PEDIGREE PASTURE STRAINS AND THEIR MANAGEMENT

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The main reason for the committee asking me for this paper was to hear some information on Grasslands Division's new long-rotation ryegrass. At the outset let me say that although this new strain is still at the field testing and early seed multiplication stage, I am sure that in it New Zealand has another outstanding string to its agricultural bow. This ryegrass strain has been developed over the past 15 years or so by appropriate crosses between perennial and short-rotation ryegrass, with the selection emphasis towards the dense perennial ryegrass type of plant. In other words the effort has been to develop a perennial ryegrass with more palatability and with more winter growth than the true perennial. It is the final step in Sir Bruce Levy's concept of a series of true New Zealand ryegrass strains, from the Western Wolths, Italian, and true perennial to the rotation types suitable for different farming systems. These have all now been produced largely by the genius and painstaking green fingers of Dr Corkill and his team, which team is now led by his protege Dr Barclay. To me it is a classic example of how great a contribution to agriculture can be made by a small group of very high quality scientists provided with good assistance and facilities and knowing what they are looking for. Dr Corkill will, however, agree that the associated pasture and chemical studies at Grasslands, Plant Chemistry Division, and other research centres, and by extension workers and farms throughout the country, have all added their more indirect help, even if only in defining merits and demerits of the various models, and thus in assisting the plant breeder in his clarification of breeding objectives.

This closely integrated programme between field, laboratory, and the plant breeder over the past 30 years has resulted in a continuing pattern of pasture plant improvement in New Zealand, with the objectives always in view of plants useful for actual pasture in the particular, and indeed somewhat unique, farming system of New Zealand. Essential features of this farming system include continued outdoor grazing on hill and lowland, high continued pasture productivity due to climate, plus our national programme of soil fertility increase, low use of artificial nitrogen because of our excellent clover nitrogen potential, specialised seed production areas, but not very extreme regional specialisation of farming systems at the high production levels.

Thus the basic aims in our pasture plant improvement have been in terms of greater and better spread of production under actual grazing, high palatability at all growth stages, disease resistance, good herbage production even in the specialised seed production areas, and, for simplicity in the seed trade and certification system, a strong bias towards national rather than regional strains. It is thus of considerable interest that while short-rotation ryegrass was originally produced to replace the old Canterbury ryegrass used there in its 4-year rotation of crop and pasture, the strain has also proved of tremendous value all over the country. Likewise the original concept (and the name) of long-rotation ryegrass was to provide a better ryegrass for the lo-year rotation of Southland. Personally I can't quite follow the concept of a grass plant that would live for four or for ten years, as one would expect such plants to be perennial if they survived a couple of flowerings; except for susceptibility to sporadic disease, or a pasture deterioration under a pattern of deterioration in soil structure, soil fertility, weeds, or heavy stock traffic, and these last can be checked by appropriate farm management. Whether I can follow the original concept or not is, however, a matter of small moment. The significant point is that our long-rotation ryegrass so produced *is* doing extremely well in Southland and will undoubtedly be used to a great extent there. But it will have to perform remarkably well there to displace short-rotation ryegrass, as this strain also does very well indeed in their long winter and moist summer and autumn. But long-rotation ryegrass is also really proving outstanding on our other extremes of soil and climate, on the dry and sandy areas, and also in this warm north. In these areas its better winter growth than perennial, and its much better (to date) summer growth and persistence (even with Argentine weevil present) than both perennial and short-rotation, make it of obvious greater value. Indeed my general impression so far is that it is not very far behind paspalum in its summer growth, and of course well ahead of it at all other seasons. But we have to do much more farm and field trial on this strain before we finally offer it to the Department of Agriculture certification, scheme. However, we are doing preliminary multiplication for pedigree seed supplies as well as for wider scale farm trials, as so far we have had only minor worries related to some slight summer scouring in lambs and also some frost-burn under lax winter management, You will agree that this new strain thus offers plenty for discussion at this stage, but let me summarise at this point by saying that it is a strain with plenty of the herbage growth attributes we are- all looking for, and it also has plenty of "body" or "guts" in its tillering and recovery ability to stand up to the required

corollary of very heavy stock traffic in utilising its high productivity throughout the year. Its relatively high palatability should fit it well with associated clovers.

At this stage it is, however, of interest to consider in brief all our pedigree strains, their use, and their particular attributes, needs, and limitations.

Such is always essential in considering a new strain for correct perspective. It is also particularly appropriate at present, for as you know this year is the "Better Seed Year" of FAO, which organisation has done and is still doing so much to further better seed quality and appropriate species and strains in most of the world's underdeveloped countries. Our situation in New Zealand as regards pasture seed is of course now very good, with, a first-class seed trade operating for the most part only on seed certified by the Department of Agriculture, and this in turn based on strains bred specifically for our own special requirements. Over 85 per cent of pasture seed now used in New Zealand is New Zealand certified, and most of the balance contains much seed of certified origin, Indeed it is now very difficult for us at Grasslands to find seed of the old uncertified types for our comparisons, and in fact we now have to use different bases for certification testing. As a country too we are also contributing greatly to overseas countries by our large' export of certified seed. At the same time we are of course earning a tidy sum of overseas exchange from such sale. However, though I can partake of our national feelings of virtue or of financial gain from such seed export, I cannot but wistfully think how much more sensible it would be if we used much more of this seed in our own country. There is certainly plenty of scope for its greater use in New Zealand, which scope is easily seen by even a most cursory glance around any of our lowland or hill areas. Yet we resow only about 2 to 3 per cent of our pastures each year, while we export enough certified seed to sow about a like area. One cannot help wondering what our national reaction would be if we exported an equally large proportion of the bull semen from our Dairy Board centres because we were too slow to use such improvement potential in our own herds. It is certainly in sharp contrast to our increasing national preoccupation in processing all manner of industrial raw materials, even though many of these latter pursuits cost the country quite a lot in protections of all sorts. However, I know there are many reasons for the relatively slow rate of incorporating our pedigree strains into our New Zealand pastures. There is undoubtedly much greater output possible from many of our present pastures; in some cases (for

example, on some areas near Mangere) our strains of perennial and short-rotation ryegrass have not so far proved superior to the local strains; finance and labour restrict greater pasture improvements in many cases, and there are also naturally many cases of general disbelief in the whole business of pasture and soil improvement, as well as simple inertia. But of equal importance is the fact that there have been some disappointments with new pastures of these pedigree strains as a result of poor management adjustments to the greater growth potential and to particular needs of the new strains. I am reminded at this point of an opinion given to me by a golf professional that it is not much good using a high quality golf ball unless it is hit very hard; for the light hitter he thought the more humble type was perhaps more useful due to its softer nature. He also mentioned to me, rather pointedly I thought, that it is necessary to hit with correct timing as well as with adequate strength.

To me it is somewhat similar with the management of our pedigree strains. They have to be hit hard and firmly, with soil fertility and with stock. But they also have to be hit correctly; with the correct fertiliser, with the correct soil moisture, and at the correct time of year, from sowing right through to final pasture or herbage crop. Essentials to keep in mind are the balance between grass and clover, between holding enough herbage leaf cover for full photosynthesis, but not so much growth as to cause undue internal shading, or to develop into unpalatable tough herbage, the balance between the appropriate close cover to give some grass grub control at the beetle stage, and finally the very tricky balance of seasonal animal treading to keep out weeds and weed grasses such as fog, browntop, and *Poa trivialis,* but not sufficient to punish too much the soil or the desired ryegrass, white clover, timothy, etc. This is of course essentially the key to why high production pastures go to ryegrass and white clover in New Zealand; and by contrast the reason it is so essential to keep the stocking right up to the growth potential of these new strains. And thus, I think a main reason for many disappointments with our new strains is simply that they are not stocked up to their full growth potential with appropriate seasonal adjustments for balance between grass and clover. The invasion of *Poa trivialis* and Yorkshire fog into many pastures is in most cases a reflex of insufficient winter carrying in a too extreme policy of saving feed for early spring, plus, of course, any low winter competition from either poor ryegrass and clover strains or soil fertility defects.

In relation to pasture management a few points on our pedigree strains may give leads to their requirements and limitations in the field and also will illustrate our aims in each programme.

White Clover

Has high productivity and high nitrogen fixation. Adaptable growth form including tolerance of the tall summer grass competition. Because of its high prussic acid content has medium herbage palatability to stock, but this also acts as deterrent to slugs at the seedling stage. Species has high summer temperature tolerance, which can thus lead to its dominance in association with the ryegrasses, especially short-rotation ryegrass with grub and weevil about. Our present work on this strain is towards greater winter growth, using new plant material from the western Mediterranean.

Red Clover

The broad red or cowgrass has much greater and larger spread of growth than the uncertified types, while our Montgomery is persistent and has strong late summer production even under hard grazing on dry situations. Both strains are more tolerant of competition at the seedling stage than white clover. Both strains are also highly palatable to stock, and thus present strong bloat hazard requiring preventive action. Characteristically the red clovers do not pass nitrogen directly to the associated grasses, but only through the grazing animal, in contrast to the white clover, which functions both ways.

Cocksfoot

Has much more winter growth and less "burn", more palatability, and greater overall growth than the uncertified types. Limitations of this species are its slow establishment in autumn seedings, and its low tolerance to heavy animal grazing; it is more resistant to grass grub than the ryegrasses.

Timothy

As for our pedigree cocksfoot, has more growth than the uncertified, especially in winter. Unlike cocksfoot, however, it stands up well to heavy winter treading and is also much more palatable at tall growth stages, even the seedhead itself. Very slow establishment, especially in autumn seedings.

Ryegrasses

Series ranging from short-lived, bulky growth of Western Wolths, useful as a winter catch crop, Italian likewise, but giving two useful years, and short-rotation ryegrass, a virtual perennial under high fertility and with grazing focused on somewhat heavy winter but lax summer defoliation. All these strains are highly palatable, with low leaf breaking strengths at all stages, including the seed head, rapid establishment from seed, and all more tolerant of traffic than say cocksfoot, fog, or red clover. Difficulty is in

terms of low tolerance to summer heat, to grass grub and Argentine stem weevil, and also to excessive summer defoliation, particularly from the tall seeding stage. These strains can also cause difficulty by their excessive competition to clovers in autumn sowings, particularly with high initial soil nitrogen (sowing grass to grass rather than through a crop), tall growth between defoliations (9 in. instead of 3 in.), heavy rates of grass seed sown (40 lb instead of 15 lb), and also uncontrolled use of artificial nitrogen.

Our pedigree strain of perennial ryegrass is still, with white clover, our major high production "bread and butter" grass all over the country, due to its higher productivity, greater rust resistance, greater winter growth, and ability to take all sorts of grazing and cutting punishment. Difficulty occurs from its relatively rapid increase in toughness (or leaf breaking strength) with increase in leaf age; its seedhead; and also grass grub is quite partial to it. However, experience in field trials and from farm observation suggests that considerable grass grub control can be obtained by keeping such ryegrass and white clover very hard grazed during the period of beetle flight.

You will thus appreciate how excited we are at Grasslands about our new long-rotation ryegrass. From our preliminary trials it looks as though we have in it most of the best attributes of the perennial and the short-rotation, and thus it should give us that extra growth and extra animal carrying and feeding, and thus the extra flexibility we are always seeking. But I am sure that we will still have to use common sense and continued attention to soil fertility, insect control, and grass and clover balance to get the best out of it.

We at Grasslands, although appropriately upset about the slow rate of pasture improvement in New Zealand, are also far from being complacent about our own work and our present improved strains. We are steadily working on all the strains mentioned, not only in trying for major seasonal growth and feed quality improvement, but also in continually tidying up the breeding backgrounds and the many parents involved. We are also exploiting the potential of new techniques, of polyploidy of induced mutations, and of embryo culture for production of fertile hybrids between incompatible species. For example, *Lotus corniculatus* and *Lotus ulignosus,* tall fescue, and the bromus group, including prairie grass, are all under exploratory improvement programmes, while paspalum and kikuyu are likewise being studied. Such a continuing programme in field, laboratory, and farm should continue to produce dividends.