

THE VALUE OF STRAINS OF RYEGRASS IN CANTERBURY.

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Canterbury is recognised as one of the main cropping areas in the Dominion and the climate and soil conditions are particularly suited for this type of farming. Nevertheless, the greater part of the land is in pasture. Of the $2\frac{3}{4}$ million acres of cultivated land, $1\frac{3}{4}$ million acres are in grass over two years old, and about $\frac{1}{4}$ million acres are sown down in new grass each year. Cereals and pulse crops occupy about $\frac{1}{2}$ million acres and fodder crops about $\frac{1}{4}$ million acres. The $\frac{3}{4}$ million of crops are sown in rotation with pastures which remain down from 2 to 10 years or so, and the young grass is sown at the end of a cropping programme. Fat lambs are the chief source of revenue from the grazing of the pastures. Owing to climatic conditions these pastures fail to provide the necessary ~~at two~~ periods; namely in winter and early spring as a result of low temperatures, and in summer and early autumn as a result of drought. It is necessary, then, to provide the supplementary feeds for, these two periods. Turnips, hay, chaff, greenfeed, oats and Italian ryegrass for the winter and early spring, and greenfeed, rape, soft turnips, etc. for summer and autumn periods. These supplementary feeds are essential, but they are costly to grow so that any feed which can be secured from pastures at these times will lower the cost of producing supplementary feeds and will be more valuable than a heavier production during the periods when feed is plentiful.

Variations in the type of farming in Canterbury on the different classes of land and on different farms on the same class of land are frequent. One farmer might run a grazing farm, another a cropping farm, but the majority are engaged in mixed farming and can increase or reduce the grassing or cropping as the market conditions indicate. This is shown by the correlation between the number of sheep and the area in grass. For example let us compare the two seasons 1932-3 and 1933-4. In the latter season there were 450,000 more sheep in Canterbury than in the former season. This increase was associated with an increase in grass area as follows:- old pasture, 56,000 acres; new grass, 49,000 acres; while 28,000 acres less seed (grass and clover) and 15,000 acres, less hay, were cut. In addition to the extra feed from pastures there was an additional 14,000 acres of fodder crops. Cropping was reduced by 50,000 acres. This means that many of our pastures in the cropping district must be capable of remaining for several years in a productive condition when profits from lamb and wool are greater than the profits from cereal growing, i.e. the dominant species shown in a mixture should be permanent ones. When a period of profitable cereal cropping arrives the farmer will then be in the position of having to make a decision as to which of his pastures he will plough up rather than in the position of having to plough up a field because there is no grass on it, and it needs little imagination to visualise the better crops which will be obtained when a good turf which has been well stocked be ploughed under than when a bare open caked surface be turned over. One is well aware that other factors such as management, manuring and climatic conditions will all have their

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effect in making a good pasture, but unless the foundation of perennial plants is there, a satisfactory long lived pasture cannot be secured.

Perennial ryegrass can occupy the dominant position in most permanent pastures on the medium and better soils where it persists and its production is influenced by rainfall and management. It shoots to seed readily on the approach of dry weather and remains in a dormant state until conditions again favour growth. On the light plains it does not satisfy the requirements of a permanent pasture after the relative high fertility associated with fodder crops and cultivation has reached normal in two or three years. The rapidity with which these soils dry out and their low moisture holding capacity make conditions too severe for permanent productive ryegrass pastures. For long term pastures on this class of land cocksfoot should form the dominant constituent in the mixture.

It is at this stage that the question of "strain" in perennial ryegrass can be introduced. Some years ago it was the general experience that perennial ryegrass would not hold for more than a year or two on many areas in Canterbury. Dr. Hilgenborg, when he commenced work on grasses, drew attention to the fact that, in Canterbury, it was not so much perennial ryegrass that was at fault, but the strain of ryegrass used. He grew plots of the ordinary commercial ryegrass alongside plots of ryegrass harvested from a field which had been in grass from 45 to 50 years, and at the end of two years about 90 per cent of the plants from commercial seed and 5 or 6 per cent of the plants from the old pasture had died. Mr. Levy, at Palmerston North, grew a comprehensive series of commercial lines of ryegrass from throughout New Zealand and he showed that the only lines of true perennial which were being harvested and sold on the market came from old pastures in non-cropping areas, chiefly from Hawkes Bay, with the result that these lines now occupy the pre-dominating position in the Department's Certification Scheme which was started as a result of these trials.

What is the origin of these temporary strains? Among the crops that are frequently grown in Canterbury is Italian ryegrass. Sown in summer or early autumn, it provides valuable autumn, winter and spring greenfeed for ewes and lambs when pastures are dormant. After the flush of other feed arrives it is shut up for seed. From 10-15,000 acres of Italian ryegrass are so used each year. This, in itself, would probably not have been detrimental to the perennial strain of ryegrass, but in addition to its use as a fodder crop, a small amount of Italian was often included in the rotation pasture mixture with the object of providing the valuable winter and early spring grazing. These pasture mixtures were predominantly perennial ryegrass and, when conditions warranted, they were shut up for seed. The seed crop, especially in the first year, would contain a percentage of Italian ryegrass in it. If this mixture were only a mechanical one, and was purchased with this knowledge, no harm would result, but experimental work has shown that the two species, Italian and perennial ryegrass, are readily cross pollinated, with the result that, in addition to a mechanical mixture, we get a biological mixture. Frequently this complex mixture was sold as perennial and was included in a pasture mixture together with a bit more Italian, and so

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the process went on for some generations until many of the lines were predominantly Italian or Italian hybrids. They were temporary in nature and contained a small percentage of perennial plants according to the number of generations that they were exposed to Italian contamination.

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In the first place true perennial ryegrass is long lived under a long range of soil and management conditions and should form the basis of mixtures for the rotation pastures of from 2 to 10 years or so on medium to better class soils. The temporary strain thins out after the first year or two and low production grasses such as browntop, sweet vernal, fog or Danthonia establish... on the bare spaces and soon gain possession. The widespread occurrence of these and other pasture weeds on many areas of cultivated land is mute testimony of the temporary nature of the sown species. The temporary strains, owing to their Italian "blood," produce earlier and more palatable grassing, and this superiority may last for a few months; but after the first autumn, a high percentage of the plants die, so the strain is not at all suited for the long term pastures. For one or two years grazing on all soil types supplying the autumn, winter and spring periods, the Italian and red clover mixture is supreme. The occupation of the sward by the true perennial ryegrass under good management gives a higher carrying capacity than a sward dominated by the low producing, but long lined browntop and Danthonia, and this in turn means higher fertility when the pasture is broken up for a period of cropping. The treatment which perennial rye gets is responsible for its behaviour and many pastures are ruined by overgrazing at critical periods. This applies particularly to the pastures of the light shingly plains. During dry periods the perennial rye dries up or shoots to seed and unless there are supplementary feeds available, the pastures are of necessity, heavily punished by overgrazing. This period of overgrazing, during drought weakens the plants and those that do not die are unable to grow vigorously when conditions do favour growth.

The question of palatability has been prominent in reference to the perennial ryegrass. There is no question that it is less palatable than Italian or than the "mixture" with which it has so often been compared to its disadvantage. When badly managed, the unpalatable nature can be so emphasised that sheep will not eat it and go back in condition. Under good management, however, it forms the basis of a palatable pasture on which sheep thrive. Most of the criticism against perennial ryegrass has fallen on those pastures which were sown with pure ryegrass for seed purposes, those which had become rank before grazing, or those which had been cut for seed and the dry-aftermath grazed. Another condition which accentuated the unpalatable nature was the practice in cropping farms of sowing the grass in the autumn after one or two cereal crops. Under these conditions the fertility is relatively low, the soil is dry and the tilth is poor, with the result that autumn growth of grass is slow, and the plants are fibrous and lack vigour. This pasture will remain poor and unpalatable for two or three years, while one sown on a fertile and well prepared seed bed will be high producing right from the start. Palatability is important for, after all, the feed is grown for the stock and they eat less of an unpalatable food and consequently do not thrive. Therefore,

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every effort should be made to keep the grass as palatable as possible by sowing suitable mixtures, by grazing reasonably short and by sowing under high fertility conditions.

There is another factor which must be taken into consideration and that is the effect of competition of perennial rye on its associate plants in the mixture. Perennial ryegrass is an aggressive plant, not only in the first year when it is severe, but also in succeeding years to a less extent. This aggression is the result of its relative rapid growth on a cultivated seed bed, its strong growth under stocking, i.e., and the thickness of seeding which is usually applied. It thus competes with other plants in the mixture - cocksfoot, red clover and white clover, which are slower to establish. The effects of this competition are not so marked when the mixture has been sown in November, December or January, because the slower established plants, though checked, are not killed and after some autumn grazing and dry weather has checked the ryegrass, they are enabled to become sufficiently well established to survive the winter and later contribute to the feed supply. When, however, the mixture is sown in late February, March or April, as is commonly done in cropping areas, the checking of the cocksfoot and clovers is responsible for their slow development and the clovers are hardly out of the three leaf stage and the cocksfoots are only small plants when the frosts come. In this stage they are subject to frost lift, more especially when the ground is wet. In order to make conditions as favourable as possible for the other plants sown in a mixture with perennial ryegrass, early sowing should be practised and the young pastures should be judiciously grazed to prevent a smothering growth of ryegrass.

CONCLUSION: The true perennial ryegrass strain is a long lived perennial and should form the basis of all long term pasture mixtures, on all but the lightest and driest soil types, while the temporary type, which is not ^{perennial} ryegrass at all but a hybrid mixture, is short lived, and should be omitted from all long term pastures. There is a difference in palatability between the two, but the lower palatability of the true perennial can be minimised by sowing well proportioned mixtures, by encouraging rapid growth and by keeping the grass grazed to prevent it becoming tough or fibrous. The severe competition exerted by perennial rye is responsible for a deficiency of ~~these~~ plants in a pasture but this can be minimised by early sowing and by grazing to prevent the ryegrass developing a smothering growth.