

THE SEED TRADE.SOME NEW ZEALAND AND AUSTRALIAN OBSERVATIONS.

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In almost every phase of agriculture it is upon seeds that man relies for the renewal of crops and pastures, and upon the quality of these seeds depends in no small measure the ultimate return that he receives for his labour.

Furthermore, the problem of making the best use of the earth's seed supply so that agriculture may be supplied with pure, **viable** seed of known variety, is a fundamental one, yet it seems one of the last to receive the world's most thoughtful attention.

Only of recent years has there been recognition of the demand for organisation in dealing with this, the **most** vital and universal of agricultural supplies.

Of all trade commodities, agricultural seed is probably the most cosmopolitan, for it is difficult to conceive of any other material in which there is so much movement between the various countries of the world, or any trade which is more complex in its activities. Furthermore, this trade is fundamentally different to any other in that the product does not usually go into consumption in the ordinary sense of the term, but is used to produce a more or less permanent medium of food production through the grazing animal, or, and this is perhaps even more significant, to produce its own kind, which may quite conceivably come into competition with produce from the original parental sources. All these circumstances arise out of the fact that agricultural seed is not a completed product nor material to be converted into such but is composed of living units, its commercial value being based on a measured ability to produce plants of the requisite species and of the requisite type, and -that although the normal life processes are almost entirely suspended the potential ability of the seed to produce plants exists for a limited period only, but is also influenced to a remarkable degree by the factors operating from the time of the sowing of the parent plants right up to the use of the seed for pasture or crop production.

Considered among agricultural products therefore, seed is in a class by itself, both in production, trading and utilisation, and in the cycle of plant to seed and again to plant, three groups play an important part. First the grower, upon whose selection of the most valued plant types, provision of the required soil fertility, and care in harvesting thoroughly matured seed, depends the strain purity, maturity and germination vigour of the harvested seed. Secondly, the seed merchant and machine cleaner, upon whom rests the responsibility of the removal of undesirable material, weed and other seeds, the proper storage and final marketing of the now commercial product. Finally, the farmer buyer, whose duty it becomes to exercise the utmost care in the selection of seed of the proper strains, of the

highest purity and germination capacity.

In the distant past when farmers and planters grew their own seeds, what little distribution existed was simple and of limited extent, but as agriculture progressed, the seed grower and the seed user became separate individuals and the middleman sprang up as a link between the two groups. He rendered a real service in many cases, yet did it solely for profit, and this very fact gave rise to certain somewhat irregular trade practices. As time brought new knowledge and information, and the pressure of competition gave rise to unethical practices, there came into the field the trickster and the quack, of whom today most that we know fortunately is by legend and not by contact. This dangerous and short-sighted-policy on the part of those engaged in the exchange of seed stocks from grower to consumer brought down upon the seed business in most old world countries, and to some of the new, a veritable maze of seed laws, rules, regulations and standards, some of them based upon sound practice and research, others wholly theoretical, and in practice valueless, if not confusing and harmful.

Today the marketing of agricultural seeds demands not only trade integrity **Jf ths** highest order, but also the exercising of considerable technical knowledge and skill, and, unfortunately, it has to be admitted that to some degree in all countries, seed is still handled by vendors who are in no sense of the term "seedsmen," and who can pretend to no knowledge of seeds nor of their evaluation or the interpretation of analytical or varietal data. Hence the need almost throughout the world for various enactments to control in some way the sale and distribution of agricultural seed. It is true that the advancement of agricultural practice, particularly in respect of grasslands, that the seedsmen are becoming specialists, in many cases in spite of themselves, and with this advance the purely commercial man is being relegated more and more into the discard. This specialisation has become particularly noticeable in New Zealand and Australia during recent years, and can be associated with the institution of strain certification schemes, and in New Zealand particularly with a characteristic feature, the almost entire reliance of the established trade on percentages of purity and germination. It will be admitted generally, I think, that this technical bias is in the best interests, not only of the members of the trade themselves, but also of the country's agricultural industry.

In the Australian and New Zealand seed trades we have two distinct types, both of course resulting from the requirements peculiar to the respective countries and to the outlook and policy of the different Governments. As to this last aspect, Australia follows the example of most agricultural countries in providing fairly strict legislation to govern the entry of seed into Australia, and its sale within the States of the Commonwealth, whereas the position in New Zealand is unique in that although one of the foremost pastoral countries of the world, a seed-producing and exporting country, there is as yet nothing on the Statute Book which requires that seed when offered for sale shall conform to prescribed standards of quality, a state of affairs apparently considered to be so desirable and essential elsewhere. Yet against this is the fact that it is generally readily considered that the standard of the trade in New Zealand is on the whole a high one, and I venture the opinion that viewed broadly it is of a higher standard than the trade of Australia. Until recently the Australian trade was almost

entirely a retail one, and it is in this trade that opportunity permits of some relaxation which cannot persist in wholesale and export trading. One feels therefore that the fact that most New Zealand retailers are first wholesalers, and that as the wholesale trade is based entirely on specified value, the practice of selling on a quality basis has automatically extended to the retail trade. Actually, this should be a fundamental principle of all seed trades, but in many countries there is a tendency to trade in seed which complies with the requirement.3 of control acts, -rather than as in New Zealand, on a competitive basis of quality. The credit for this admittedly satisfactory position is due partly to the trade itself, partly to the State for the provision of readily available testing services, and to the circumstances already referred to in respect of wholesale and export trading. The education of farmer buyers as to the meaning of quality in seeds has also had its influence, but I think that the majority of farmers still rely on the judgment, and integrity of the seed vendor.

The position outlined refers only to the established reputable wholesale and retail houses, for there are others, happily a minority, who, as the scavengers of the established trade, deal in low grade lines and dispose of stocks through attractively worded advertisements, and apparently lower than at market price. There are also the country storekeepers and the few dealers in rough, farmers' dressed lines, and collectively these retailers dispose of fairly large quantities of seed, some of it of very doubtful quality, and should legislation designed to control the sale of seeds in New Zealand ever become necessary it would be designed to curb the activities of this type of trader. It will no doubt be considered by some of you that the established trade has in these remarks been somewhat generously "white-washed", but while there may be a few slips from the path of virtue I believe that credit should be given where credit is due, and that in New Zealand we are fortunate in possessing a trade of relatively high ideals, and, in passing, may I say, whose members augment the Agriculture Department's 3 advisory extension services to no small degree.

-In Australia what may be termed "the specialised trade" is in the hands of a few large city firms, who, while doing a fair amount of retail business, act mainly as distributors to smaller country merchants, and co-operative organisations. It appears to be the concern of the city firm to see that importations comply with the State Act³ before distribution, and if the sale is on a basis of test, to have the necessary tests made. While naturally the city merchant takes a keen interest in the agricultural welfare of the State, incidence of rains, and so forth, he does not maintain the direct contact with the farmer as is done in New Zealand. Furthermore, the interest of State Departments in the seed trade is confined almost entirely to the administration of Acts and regulations, and have not encouraged the use of testing institutions to anything like the same degree as in this country - in fact, with one or two exceptions, one would say that the fetling between trade and State is slightly antagonistic rather than co-operative. This, no doubt, arises from the fact that the State had set out to discipline the trade - and I have no doubt that some of its members needed it - rather than to educate through co-operation, but one is nevertheless of the opinion that the reputable seed merchant is essential to many of the aims and ideals of a State grassland policy, and taking the long view it is probably to greater advantage to the State and to agriculture, that the unofficial business group between the State and a large proportion of the rural community be encouraged rather than coerced.

Before leaving the matter of Australian legislation.

for the information of New Zealand exporters it may be of interest to review briefly the requirements of these Acts and regulations.

Firstly no seed may enter the Commonwealth of Australia without full compliance with the Federal Quarantine Act, administered by the State Departments of Agriculture on behalf of the Federal Health Department, and it operates only in respect of analytical purity, that is, absolute freedom from certain species of weed seeds, and for other species a stated number per ounce is permitted.

Secondly, the Commerce Act, a Federal Customs Act, administered by the Fruit Inspection Division of the State Agriculture Departments, requires that all seed entered must be sound, clean and new. Some exporters of New Zealand peas during the past season have occasion to remember this Act, in that certain shipments were not permitted entry because of contamination with various moulds and bacteria causing rot. Compliance with these two Federal Acts means that seed may enter the Commonwealth, be stored, cleaned or sold wholesale, but immediately it is offered for sale it comes under the provisions of the State Acts. Now there is absolutely no uniformity between these, as in extreme cases seed which may be sold in Victoria may not be sold in New South Wales, and vice versa: and further, it is to be feared that some of the regulations are technically unsound, and to an observer, unnecessary. The position is also complicated by the fact that there are various degrees of strictness of administration, that of New South Wales being the most notable in this respect. It is now the practice of Sydney importers to submit the line for official sampling and to obtain a decision as to its conformity with the State Act before distributing it from their stores, and arising from this practice New Zealand exporters are now asked to obtain a preliminary clearance, as it were, from the New Zealand Department's Station before the purchase is completed or the line shipped. There can be no doubt that this is a forward step, but so far as the State Acts are concerned, the New Zealand decision is advisory only and can be reversed on the other side.

As the outcome of discussions at the Official and Trade Conferences at Adelaide last October, a scheme will shortly be instituted which will permit of New Zealand certificates of analysis covering lines of New Zealand certified seed being endorsed by the New Zealand Station to the effect that the seed conforms to the requirements of the Federal Quarantine Act, and provisionally only to the requirements of the Act of the State specified.

As a delegate to the Conference I made a strong plea for the simplification and uniformity of the State Acts, and while State delegates agreed as to the desirability of such a course, it is doubtful whether in the face of inter-state political feelings much in this direction will be attained. My further suggestion that the Federal Government control the whole business and that thereby seed permitted entry would automatically be saleable was considered, I am afraid, to be unconstitutional and inimical to the welfare of the States.

It will no doubt be wondered why so much of my time has been devoted to Australian legislation, but Australia is the largest buyer of New Zealand grown seeds of the species and strains utilised in grasslands, and the administration of the different regulations concerns our trade and our exporters directly. At previous Conferences of this Association lengthy discussions concerning the prospect of the development of our seed export trade have taken place, and some years ago my own contribution was to the effect that, apart from Australia, the

exploitation of other world markets would be dependent more upon price than on the reputed excellence of our product. So far there has been little reason to alter this view, and it is unfortunate that all indications point to higher rather than lower prices in the future. Outside of New Zealand the Australian trade provides the most notable exception to what may be termed the large bulk commodity 'market' of the Northern Hemisphere, for the reason that the Australian trade is rapidly changing into a speciality market on similar lines to our own, the value of the special strains of grasses and clovers being not only fully appreciated, but also fully exploited. Apart from our fixed export of Chewings fescue to Great Britain and North America, Australia is easily the largest and most consistent buyer of New Zealand seed with particular reference to certified strains.

A review of the potentialities of that market should therefore be of interest to those engaged in the production and marketing of New Zealand seeds. Australian merchants, more particularly those in Victoria, have always been active buyers of New Zealand ryegrass, and with the inception of certification of this seed even at record high prices, they were relatively heavy buyers. With the extension of the production of certified perennial in New Zealand and a consequent lowering of prices, an anticipated wide export materialised only in the case of Australia, who, in 1935, purchased 75% of the total export, and in 1936, of a total of 1,200 tons of ryegrass, 500 tons were certified seed, which quantity represented over 93% of the total New Zealand export of certified perennial.

With abundant uncertified seed offering at practically bargain prices, the Australian preference in 1935 for half her importation in certified provides a tribute to the excellence of the product, and to the buyers' discrimination between type and price. The obvious success of the Dominion's exploitation of strain led to serious consideration of its duplication in Victoria and Tasmania, and in the last named an official certification scheme was established a year or two ago with New Zealand certified Mother seed as its foundation stock, and today, in consequence of the New Zealand shortage of high germinating lines and high prices, Tasmanian certified perennial has been shipped to this Dominion. Victoria, while fully recognising and appreciating the value of New Zealand strains, commenced to investigate the potentialities of her own regional strains, with the result that under official guidance production of perennial ryegrass seed under a State certification scheme is now established. Opinions concerning the relative merits of the Victorian and New Zealand strains will probably never coincide, but the fact remains that no matter what we think of Victorian strains, the Victorians themselves believe them to be superior to our own, that is, for Victorian conditions, and are out to exploit them to the full - for which no one can blame them. While inspecting a wide range of plots at Burnley, near Melbourne, my personal impression was that the New Zealand strains were easily holding their own against the natives, but possibly that was due to a fellow feeling for my compatriots. However, so successful has been the development of seed production in the Colac, Clunes and Kyneton districts, that given a normal season, the acreage under seed last year was sufficient to produce a surplus over and above the State's requirements. The season was, however, similar to that experienced in New Zealand, and the crop much reduced, so that even in the face of the shortage here, there has been some importation of New Zealand seed, Tasmanian seed also having been drawn upon.

The point I wish to make is that it seems doubtful whether we can continue to regard Victoria, in particular, as our own special market, although there are some who believe that the

uncertainty of the Victorian summer climate will prevent the continued successful production of ryegrass seed. This is certainly a factor, but I have the feeling that Victoria has not gone into the seed business without due regard for the climatic factor, and that in future we will be compelled to compete on a price basis. Unfortunately, our production costs are rising and the indications are for decreased production areas, but even at the price level of Victorian seed, I believe we can still compete. In this competition, New Zealand seed will receive the blessing of the Australian importers in the main centres, who, through the marketing schemes of the growers' organisations, have been more or less eliminated.

My remarks have so far referred particularly to Victoria, but with definite changes and advancement in grass-land farming practice and management in New South Wales, that State is a rising buyer of perennial ryegrass and other seeds, and I believe there is a market to be developed there with Victoria as a spasmodic competitor. It is true that the extensive use of New Zealand grass and clover seeds would mean increased competition for New Zealand lamb and dairy produce, but that seems to be the way of things in this world. South Australia is a limited buyer of our seeds, but shows a decided preference for them.

Australia is also a consistent buyer of New Zealand cocksfoot and white clover, and this trade is increasing. Australia was the largest buyer of certified white clover last year, and with the easing of prices this year the trade is bound to increase.

There is, however, one seed for which the States of, Victoria and New South Wales show an emphatic preference, and that is New Zealand broad red clover or New Zealand cow-grass of the trade. There, red clover means New Zealand red clover and 'nothing else, but it is to be feared a fair proportion of the seed shown on the invoices as New Zealand has never seen this country. After all, with European and Canadian seed priced well below New Zealand, the temptation to adulterate or substitute is a strong one and very much to the disadvantage of our trade. The suggestion was frequently made to me that adulteration occurred in New Zealand, but in view of the complete absence of associated impurities indicating a New Zealand and an imported origin in any samples tested at the New Zealand Station, a reasonably confident denial was given. (The 1936 importation was $3\frac{1}{2}$ tons). Yet I would not say for a moment that no one in New Zealand has even thought of the scheme. The chances of our extension in the export of red clover to Australia appear to be excellent, but I believe they would be even better if it were made possible for New Zealand seed to be sealed merely as New Zealand grown broad red clover. Apart from the security obtained I feel sure that the psychological effect of sealed bags would significantly augment sales.

In this respect, also, it is considered that the time has arrived for the exploitation of the best of the New Zealand strains of broad red clover, for there is ample evidence of superiority and inferiority in our commercial lines, especially in relation to permanency. I feel sure that a certified broad red would meet with a very favourable reception, not only in Australia, but also in Great Britain and possibly in Canada. In Australia, reference is made frequently to the mixed nature of New Zealand red clover, not only in respect of comparison between different lines, but also of plant type with individual lines. It is seriously suggested therefore that the New Zealand red clover population should be explored with a view to line segregation, this to be followed by certification. As there are no humble bees in Australia competitive production of red clover is not likely.

Australia is not particularly interested in Montgomery red, but I should say that certified Italian should definitely find a place there in association with broad red clover.

No apologies are offered for having spent some time on the Australian seed requirements, for, whatever may be our hopes and aspirations in respect of other countries, I believe that for some years at least Australia provides the greatest opportunity for the extension of New Zealand seed export in all of the species used in this country in grassland development.

So far as other countries are concerned, export extension will be contingent on the slower recognition of the value of special strains, and in particular to the adaptability of those of New Zealand, and in this respect also to the ultimate success of the good work at present being done in Great Britain by a member of this Association.

Agricultural seed is not a uniform product, variations in one or other of its main characteristics are always to be found, and for this reason it is difficult material to standardise, especially within narrow margins. Nevertheless, standards are necessary for the industry, either those fixed by law or those arbitrary standards established and catered to voluntarily by a seed trade itself, and which are fundamental to a competitive business. Competition in honest seeds, honestly traded, provides an automatic control system, which, if the seedsman is educated and encouraged to take something more than a business solely for profit outlook, nearly approaches an ideal system of seed distribution.

Out of this arises one important factor, that the successful functioning of any system of distribution is dependent upon the measurement of those characteristics which together constitute relative value, and which it is the function of seed-testing institutions to determine.

There can be no question that seed-testing was instituted as a protection against sharp and fraudulent practices, but has now advanced beyond the purely protective function for the farmer to a very close association with the trade itself, in fact, a seed-testing station can almost be regarded as a component part of the trade; However, circumstances demand that the services be operated by an independent body, and for that reason most stations are maintained by the state, whose duty it is to see that its services synchronise as closely as possible with trade movement. Today the reliance of the legitimate trade upon percentages of purity and germination, and to a somewhat different degree upon strain certification, is almost complete; at least that is the position in New Zealand.

It is proposed now to discuss briefly the nature of some of the tests made and the interpretation of the results obtained. First of all it should be mentioned that practically all official stations are linked up with an International Association, with headquarters in Denmark, the main purpose of this organisation apart from various aspects of seed research, being the formulating of exact testing technique, so that results of analysis will be readily inter-changeable internationally and interpreted everywhere on a common basis. Until about ten years ago the seed-testing stations of each country were, as far as technique is concerned, a law unto themselves, which resulted in much unnecessary confusion and dispute. For instance, in the Australian States where seed-testing practice has lagged a little, the International rules are, with the exception of Tasmania, not followed in their entirety, nor

are the requirements of State Acts based on them. This means that New Zealand certificates of analysis are not directly comparable with those issued by the Australian State Departments, nor can they be used directly to indicate the chances of conformity with the Acts. It is a fact, however, that for the purposes of the Australian wholesale trade, New Zealand certificates covering importations from this country are utilised as the basis of purchase and sale. The absolute necessity for uniformity is, however, being appreciated, and in response mainly to trade pressure a move is being made towards a gradual re-organisation of the testing services so that there will be uniformity in technique, etc., among the different States, and, it is to be hoped, with overseas Stations. When that is accomplished - and not before then - it will be possible for consideration to be given to a drastic overhaul of the provisions of the Acts governing the sale of seed, and in which we, as a seed exporting country, are interested. New Zealand exporters know only too well the difficulties which have been encountered in the New Zealand/Australian trade, and, while agreeing with the aims and possible necessity of Australian seed legislation, would welcome a general simplification of it. In this legislative overhaul the advisory co-operation of our own Department has been requested.

Reference will therefore be made to those special tests employed at the New Zealand Station for the purpose of strain diagnosis.

The Ultra-Violet light test which is used to distinguish the seed of perennial ryegrass from that of false perennial ryegrass is doubtless known to everyone here. The test is based upon an obscure physiological characteristic of Italian ryegrass, namely the secretion from the root of a substance which, by reacting with the filter paper in contact with the seedling roots, produces a material that glows or fluoresces in ultra-violet light. This characteristic enables even a small degree of genetical contamination of perennial ryegrass with Italian ryegrass to be detected.

The degree of contamination is measured as a percentage of the total germinated seedlings, but, contrary to a generally accepted belief, this percentage does not represent the proportion of non-perennial present in a sample of perennial - that is to say, a quantitative interpretation, but does indicate the degree of genetical contamination of the whole of the sample, both fluorescent and non-fluorescent seedlings. For example, a line returning 50% positive reacting seedlings is not half annual and half perennial, but would consist wholly of a poor type of false perennial.

Some merchants have become a little impatient with the Station's refusal to divulge the ultra-violet percentages upon which the perennial classification of their samples is based, but it is known definitely that such percentages would be given a quantitative interpretation, and that the 50% sample just referred to would be sold as half perennial and half false perennial at a price intermediate between that of certified and of the worst type of uncertified. That the Department could not knowingly supply information which would lead to an unconscious deception should now be quite obvious.

Before this method was introduced as standard practice, it was thoroughly tested against the results of plot trials, and it was found that although the test offered a reliable test for perenniality it could not be used to differentiate between regional strains. Thus, Hawke's Bay perennial types and Canterbury perennial types both gave identical reactions.

As you know, the Ultra-Violet test is used as the

basis of approval of the certified commercial class of perennial ryegrass, and although its establishment met with some opposition, especially from those who had let contracts for the production of permanent pasture, the class has nevertheless survived. The absence of unsatisfactory reports, the ease of certification procedure, and the attractive price of the seed, have resulted in certified commercial becoming more or less the standard perennial of the New Zealand trade, and in this respect it has done much to eliminate the fairly wide use of inferior uncertified seed, which fact, I, as one of its sponsors, consider to be ample justification for its inclusion in the certified group.

The Picric Acid test - the companion laboratory test for strain diagnosis in white clover - has survived the experimental stages, and since January of this year the official certification of white clover has been based entirely upon it. Differentiation between superior and inferior strains is dependent upon the presence in the seedlings, and, incidentally, in the green tissues of the adult plant, of minute quantities of a glucoside which, when the tissues wilt or die, breaks down and escapes as hydrocyanic acid gas. It was found that the proportion of the glucoside present was highest in the more productive and persistent forms of white clover, and lowest in the inferior or annual types. Classification on this basis then became merely a matter of applying a simple chemical test for the presence of a cyanide gas - the Picric Acid test. Fifty eight-day seedlings are lightly crushed into a test tube, anaesthetized with toluene or chloroform, the picric acid test paper inserted, the tube stoppered and incubated for forty-eight hours. During this period the HCN gas is liberated, reacts with picric acid, and the lemon coloured test paper coloured orange to a degree relative to the amount of gas present. When the reaction is complete at the end of the test period the tubes, four for each sample, are graded on a colorimetric basis into six classes. For the two grades of certified seed the top three classes are accepted, the lower three rejected. The short time required for the test, the simplicity and uniformity of technique, which, by the way, is essential, especially the amount of light admitted to the growing seedlings, and the simplified certification sampling and sealing routine have amply proved the value of the method. Prior to its being practically applied a very large number of samples previously classed by plot trial were tested, and on the results an agreement of approximately 95% was secured.

Of passing interest is the fact that the Picric Acid test is receiving fairly wide support in Great Britain, and from advices it is understood that some sections of the seed trade are using it extensively.

The attitude of the Australian trade and State Governments to seed certified solely on laboratory tests probably needs some clarification. Tasmania uses the Ultra-Violet light test to supplement results of plot trials, and, I believe, as the sole basis for the certification of seed from approved areas. As most of the seed under certification in that State originated in New Zealand the Ultra-Violet test is employed with the same confidence as in this country. On the mainland, however, where deterioration is due either to unfavourable environmental conditions or to inter-crossing of perennial and the non-fluorescent annual, *Lolium rigidum*, the Ultra-Violet light test is not necessarily a reliable indication of superiority, and the method is not employed to any extent.

This accounts to some degree for the preference of Australian buyers for certified seed of the permanent pasture class, rather than for the commercial class, which, as is generally known, is certified on the result of the Ultra-Violet test alone; but not for the fact that the sale of New Zealand

certified commercial in Victoria is not permitted under the provisions of the Pure Seed Act. The Victorian system of certification is protected by Statute, and in order to protect the word "certified" in case of its adaption by private interests to seal and certify on their own account-, a full definition was provided. This definition requires that all seed sold in the State of Victoria as certified seed under seal must be the produce of a known area, with which, of course, New Zealand certified commercial cannot comply, as was discovered when it made its appearance on the Victorian market. The position of certified commercial was discussed with the Victorian authorities, who undertook to review the whole question when the results of certain trials with the seed were known. As nine-tenths of the class consists of the standard Hawkes Bay type, it is unlikely that a decision based on the score of its performance in Victoria would be unfavourable.

There is, of course, another aspect of the situation, perhaps unofficial but none the less significant, and this is that in 1936 when the seed was reasonably priced, certified commercial appeared as a dangerous competitor with Victorian seed, for which a price nearly twice that of New Zealand seed was anticipated for the 1937 crop.

In this respect the position of New Zealand certified white clover is interesting. As the regional origin of New Zealand certified white clover is now unknown, its sale as certified seed is illegal, but to my knowledge no official action has been taken although the method of certification is widely known. Perhaps the fact that white clover is not yet produced in any marketable quantity has something to do with the difference in attitude adopted for certified commercial perennial ryegrass.

The recently instituted method of certification of white clover is responsible for a considerable increase in the amount placed under seal, and, as already stated, has resulted in a marked fall in price. It is confidently anticipated that this will effect an immediate increase in domestic and export demand, which should bring certified white clover into line with certified perennial ryegrass, cocksfoot, etc., as the standard commercial grade of New Zealand.

Finally, I should like to deal for a few minutes with a very much used, and somewhat misused, measure of quality in the grass seed trade - I refer to bushel weight or the weight in pounds of our imperial bushel measure. The question frequently arises, particularly in respect of perennial ryegrass, is bushel weight essential to an estimation of value? Does it convey a false impression as to quality, or is it so much "hocus pocus" employed by the trade to impress and bewilder retail buyers? It can be shown, I think, that bushel weight is of importance in the estimation of value and quality, it all depends on the definition of value and the particular factors responsible for a high or low bushel weight.

If weight is a measure of quality, what constitutes the particular merit of a line of high weight? Are there more seeds to the pound, or are the seeds themselves possessed of some special characteristic? In order to test this point the number of seeds per pound were estimated for a range of samples of certified perennial ryegrass of bushel weights rising from 25 lbs. to 35 lbs. It was found that there was no constant relationship between bushel weight and the number of seeds per pound, and that both are influenced by the immeasurable characteristics, weight and size of grain, that is, immeasurable except by weight per bushel of grain plus glume, or more inconveniently but more accurately, by estimating the weight of 1000 seeds. The question must arise then, is the weight and size of grain significant? If so, then bushel weight is an important factor; if not, there should be no

price difference between lines of low and high weight, all other factors being equal. The answer must be narrowed down to the matter of "quality," and its definition in relation to seed value. A line may be of high purity and germination, good strain, and yet of poor quality, and I suggest that the only easily determinable factor which can be used to discriminate between the quality of two lines, equal in strain, purity and germination, is bushel weight. Strictly speaking, the weight of 1000 seeds is a more accurate and precise method of evaluation, but the two serve the requirement - a measure of quality which may be defined as "substance," "body", "stamina", or perhaps by the improper, but intelligible term "g-ts".

It has been repeatedly shown that the plant establishment is dependent not only on the ability of the seed to germinate, but also on its ability to produce normal root and shoot, and to commence an independent existence in the soil. Under the most favourable conditions any viable seed can establish, but given unfavourable or -even average soil conditions, the proportion of establishment of viable seed is dependent on the latent energy stored by the seed, the releasing of which supports the seedling through the critical period of root and shoot formation. There should be no argument against the fact that heavy, full-grained, mature seeds are more generously provided with the necessary materials to enable survival during unfavourable establishment conditions, and that the seed of a proportionately low grain weight will fail through the absence of the essential quality-stamina.

To my mind, therefore, the usefulness of bushel weight cannot be ignored, and that for pasture establishment the use of seed of average, or good average weight, is essential. Of course, it does not necessarily mean that all seed of high bushel weight is of equally high quality. Heavily dressed, small grained lines (redressed seconds), will return a high weight and a very large number of seeds per pound, but it could not be said that such a line was of high quality. However, the size of the seed would be evident to the purchaser and also the reason for the high weight.

As is generally known, price increase proportionately with bushel weight, which fact, no doubt, is the reason for the enquiry - does the buyer get more for his money? Provided the line is of normal appearance the answer is "Yes, more plant producing material, but not necessarily more seeds." It follows that as high weight lines are worth more to grower and trader - approximately 3d. per bushel for every pound increase in chondrometer weight, over-dressing of lines of average quality proved to be easy and profitable, and although the practice is not prevalent, some lines return an exaggerated price to value ratio. Simply put, the position is this: for instance, a 30-lb. line contains 270,000 seeds per pound and is priced at 10/- per bushel; if this line is heavily machined, the protruding, light-weighting glumes broken off, more of the seeds can be packed into a bushel measure, the weight will increase to 33 lbs., the price to 10/9d. to 11/- per bushel, but the number of seeds per pound weight remains about the same. The purchaser thus pays 9d. or 1/- per bushel more for exactly nothing; but in pre-certification days, a heavy weight line at 33-34 lbs. was traded as high-grade old pasture, the higher price return more than covering the additional dressing cost;

The sale and use of over-dressed seed is preferable to that of lines under average weight, where the seed is very light and of poor quality. As a protection against the trading of this class of seed, although of satisfactory purity and germination, the continuance of the use of bushel weight is justified*

A mature, well-grown and harvested, fully machine dressed line of perennial ryegrass should weigh round 30 lbs. to the bushel - a range of 28 - 32 lbs. could be regarded as representative of average quality.

The main contributing factor, therefore, in bushel weight is the size and density of the grain, the number of seeds per pound being related normally not to bushel weight but primarily to ratio of size and weight of grain to length of glume.

As previously inferred, bushel weight may provide a false indication of value, that is, in those instances where high weight is due to heavy dressing of small seeds (seconds). Therefore, when weight is employed as an index value, it should be associated with a superficial examination of the seed itself, when the reasons for unusually high weight will be evident. If the seed is of average size and condition, high or low weight will be due to a high or low grain mass. If the seed is below average in size and the bushel weight exceptionally high, the reason for the abnormal weight will be evident - a dense mass of small units against a dense mass of larger units exemplified by high quality average weight.

Therefore, unduly high weight, while preferable to weights below average, should be regarded with caution, unless, of course, an extremely high number of seeds per pound are desired, in which case such lines ably fill requirements.

For the evaluation of seed on a weight basis, the "weight of 1000 seeds", is the only really reliable method. It is used in some European countries, but has been displaced generally by bushel weight on account of the ease and convenience of the determination of the last named, and the easy standard interpretation of "30-31" or "33 lb." seed.

Nevertheless, from the point of view of application, the 1000 seed weight has all the advantages of bushel weight, and none of the disadvantages, in that whatever the contributing circumstances, immaturity of low bushel weight seed, overdressing of average weight seed, or redressing of high weight terminal seconds, the fact is demonstrated by the 1000 seed weight. On this basis the ideal should be the highest weight, which, incidentally, will return a lower number of seeds per pound. The highest number of seeds per pound will be returned obviously by low 1000 weight, by lines of abnormally high or abnormally low bushel weight.

In conclusion, may I express the hope that the various **matters** relative to seeds and the seed trade, more or less briefly touched upon in this paper, will prove of interest to members of the trade and to those associated with grassland farming, or, at least, that they will provide the basis for informative discussion?