there exist in New Zealand tracts of country that are suitable for only one or two species, and where these conditions exist such pure species or simple mixtures must be relied on almost in their entirety.

REFERENCES.

- (1) ARTHUR YOUNG : Farmers' Letters.
- (2) R. H. ELLIOT : The Clifton Park System of Farming.
- (3) PROFESSOR STAPLETON : The Improvement of Grasslands' by Seeds and Manures.
- (4) E. BRUCE LEVY : The Grasslands of New Zealand.
- (5) JAMES CRUICKSHANK : Changes in the Agricultural Industry of Aberdeenshire in the last Fifty Years. *Scottish Journal Of Agriculture*, April, 1936.
- (6) DR. O. M. WILKINS : Reshaping Agriculture.

DISCUSSION OF PAPERS BY MESSRS. E. B. LEVY AND J. M. SMITH.

Mr. *Stafford* : We cannot get the maximum efficiency by including rye-grass and cocksfoot in the same sward, because the earlier production of the rye-grass--i.e., throughout the spring period--swamps the cocksfoot and any other species to the extent that they cannot produce at their best at their proper growth-period. Therefore I advocate a rye-grass-dominant pasture, because in certain fields rye-grass produces early in the spring. Then there is a slump period for rye-grass : to cover that slump period in the summer, January-February-March, the farm should be so organized that certain fields are sown with cocksfoot--i.e., make a cocksfoot-dominant pasture to cover that minimum production period of rye-grass. If farms can be managed, and they are being managed, in that way, then we get the maximum efficiency from those farms, and the matter of supplementary fodder for the dry period does not affect the position to the same extent. It is assumed in this view that the clover content of the two types of pastures is kept to its proper height.

Mr. *Woodcock* : What is Mr. Levy's present attitude in regard to the bush-burn seed-mixture ? Mr. Levy has stated relative to deteriorated land in Taranaki, that certain species should be included in the original bush-burns as an insurance against times of depression or against lowered periods of fertility--e.g., brown-top, danthonia, and *Lotus major*. I think at present Mr. Levy, if sowing down a bush-burn on some of that harder country in Taranaki or the King-country, would include at least five species. Further, what is Mr. Levy's opinion of a pasture composed of paspalum, rye-grass, and white clover ? Mr. Levy practically said that the highest-producing pasture possible was rye-grass + white-clover. I think that a pasture composed of paspalum, rye-grass, and white clover always will outyield a pure rye-grass + white-clover pasture, in the North at least.

Mr. *Levy* : The claim for complex seed-mixtures is sound where we are dealing with the complexity of soil types and the complexity of ecological conditions, such as exist on bush-burn country. Where one is sowing a bush-burn embracing a great number of habitats, it is well to include in the seed-mixture, for the economy of sowing, a greater number of species, but after three or four years the species sort themselves out and are, in effect, pure and simple mixtures according to the habitat of the country--i.e., rye-grass + white-clover on hills ; cocksfoot where there is timber ; shady slopes running to brown-top. In sowing down bush-burns it probably is not advisable to use more than six or seven species, each species having a habitat to occupy. Relative to the paspalum + rye-grass + white-clover seed-mixture, if paspalum is associated with the rye-grass and white clover and the sward managed as a rye-grass + white-clover sward should be managed the paspalum in that pasture will not produce nearly as much as it would produce if that paspalum were in a special-purpose pasture by itself associated with clover and managed as paspalum should be managed. The two pastures--i.e., rye-grass white-clover and paspalum + white-clover--would produce more from the total farm than would result from sowing the paspalum, rye-grass, and white-clover together.

Mr. Flay : The final test is very largely what farmers can utilize to get the maximum net returns. In Canterbury, where they are sowing true perennial rye-grass along with red and white clover, they are not satisfied, and in some instances are actually going back to the Italian rye-grass for their fat-lamb and sheep production.

Mr. Hudson : Neither Mr. Smith nor Mr. Levy meant all they said ; they have generalized too much from the specific, and they themselves will be prepared to admit that. There is no doubt there are circumstances under which the simple mixture will prevail and circumstances in which the complex one will be very much better. Mr. Levy, in endeavouring to indicate the result of including additional species in an otherwise simple mixture, used data from Marton trials, and I am just a little afraid he may have conveyed the wrong impression. Differences which he cited as differences must be regarded as having no significance whatever. A point struck me about the criticism of the methods of the research worker : it was stressed that rarely, if ever, could the farmer exercise control at all comparable with research conditions ; but as farmers' practices range from ones approaching first-class grassland control to the worst control possible, how is the research worker going to carry out investigations under conditions which are really typical of those practised by farmers ? It is essential that he adopt such methods as are productive of first-class control or utilization of the particular pastures he is comparing. Mr. Smith's citation of Southland examples brings to mind that the behaviour of mixtures in one locality under one set of soil and climatic conditions is likely to be vastly different from that under other conditions.

Mr. Webster : I consider palatability of great importance. What value is quantity if one has not got quality ? If feed is palatable, stock will eat more than they will if it is unpalatable.

Mr. Hewitt : I have given up sowing Hawke's Bay certified rye-grass and use Sandon certified rye-grass. I found that my stock were not at all attracted by the Hawke's Bay rye-grass, and did not thrive as well as they had on Sandon rye-grass. I am wondering if it is for this reason : that my climatic conditions more nearly approach the conditions of Sandon than those of Hawke's Bay.

Mr. Galpin : I think the time is coming, and the farmers in the district are raising the point, when the measurement of results in pasture trials such as these under discussion must be done not by mechanical means, but through stock.

Mr. Hudson : Even though production may be measured by mechanical means, that production should be under the conditions of different systems of management of the pastures. Mr. Levy's figures are indicative of the production under the particular conditions.

Professor Peren : I am not at all sure that in this part of the world we are not actually losing through putting our ewes on these specialized pastures. The sheep may not do so well as if they had a wider range of feed. I am not sure that for stud sheep rye-grass and white clover are best. The time is long overdue when this question of palatability should be gone into.

Mr. Montgomery : How many differently constituted simple pasture-mixtures would be required on different classes of dairy farms and sheep-farms in different parts of the country ?

Mr. Abraham : Relative to Mr. Smith's remark that once-removed rye-grass in the South Island gave much better results than the rye-grass direct from Hawke's Bay, which he put down to poor germination, we have had the same results in Manawatu. I think palatability is hound up a good deal with climatic conditions.

Mr. Smith : The once-grown crops to which I referred were not so much crops that were sown and gradually became more palatable, but once-sown and harvested in Southland one year, and a crop from that harvested seed is grown in the area where germination trouble exists.

Mr. Marshall : I have instances in South Canterbury in which, where seed produced from mother seed sown in South Canterbury, was used, the feed of these areas was as unpalatable as that from the original seed sown. We must keep fertility up, and the palatability question will disappear.

Mr. Holford : Dr. Hilgendorf, nearly twenty years ago, advocated simple mixtures. What is a simple mixture ? Just two, three, or four or more species. The simple mixture from a farmer's point of view makes the pasture easier to manage than a complex mixture which allows certain latitude for certain periods. To my mind, the simple mixture simplifies management, rather than makes it more complex.