

# Lincoln College

CANTERBURY AGRICULTURAL COLLEGE

SCHOOL OF  
AGRICULTURE



UNIVERSITY OF  
NEW ZEALAND

FOUNDED 1873

## \* RURAL EDUCATION BULLETIN



Vol. 2 No. 6

JULY 1947

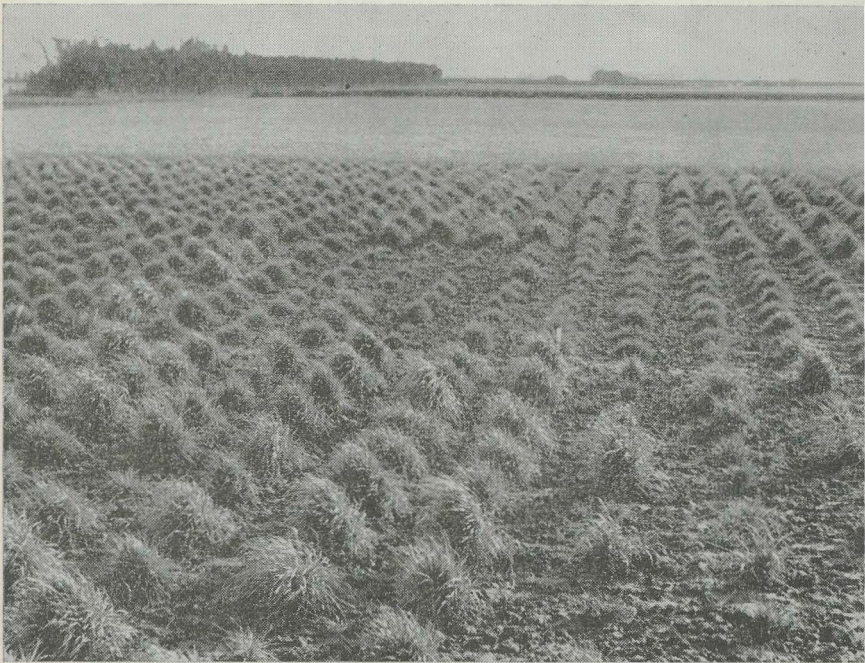
### CONTENTS

The History of Strains and the Certification of Small Seeds in N.Z.	2	Yarrow	- - - - -	13
Further Education for Adults	- 10	Recent Publications	- - - - -	14
		Some Effects of Allimatization in New Zealand	- - - - -	15

# THE HISTORY OF STRAINS AND THE CERTIFICATION OF SMALL SEEDS IN NEW ZEALAND

J. W. Calder, M.Sc., B.Ag., Assistant-Director

A revolution has been occurring in Agriculture over the past 20 years. Throughout the English speaking countries the present generation of farmers has awakened to the importance of the pasture in a system of mixed farming. From the experience of the past agriculturists had learned that the land is rested and recuperates during the period it is down in pasture but the lesson had not been well learned and it was often the practise to let the land develop into grass by an easy method. Sometime the pasture mixture was sown after the last crop was harvested; sometimes the pasture mixture was sown with the last crop—be it a cereal or a forage crop and often the land was allowed to drift down to grass as best it might. Grass was not thought of as a crop. The principles underlying the power of a pasture to restore the fertility of the land and the principles of pasture



Strain investigation in ryegrass at the Grasslands Division Sub-station at Lincoln.

establishment and management were not widely known, or where known, their significance was not fully appreciated. Even less than 20 years ago it was almost universally held that a ryegrass pasture would not last for more than three years in Canterbury. An associated belief was that lime was of little value and that applications of super were worth while only on wheat, turnip and rape crops and that there was no need to sow white clover which developed naturally in "good" clover years. Today we have an entirely different situation. Ryegrass pastures mostly remain good for several years (except where the grass grub cleans them up); white clover is regularly sown; lime is used extensively at rates of 1 ton per acre and is regarded as essential for good pastures, and super is commonly used annually at the rate of 1 cwt. or more per acre on improved grasslands. Pastures are looked upon as a crop and considerable care is taken in methods of establishment and management. In other words, the farmers on mixed cropping land have become pasture conscious.

There have been a number of factors working together which have been responsible for this change in outlook. One of the earliest was the recognition of the existence of different strains of the major pasture plants and the extensive utilisation of those strains which had proved to be superior to others when thoroughly tested under field conditions.

## EARLY HISTORY OF VARIETIES OF PASTURE PLANTS

Before I discuss the story of the recent development of strains of pasture plants it will be interesting to review the early history of ryegrass in England. Ryegrass was first used as a sown grass about the middle of the seventeenth century. In Dr. Plot's "*Oxfordshire*," published in 1677, he says, "They have lately sown rye-grass, by which they improve cold, sour, clay-weeping ground for which it is best, but good also for dry upland grounds, especially light, stony or sandy land. . . . It was first sown . . . by one Eustace, an ingenious husbandman of Islip who, though at first laughed at, has since been followed even by these very persons who scorned his experiments." It continued to make good progress in the opinion of farmers during the 18th century. "The repeated sowing, however, of ryegrass seed from the first crop by earlier growers resulted towards the end of the last century (1790 approximately) in the prevalence of a short lived variety afterwards termed "annual ryegrass" and unfit in many cases for laying down of land to two or more years' pasture, which naturally directed attention to the selection of a more lasting variety.

Accordingly we find that this desideratum was soon supplied by Mr Pacey, of Northleach, whose perennial rye-grass, as it is still called, has since become known throughout the whole country." This account was published by John Wilson (1) in 1859, over 88 years ago and you will recognise that when the story of rye-grass in New Zealand has been told, a similar phase has been passed through in New Zealand. Pacey's work stimulated others to select and grow other varieties with special characteristics and John Wilson, in 1859, recorded the following important varieties established in England: Scottish Perennial, Common Perennial, Evergreen, Molle's Orkney or Pollexfen's, Pacey's Russell's, Spreading, Stickney's, Thickstalked, Whitworth's, Holstein, Broad-spiked etc. In New Zealand, in the early years of this century ryegrass from certain districts was recognised by merchants to be superior in persistency. Of these, Maniototo ryegrass had a short-lived fame. In later years, just before the introduction of strain work in New Zealand Sandon ryegrass, Poverty Bay ryegrass and Hawke's Bay ryegrass had a similar reputation but were not officially recognised.

### **MODERN STRAINS**

Sir George Stapledon, first director of the Plant Breeding Station at Aberystwyth in Wales, was the pioneer of the modern work on strains in pasture plants. In 1928 (2) he published the results of his analysis of cocksfoots collected from different locations over a number of years in the British Isles. His interpretation of his material was inspired by the work of Turesson (3) who in 1922 had published an account of variation which he had found to exist in a number of European species of plants. He reported that a population of plants of a species such as the common plantain, growing under one set of environmental conditions differed in certain hereditary characteristics from a population growing under other conditions. He called these different forms or varieties "ecotypes." Stapledon applied this concept to his cocksfoot collections and established the existence of various ecotypes in cocksfoots. He proposed that these ecotypes had developed as a result of the conditions under which the cocksfoot had been growing for a considerable number of generations. Thus, from the old fattening pastures of Leicestershire he isolated the "dense pasture" ecotype and from the meadows and hedges the "hay" ecotype.

### **STRAIN IDENTIFICATION IN NEW ZEALAND**

In 1928 (4) Hilgendorf published the results of some preliminary studies he started in 1923 by collecting plants of

ryegrass and cocksfoot from different localities in the South Island. Considerable variation was exhibited between different collections from different fields. Within the collections there was also considerable variation. A leafy selection of cocksfoot from this material known as "C23" formed the basis of a strain of Pedigree cocksfoot which has been distributed from Lincoln College under certification for a number of years. In 1929 Levy and Davies (5) published the results of an analysis of all commercial lines of ryegrass seed in New Zealand. They classified the ryegrasses into five types ranging from the true perennial highly productive types (Type I) most of which came from the permanent grasslands of Hawke's Bay, to the temporary types which had developed in the arable farming districts of the South Island. (Type V). True perennial and annual types were shown to exist. It is here that we have a recurrence of the conditions which were recorded in England for the end of the 18th century by Wilson in 1859. In the South Island particularly it had been the practice to sow pasture mixtures with something like 25lbs of perennial ryegrass and 5 to 10lbs of Italian ryegrass, sometimes with clover, but often without clover where white clover was thought to be in the soil. In many cases a crop of seed was taken at the end of the first year and the seed was harvested and marketed as perennial ryegrass. After several generations of this practise the perennial ryegrass of commerce consisted of a complex mechanical and biological (as a result of hybridisation) mixture of Italian and Perennial ryegrasses. Many of the lines were palatable and productive for the first year but subsequently died out and left the ground bare for weed infestation of one sort or another. Hawke's Bay ryegrass which had been identified by Levy as a highly productive persistent strain (or ecotype) became extremely popular for permanent pastures. The strain might well have lost its identity (as did Pacey's) had not some earmark been agreed upon and given to these superior strains. This earmark was provided through the establishment of a certification scheme for pasture seeds. A certification scheme had been operating for potatoes since 1927 and it was quickly adapted to suit grass and clover seeds. Hadfield (6) describes the inauguration of this scheme in 1929. During the eighteen years the scheme has been operating it has been modified to suit changing conditions but it has been the main factor in retaining the identity of the various strains which have been developed by grassland workers in New Zealand.

The importance of the early strain work in New Zealand was recognised by the Department of Agriculture and in 1929 the Plant Research Station was established in Palmerston North with Mr E. Bruce Levy in charge of the grass breeding work. In 1936 the Department of Scientific and Industrial Research took over the research activities of the Plant Research station from the Department of Agriculture and the Grassland Division was established at Palmerston North with Mr Levy as Director. The Grassland Division has developed certified strains of Perennial ryegrass, Italian ryegrass, white clover, Montgomeryshire red clover, broad red clover, brown top, etc., by isolating the better regional strains of these plants. Certain fields of proved quality were certified and the seed from these areas was certified as "mother seed," "permanent pasture" or "commercial," according to certain standards.

### AIDS TO STRAIN IDENTIFICATION

In the course of this work it was found that certain physical and chemical tests applied to *germinating seeds* could be of considerable value in the identification of strains.

#### 1. The U-V test for Ryegrass

The first to be used was the *Ultra-Violet light test* for ryegrass. Foy (7) in 1931 describes the origin and method of this test. Gentner in Germany discovered that the roots of germinating Italian ryegrass on white filter paper excreted a substance which reacts with the filter paper and causes a fluorescence when subjected to Ultra-Violet radiations, whereas the roots of perennial ryegrass do not. Lineham and Mercer in Northern Ireland attempted to apply this test to distinguish commercial lines of seed without success. When the test was applied to the certified strains of Perennial and Italian ryegrass recently established in New Zealand it was found to be extremely reliable and was adopted by the Seed Testing Station for classifying lines of Perennial ryegrass. Previously lines of ryegrass were classified as a result of plot tests of individual plants. The U-V test, as it became known, ultimately replaced the plot test for the lower grades of certification. The technique of the test is fairly simple and consists of germinating four, six or eight lots of 50 seeds on filter paper. After 6 days the filter paper is placed under ultra-violet radiation from an U-V lamp or from filtered sunlight. There is a negative reaction from perennial ryegrass but all the roots of Italian rye grass and some or all of those from hybrid seeds exhibit the violet fluorescence. Certain standards have been set for the different grades of certified seeds and thus a considerable amount of time-consuming plot work has been saved.

## 2. The Picric Acid Test for White Clover

The second is a chemical test used to distinguish between the different grades of certified white clover. Foy (8) described the technique which is based on work by Doak who showed that the higher grades of certified white clover contain a higher percentage of HCN than the lower certified and the uncertified white clovers. The technique is fairly simple. Seed of white clover to be tested is germinated and on the eighth day, when the cotyledons are dark green, fifty seedlings are taken and placed in the bottom of a test tube. Two or three drops of toluene or chloroform are then added to kill the seedlings. A strip of filter paper dipped in a solution of picric acid (1 gr. picric acid; 10 grams sodium carbonate, 200 cc water) is inserted and held in the tube by a cork. The tubes are then incubated for 48 hours at 30°C. At the end of this period the amount of HCN liberated from the seedlings is indicated by the change in colour of the picric acid paper. The original lemon colour changes to a dark brown with increasing amounts of HCN liberated. Certain colour standards have been adopted for the different grades of certified seed and the test is used extensively in the classification of white clover seed lines.

## BREEDING IMPROVED STRAINS

During the course of strain work at the Grassland Division thousands of lines of seed were tested in single-plant plot trials. The best lines were graded in the highest grades of certification. Within the best lines there was considerable variation between the individual plants. Some were better than others in regard to their agronomic characterisation—growth form, leafiness, resistance to rust and other leaf diseases, palatability and so on. The details of breeding improved strains from the best plants vary but a general scheme such as the following is usually adopted: The best plants are selected for breeding purposes and planted out in isolation (either in glasshouses or other isolated position) and allowed to breed together or hand-crossing is practised. The seed from each plant in the isolation block whether open or hand crossed is harvested separately and planted separately so that a study can be made of the progeny of each plant. Those plants which produce good progeny are retained while those which produce inferior progeny are culled. By this process of selection and progeny testing improved pedigree strains of most of our pasture plants have been developed. They have been widely grown in New Zealand and have been exported to Australia and England where they have proved their superiority over the common "commercial" strains.

The Grassland Division has also developed a new grass—a cross between Italian ryegrass and Perennial ryegrass—in which the proportion of Italian and perennial “blood” is carefully controlled and standardised. This grass has the palatability, earliness and high productivity in the first year of Italian ryegrass and some of the permanency and productivity of perennial ryegrass. It has become extremely popular in the mixed farming districts where a short rotation pasture is required to fit in the rotation. It is called H1, or Short Rotation ryegrass. This is the first instance where a new grass has been deliberately bred by crossing two different but closely related species and could well be given a botanical name of *Lolium hybridum*, or *Lolium italperenne*. (Levy.)

Grassland workers in England and Australia are fast following up with similar work and the pedigree strains developed by the Aberystwyth Plant Breeding Station are proving as popular with the English farmer as are the New Zealand pedigree strains with the New Zealand farmer. The Australian plant breeders are likewise developing improved local pedigree strains. Both these countries, and Denmark in addition, are also growing our pedigree strains for their own use and for export. The workers in New Zealand have done a great job in developing strains of high quality which are accepted in the world's markets and our retention of this market will depend on our ability to retain the lead we hold and on the efficiency of our seed production methods.

## CERTIFICATION OF PASTURE PLANTS

Owing to the fact that seed of superior strains cannot be identified on appearance the chances that they would lose their identity through ordinary commercial channels was recognised. Certification of superior strains of farm seeds had been operating in Canada and in other countries prior to 1929 and the Department of Agriculture had been operating a scheme for the certification of disease-free, true-to-type varieties of potatoes. The value of such a scheme applied to pasture seed was recognised and in 1929 the scheme was commenced. It has been modified to suit changing conditions and has now been designed to include the pedigree strains produced by the plant breeders and succeeding generations of seed as well as natural strains. The general scheme is similar for most kinds of pasture plants but modifications are introduced according to the particular species concerned. The first line of seed produced by the

plant breeder for propagation on a field scale is called *Nucleus seed*. This seed is grown by farmers on contract to the Department of Agriculture.

The produce of *Nucleus seed* is called *Government Stock seed*. The Department of Agriculture distribute the stock seed proportionately to the different seed growing districts. It is allocated to farmers through merchants in consultation with the local Instructors of Agriculture who take such factors into consideration as suitability of the area, freedom from weeds, experience of the farmer, equipment available and previous allocations.

The produce from areas sown with *Government Stock seed* is the farmers' own seed and is graded as *Government Pedigree seed* if it maintains certain standards of purity and quality. *Government Pedigree seed* is sold through the ordinary commercial channels.

The produce of *Government Pedigree seed* is graded as *Mother seed* if it reaches certain standards of purity and quality. *Mother seed* is the highest grade available for export and is used extensively for sowing grazing pastures in New Zealand. There is one other grade for most grasses and clovers. In the case of Perennial Ryegrass, White Clover, Red Clover, Cocksfoot, it is called *Permanent Pasture*, while with Italian Ryegrass, the new H1 ryegrass, Timothy, and Phalaris, the lowest grade is called "Standard."

Regardless of origin, any line of seed of the main pasture plants may be entered for certification and on the basis of the results of the U-V test in Perennial ryegrass, the picric acid test in White Clover and plot tests in other species the line may be certified as "*Mother Seed*," "*Permanent pasture*" or "*Standard*," according to the results of these tests.

The development and operation of this certification scheme is a credit to the co-operation between the Research Divisions the Department of Agriculture, the merchants and the farmers. It ensures that the high standard of our certified seeds is maintained. It is through this scheme that we hold the confidence of overseas purchases and it is on their recognition of the value of our small seeds that our valuable export market is based.

References:—

1. Wilson. 1859—Our Farm Crops, Vol. 11 p. 203.
2. Stapledon. 1928—Cocksfoot Grass: Ecotypes in relation to the Biotic factor. *Journal of Ecology* 16.
3. Turesson. 1922—*Hereditas* 3. pp. 100 and 211.

4. Hilgendorf. 1928—Plant Breeding: Methods and Results, S.I.R. Bulletin No. 5.

5. Levy and Davies. 1929—Strain Investigation relative to Grasses and Clovers. New Zealand Journal of Agriculture Vol. 39, No. 1.

6. Hadfield. 1929—Certification of Grass and Clover Seeds, New Zealand Journal of Agriculture, Vol. 39, No. 5.

7. Foy. 1931—Use of Filtered Ultra-Violet Light in Diagnosis of various types of Ryegrass, New Zealand Journal of Agriculture, Vol. 43, No. 6.

8. Foy and Hyde. 1935—Laboratory methods for the determination of Plant Type, 4th report New Zealand Grasslands' Association.

## FURTHER EDUCATION FOR ADULTS

(Report of the Consultative Committee of the Council of Adult Education)

### Implications of the Report for Rural Education.

In country districts, adult education is called upon to satisfy special needs associated with the conditions of rural life. The problems it confronts are different from those met with in the town and cities. The report indicates that throughout its investigation the Committee has attempted to take into account these special needs and problems. Two of its most important general recommendations reflect this recognition and indeed offer some hope for the immediate improved development of rural education—should these recommendations be implemented.

These recommendations are for:—

(1) The provision of increased funds “to permit the building up in each district of a staff of resident (or ‘area’) tutors, together with a team of specialist itinerant tutors.” (para. 34)

(2) The development of community centres designed to meet the needs of a wide range of types of community.

The Committee regards the first of these as a “key recommendation” without the acceptance of which much else that is recommended would be impossible. Paragraph 140 points out the voluntary nature of adult education, and also that “It must grow out of the community it serves and must meet the needs of that community.” This is especially so in country districts since one of the problems of rural adult education is the establishment of an effective link between the educational agencies and the people. The confidence of the community must be gained, largely through the development of personal contact and the turning to

account of existing interest, leadership and organisation. Satisfactory results demand time and continued contact, something that has so far been almost impossible. (Para. 29, 30). A greater number of tutors, especially resident tutors, should help in this respect. Extra tutors would also make more effective the writing of courses by those "with experience in the field" (para, 63) and the reviewing of "certain special subjects written by experts" by "tutors who have an intimate knowledge of the groups for whom they are intended." (para. 63).

Adult education is throughout the report thought of in the broadest terms (para. 77, 87), especially in rural districts. In paragraph 73 we read "we are convinced . . . that the provision of the right kind of services might have marked effects on the quality of rural life." This is brought out even more clearly in the recommendations for community centres. Paragraphs 207-221 (inclusive) discuss the wide range of services which centres could give, and paragraph 243 indicates the different types of centre that might be suitable for the various sizes and types of rural community. The idea behind them is that they should provide a focal point for recreational and social activity, out of which might be developed, first of all, courses that meet immediate practical requirements, and then courses of wider intellectual interest according to the demand. Paragraphs 87 and 88 suggest the choice of a portion of one region for experiment in this last idea with country women, in the belief that "in many areas the successful achievement of . . . practical and humble aims is a condition of the achievement of significant work at a later date in the more cultural, aesthetic and intellectual subjects. . . ."

A third recommendation, though its effect could not be felt immediately, has almost endless avenues of potential development. The Committee thinks that a reconstituted National Council of Adult Education, which they recommend, "should immediately give serious consideration to the establishment of a residential people's college." (para. 101) Paragraph 102 makes specific mention of at least one use to which such a college might be put for country people (short courses in June and July).

The recommendations with an important bearing on rural education are not great in number. But if implemented whole-heartedly they could go some way towards meeting the needs.

But from the point of view of rural education there does seem to be a weakness in the Report. Though recog-

nising the necessity for an adaptation of methods and organisation to the special requirements and problems of rural districts, the Report and its recommendations have an urban touch. This is seen in the recommendations for control (except perhaps in local organisation, (para. 196) the appointment of tutors, (para. 181) but most of all in the recommendations for the training of tutors. The tutor, academically trained, has unless gifted with considerable imagination, a difficult task before him in bridging the gap between his knowledge and the lives and experience of the people he is serving. A majority of tutors have an urban background; this makes the problem just mentioned an especially difficult one for those working in country districts. The handicap they suffer shows up in two very important ways:

(1) With adult education conceived in the widest sense, the rural tutor must know something of the special needs of those with whom he works. But rural life is not simply a poorer, handicapped version of town life. It has a reality and organisation of its own, a vitality of its own. Distinctive attitudes and outlooks exist, and in order that they might be understood and even turned to account, special interest, experience or preparation is surely necessary. If the reality of this problem is not recognised, the whole system of adult education in rural districts can become ineffectual.

(2) All courses, whether domestic craft or world affairs, must use the experience of the student as their starting point. This does not suggest that the courses should not take the student beyond that experience. But there is a great difference between the course which merely grafts something theoretical and foreign on to the student's mind and that which really enters his experience, perhaps remodels his mind and values by first enabling him to view his own known environment in a new light. The problem of adaptation to rural experience requires special training and knowledge. The proposals made for tutor training seem inadequate to meet this necessity.

The agricultural industry is of basic importance in this country, calling for a high standard of education and responsibility. In view of the standard of education of those entering agriculture, which is much lower than those entering other occupations (and in the past has been lower still) the need for rural adult education is so urgent that a more vigorous approach to the whole problem seems necessary.

—T. H. Scott.

# YARROW

L. W. McCaskill, Lecturer in Rural Education



While yarrow is probably commonest in the cereal growing districts of New Zealand it is also found on road sides and odd corners in most parts of the country and is frequently used for lawns in dry situations. It was sown as sheep feed in the early days in parts of Canterbury and in such districts it becomes the bane of the cereal grower. The constant cultivation seems to suit the underground stems. The cultivator and other implements break these stems rather than drag them to the surface. As each piece can give rise to a new plant, cultivation may if not handled carefully actually increase the plant.

The upright stems are grooved or furrowed. The leaves are very feathery in appearance being cut into fine segments. The main rib has a groove running along it so that the natural upward tilt of the leaf causes any water falling on it to run down to the stem and then down the grooves to the roots. Milfoil or millefoil are other names used for yarrow in England. These names arise from the appearance of the leaves which at first glance look as if they were composed of thousands of leaves. (The Latin for thousand leaves is mille folia.)

Each individual flower, on close examination, is found to be a true daisy in that it is composed of numerous small florets—white ray florets on the outside, with yellow florets forming the disc. So many of the flowers are crowded together in one head that a very showy flower results. Each flower is rich in pollen which supplies food for a large number of very small insects easily collected by shaking the flowers over a sheet of paper. Normally the ray florets are white but sometimes they are pink and occasionally bright red. Quite useful garden plants may be selected from these coloured varieties.

If crushed, the leaves of yarrow have quite a fragrant smell; few leaves are so bitter if chewed. An old herbal

says. "Most men say that the leaves chewed, and especially green, are a remedy for the toothache." Anyone who has chewed the leaves would probably prefer the toothache. Another herbal said, "The leaves being put in the nose do cause it to bleed and ease the pains of the megrims," hence the name "nose-bleed" and "old man's pepper." In Europe today country people will stuff their nostrils with yarrow leaves to cause the nose to bleed and relieve a headache.

From the earliest times the leaves of yarrow have also been used to make an ointment for the treatment of cuts and bruises. The botanical name, *Achillea millefolium*, is a reminder that the Greek, Achilles, at the siege of Troy, used yarrow ointment to treat the wounds of his men. In Iceland and the highlands of Scotland this yarrow ointment is regularly used today. Other afflictions which have been treated with extracts of yarrow are hysteria, heartburn, colic, and sore throat.

To the country girl in Europe and England the chief virtue of yarrow once lay in the fact that it was a good fortune-teller. One had only to stitch up an ounce of yarrow in a piece of flannel and put it under one's pillow and say before getting into bed:—

"Thou pretty herb of Venus tree  
Thy true name it is yarrow,  
Now who my bosom friend must be  
Pray tell thou me tomorrow."

and the information would be supplied in a dream overnight. Another method was for the maiden to rise at dawn, gather three pieces of yarrow and say:—

"Good morning, good morning, good yarrow,  
And thrice good morning to thee;  
Tell me before this time tomorrow  
Who my true love is to be."

If she placed the pieces in her shoes or glove she would be certain to meet her future husband during the day.

## RECENT PUBLICATIONS

### NEW ZEALAND WHEAT REVIEW, 1946

This handsomely produced booklet of 72 pages has been published by the Wheat Research Institute, Christchurch, "for all those interested in wheat in New Zealand, and in particular to the members of the wheat industry, as a record of the past season and of some of the main problems and developments in the wheat, flour and bread industries."

Articles of special interest to teachers and agricultural classes include a general review of the season 1945-46, sur-

veys of the various wheat-growing districts and of harvesting methods, and the certification system for seed wheat. Of particular interest to home science classes are the articles dealing with the problems involved in the milling of high-vitamin flour and 80% extraction flour. The nutritional aspects of the latter are discussed in detail.

The booklet has already been forwarded to most secondary and technical schools. A few copies are available for District High Schools. Application should be made at once to:

The Editor,  
Rural Education Bulletin,  
Lincoln College P.B.,  
Christchurch.

## **SOME EFFECTS OF ACCLIMATISATION IN NEW ZEALAND**

### **III. THE ACCLIMATISATION OF INSECTS**

**L. W. McCaskill, Lecturer in Rural Education**

To mention the subject of insects to the average farmer or gardener, probably brings to his mind a picture of pests devouring his crops or causing injury to his stock. The damage pests do is so obvious, that we are inclined to neglect the less apparent but nevertheless valuable work of the useful insects. For this reason I wish to mention, first, those insects of most direct use to us, the hive or honey bees. Not only do they make possible the production of seed and the perpetuation of many of our plants, but they also provide us with an important article of food for local consumption and for export.

The first hive bees were landed on March 13, 1839 at the mission station of Mungunga, Hokianga. A Miss Burnby brought them from New South Wales in two straw hives. Several other introductions were made in succeeding years and as settlement proceeded numbers of swarms escaped into the bush where hollow trees provided ideal shelter. The first Italian bees were introduced in 1879 and although other species have also been tried the Italians are the only kind now cultivated.

In the introduced white clover, bees find their main food supply, and it is mainly white clover honey which is sold abroad. Among the native plants the bees have found numerous nectar-bearing plants, notable among them being

manuka, which produces a highly aromatic honey of a rich pinky-brown colour, and the various species of rata which give the well-known rata honey. Of the native plants, the two kinds of rangiora produce honey which, in the immature state, is said to be poisonous.

The naturalization of the humble bee was due to the work of the Canterbury Acclimatization Society, who introduced it to bring about the pollination of the red clover flowers. Previous to its naturalization very little red clover seed had been harvested. The hive bee is able to pollinate only the shorter outer florets in the head, but certain kinds of humble bee, by virtue of their longer tongues, can pollinate all the flowers in a head. Various private attempts at importation were made from 1873 onwards but it was not until 1885 that the Canterbury Society successfully landed consignments of live bees. These were liberated at Riccarton, and at the foot of the Port Hills at a cost of 9/5 per bee. Mistakes were made in some of the species of bee sent out, as some were incapable, because of the shortness of the tongue, of pollinating red clover; but sufficient of the useful kinds evidently were liberated since, in a short time, good crops of seed were obtained. The humble bees at first increased at such a rate that apiarists became alarmed. They feared that the hive bees would be crowded out from the flowers. But the original rate of increase was not maintained, and humble bees, though common, are nowhere in sufficient numbers to compete with hive bees. It is not possible to grow red clover for seed everywhere—on apparently identical soils, one farmer will get a crop, a few miles away another will get only a few seeds. Within nine years after the introduction of the humble bee, farmers sold £200,000 worth of red clover seed and the total value since its introduction must amount to several millions of pounds.

(To be continued)

---

The Bulletin is issued on the first of each month from February to November. The annual subscription is five Shillings post free, or four Shillings for two or more copies.

Correspondence should be addressed to:—

The Editor,  
Rural Education Bulletin,  
Lincoln College P.B.  
Christchurch.