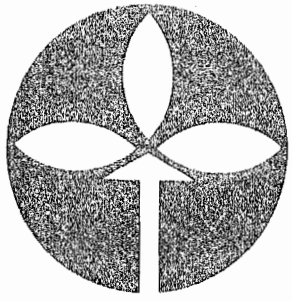

DEPARTMENT OF AGRICULTURE, SOUTH AUSTRALIA

Agronomy Branch Report

POSSIBLE FUTURE ROLES OF THE SOUTH AUSTRALIAN HERBAGE SEED INDUSTRY

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Report No.27.

FOREWORD

The following report was prepared as the basis for an address to the South Australian Seed Producers Association on the occasion of their Annual Meeting held in Naracoorte, September 23rd 1971.

The Author Mr. E. D. Higgs based his address on his long experience in production of seeds in South Australia. Initially his experience was as a research worker involved in evaluation of annual legumes particularly subterranean clover for their adaptability in South Australia.

More recently, since 1961 he has been involved in field research work aimed at improving the productive efficiency of the South Australian seed industry.

During this period he has been the officer-in-charge of the seed certification scheme of the South Australian Department of Agriculture. In addition Mr. Higgs leads the team of research officers engaged in research to plant introduction, plant breeding, seed production variety evaluation, pasture establishment and grazing management.

In 1967 he made a study tour of the herbage seed industries of Britain, The Netherlands, Denmark, Canada, U.S.A. and New Zealand.

In March and April 1971 he was the first Australian delegate to the annual meeting of the O.E.C.D. certification schemes for seeds moving in international trade held in Paris following the recent acceptance of Australia into the membership of these schemes.

He subsequently made brief visits to Britain, The Netherlands, Denmark and Oregon U.S.A. to observe the latest developments in the seed industries of these countries.

SUMMARY

1. The need for and opportunities for improvement in the efficiency of the South Australian herbage seed industry is discussed in relation to the relatively efficient seed industries of Oregon U.S.A. and Denmark.

2. The possibilities for obtaining markets for an expanded production of seed in the following markets is discussed.

   (a) The Australian market for pasture seed.
   (b) The Australian market for lawn seed.
   (c) The World market for Australian bred and selected herbage plants.
   (d) The export of seed of foreign cultivars under the O.E.C.D. scheme or other arrangements.

3. The need for promoting South Australian seed in all markets is discussed.

4. The research needs of the seed industry particularly in relation to multiplying foreign cultivars are discussed.

5. A proposal for financing the promotional and research activities is outlined.

6. Extensive appendices are attached.

   I. Cost structure of Cocksfoot seed production in Oregon.

   II. Cost structure of Perennial Rye Grass production in Oregon.

   III. The production of certified seed in South Australia for the ten year period 1961-62 to 1970-71 together with estimates of acreage available for sowing these seeds in South Australia.

   IV. A detailed analysis of species, cultivars, breeders and region of multiplication of herbage seed under O.E.C.D. schemes for 1970.

   V. Addresses of breeders multiplying seed under the O.E.C.D. herbage seed scheme for 1970.

POSSIBLE FUTURE ROLES OF THE SOUTH AUSTRALIAN HERBAGE SEED INDUSTRY.

E.D. Higgs, Senior Research Officer, Pastures.

About ten years ago a public meeting was held in the Naracoorte R.S.L. to discuss the possibility of revitalising the then almost defunct South Australian Pasture Seed Industry. Those speaking were Eric Jarman, David Ragless and myself. I would like to think that the current state of the South Australian Seed Industry is largely a development from that particular meeting. I know of at least several participants in that meeting although not previously involved in seed production who have in fact been prominent seed growers since that time.

The role that was envisaged by me at least at that particular time for the South Australian Seed Industry was one of supplying the expanding needs of the South Australian farmer. In particular I had previously been involved in research into annual legumes in the cereal areas of the mid-north of South Australia and had found a particular use for Clare sub-clover. The price and availability of Clare sub-clover was such that very little was being used for rehabilitating depleted cereal growing soils, to which Clare was particularly adapted.

In addition to this particular requirement for seed I have no doubt that the other participants in the meeting had their own particular areas of interest, but primarily I am sure at that time we envisaged that the role of the South Australian Seed Industry was one of supplying the South Australian market first and foremost.

It became apparent quite early in the development of the modern seed industry of South Australia that with the current status of the local market all the seed that was being produced would not be used locally and markets were successfully sought interstate and eventually overseas so that while the local market has considerable importance at the moment the interstate and overseas markets are certainly vital to maintaining the seed industry at its current level of production.

While the local South Australian market appears to be saturated with seed at the moment this in my opinion is merely a passing phase. When the current gloom in agricultural circles

is eliminated and this I'm sure will take place within the next two or three years, there should be a very much greater market for seeds in South Australia than current. This is not to be interpreted that I envisage that great prosperity is just around the corner in the farming world, but rather that the next few years will see some realistic proposals for rehabilitating the farming systems of Australia and that with the elimination of the weaker participants and the development of better financing techniques for the currently well established farmers these again will be in a position to re-invest substantial profits into the farming system. One of the most profitable areas for investment on many farms will be in seed and in the improvement of herbage production. What applies to South Australia will also I'm sure apply in other parts of Australia.

It must be pointed out that we cannot maintain our seed industry as it is indefinitely. We may develop it and become increasingly competitive with other potential seed producing regions. If we opt out of developing our industry we will become quite vulnerable to competition from seed industries which can undercut us in price.

With the advent of appropriate certification schemes, seed of many categories could quite easily be produced in other regions of Australia or other parts of the world and landed in South Australia at prices competitive with our current prices. We therefore really only have two alternatives, to continue vigorously developing our industry in directions which will lower our production costs or let our industry fade away in competition from more aggresive and efficient seed industries beyond our borders.

On the face of it then my attitude to the future in respect to one particular area of the seed industry at least has not changed.

However I now have had the advantage of many years of contact with the local seed industry. A number of participants have had the opportunity to visit interstate and quite a few have had the fortunate experience of seeing at first hand the successful and long standing seed industries of other part of the world.

I now propose to discuss what I feel are the essential features of several overseas seed industries and what we need to achieve in South Australia in the production, processing and marketing areas to develop an industry in South Australia

from what is at best merely a nucleus, to one which can hold a respected place among the major seed producing areas of the world.

What then is necessary to place the South Australian Seed Industry on a sound basis. I think our best guide will be from a study of the several really successful seed industries in other parts of the world.

I would suggest that at the moment there are two or three countries with a really viable herbage seed industry, these are Oregon in the U.S.A. and Denmark in Europe, and possibly the Peace River area of Canada, which I have not seen.

These owe their success to reasonably satisfactory climatic factors coupled with satisfactory economies of scale of cleaning, processing, growing and marketing aspects of their industry.

The success of the Danish Seed Industry would appear to be based heavily but not entirely on the fact that the processing and marketing of seed is extremely efficient by world standards.

In fact one firm, abreviated to D.L.F. dominates the processing and marketing of seed in that country and consequently enjoys enormous economies of scale when compared with any processing or marketing firm in South Australia.

The size of operations of the firm are such that in some of their cleaning plants, particular sets of machinery can be set up to handle only one species or perhaps only one cultivar of herbage plant. Despite this they are trending towards further specialisation by only cleaning one species in a whole cleaning plant with many sets of processing equipment enabling specialisation of equipment and staff to a very high order.

The relative disadvantages of the small scale size of most farms in Denmark is largely or entirely overcome by having large scale processing and marketing facilities available. However, it would be wrong to assume that we currently enjoy in South Australia any advantage over Denmark as far as scale of operations at the production level, for despite the fact that in Denmark the average acreage of seed crop per farm is not great the actual output of seed per farm, because of their much higher yields, would be better than the average size seed production enterprise in South Australia.

There is a distinct trend by D.L.F. at least, in Denmark to give contracts for seed growing to the farmers able to handle larger acreages so production per enterprise in increasing quite rapidly in Denmark.

Other features of the Danish seed industry which favourably effects it efficiency are:

1. Up to the present time most of the seed produced both for local use and for export is of varieties bred in Denmark by private organisations who have been conscious of the importance of seed producing ability of cultivars as an additional feature over and above other desirable agronomic features; hence the majority of varieties grown for seed in Denmark have a good genetic potential for seed production in Denmark.

2. The seed crops are all established under barley crops thereby almost eliminating establishment costs.

3. Seed crops are normally only harvested for one or at most two harvests allowing for easy changes of production as market demands change.

4. The seed crops are grown in a farming system based on barley and sugar beets, (with no pastures on the farm) as the major crops ensuring that

   (a) Weeds and other crop plants are kept under control by general husbandry rather than expensive herbicide technique.

   (b) Harvesting equipment is used for other crops which ripen at times differnt to the seed crops thereby cutting harvesting costs.

   (c) The beneficial effect of the grass seed crop on soil fertility is such that additional revenue apart from the sale of seed eventually can be credited to the seed enterprise.

5. Perhaps one of the major features is, that Denmark lies right next to West Germany one of the largest importers of herbage seeds so that contracts are physically easy to organise while freight costs are kept to a minimum.

In Oregon the outstanding area of efficiency lies at the production end rather at the processing and marketing end of their production system. This is not to suggest that processing and marketing is not very efficient but these are less outstanding than the production end.

The size of the seed enterprise can vary from a few hundred acres to many thousands of acres and these large acreages of seed coupled with very high yields per acre mean that nearly all the individual production enterprises have virtually all the economies of scale possible in this direction using machinery and techniques which are currently available. Much of the machinery other than harvesting machinery is of a design not seen in Australia and especially developed for the Oregon Seed Industries.

On the processing side perhaps they do not approach the very best facilities available in Denmark, but nevertheless the scale of operations in many cleaning plants is very considerable by Australian standards.

While on the marketing end again they do not enjoy in Oregon the scale of organisation attained by D.L.F. in Denmark they do have a large number of large efficient actively competing firms available for the marketing seed produced in that area. By levies on seed growers very large funds are created for promoting Oregon grown seed in Oregon, the rest of U.S.A., and in foreign countries. These are currently in excess of $200,000 per year.

While I do not have figures available on the actual cost of production in Denmark I do have some recent figures for Oregon which will give some indication of the price levels which must be sought in our industry to assure that we are able to compete in many of the world's markets for seed. See appendicies I and II which give a detailed breakdown of average costs for Cooksfoot and Perennial Ryegrass in Oregon.

I would suggest that the essential message coming from these Oregon production cost figures is that they are generally lower than what we currently are able to match in South Australia, although not by that big a margin that one would feel that it was impossible for our best operators by some reasonable effort to match them.

We have two particular advantages over the Oregon seed producer, these are:

1. Our price of land with the exception of the Keppoch area is considerably lower than Oregon prices where most seed growing land is valued at between $US400 and $US500 per acre.

2. We have a climate while in many ways similar to Oregon, has the dissimilarity of being considerably warmer and less rainy during the winter months. Because of this, seed crops make more winter growth and it is possible for a livestock industry to be integrated with the seed growing industry to mutual advantage in South Australia, where this is not possible in Oregon.

Because of this integration it is possible to allocate the sum of money in some instances, in grass seed crops, greater than $10 per acre in South Australia to the value of the grazing obtained from seed crops.

In Oregon this figure is seldom as much as $3 per acre so that there are these two areas where in fact we have a cost advantage over Oregon.

The particular areas where we currently suffer a disadvantage which would appear to be capable of rectification are:

1. It is rare for the size of the individual seed producing unit in South Australia to be well matched up with harvesting equipment. This means that the number of hours the harvesting machine is used per year in South Australia is generally a small to moderate fraction of the total time available for harvesting and consequently the cost per hour of work done in South Australia is of the order of double or even more thanthat for each pound of seed harvested when compared with Oregon where it is usual to expect at least several hundred hours from harvesting equipment each year.

2. A major area where our costs are considerably greater than those obtaining in Oregon is in the region of seed processing.

There are several factors contributing to the lower costs in Oregon. Firstly I would feel that on average the weed and other crop population of Oregon seed crops are considerably lower than those in South Australia, enabling seed to be processed with the minimum of effort to bring it up to an acceptable standard.

Secondly the size of the industry is such that cleaning plants are usually equipped with the largest available machinery well matched up, so that output per hour of machine is the best possible.

3. In Oregon there is the skilled work force available to set up processing machines and operate them to the best possible advantage. In many instances the machines work 3 shifts throughout the year. So that despite the fact that wages are somewhat higher for labour than they are in Australia the seed processors are able to process seed for, in some instances, as little as half the price charged in South Australia. Appropriate rationalisation of cleaning operations and the investment in better machinery could help in this area. See appendices I and II for costs in Oregon.

At the moment however, the advantages that we have in terms of lower prices for land and greater returns from grazing are largely or entirely eliminated by the greater cost of processing our seeds.

4. In general yields of seed obtained in Oregon are much higher for particular species than we have been able to attain in South Australia. Whether this indicates limitations imposed by soils and climate, by the skill of our growers and harvesters or by the lower genetic capacity of our cultivars to produce seed is impossible to say. If we can match Oregon in most categories of production costs, lower yields may not be a serious handicap because of our lower land prices.

I think in these few recent remarks it will be quite clear that to lower the costs of production in South Australia, it will be necessary to increase scale of operation by a sizeable margin.

This expansion of scale of operation will be necessary at the production end and to an even greater extent at the processing end.

It is my considered opinionthat there is room for only one properly equipped seed processor for legumes and one for grasses in South Australia now and until such time as our seed industry reaches a production level of greater than 5000 tons of either grass or legume seeds.

The current trend towards more and more small, general, inefficient cleaning plants is to be greatly deplored. Unless some formula can be devised whereby large efficient cleaning plants can be built, equipped and operated, the seed industry will be burdened by intolerable cleaning costs, which will more than any other factor stifle the development of our industry.

If in fact our local demand currently is not great enough to allow reasonable disposal of current production, what can we do to create an outlet, for what must be an expansion of the order of five to ten times current scale, to get somewhere close to the lowest possible costs of production.

Avenues Available for the Development of the South Australian Seed Industry.

1. The Australian Market for Herbage Seed.

2. The Australian Market for Lawn Seeds.

3. The World Market for Australian bred or selected herbage plant cultivars.

4. The export of foreign cultivars under the O.E.C.D. Scheme, our own Certification Schemes or by arrangements not involving seed certification.

1. The Australian Market for Herbage Seed.

As mentioned earlier my initial interest in developing the South Australian seed industry was to enable ready access to supplies of seed of improved and well adapted cultivars for use in South Australia. I think it is now opportune to review the position over the last decade regarding seed production of the various cultivars grown and certified in South Australia. See appendix III for details.

In this period the leading cultivar has been Hunter River lucerne with 6,934,402 lbs. of certified seed being produced. This has been followed by Mt. Barker sub clover with about 4½ million lbs., Jemalong barrel medic with about 3½ million lbs., Harbinger strand medic with just over 2 million lbs. and Clare sub clover just a little short of 2 million lbs., others fall away with the lowest recorded production of all Berber cocksfoot with 173 lb.

If you examine column 2 of the table in Appendix III which shows the greatest year for production some further interesting facts emerge. In quite a number of categories the greatest production in any one year as yet recorded was in the immediate past year and in many cases the production in this year has been very substantially above the average production over the ten year period no doubt contributing to some marketing difficulties in some particular areas.

While the figures by themselves may be of some interest, let us consider the relationship between the amount of seed produced and the potential area in South Australia to which this seed is adapted. Perhaps the most striking relationship of a plant with wide adaptability, between seed produced and acreage to which it is adapted, would be the case of Harbinger medic. It is considered that somewhere around 20-30 million acres in South Australia is suitable for sowing to Harbinger medic. If all certified seed of Harbinger medic we have produced had been sown in South Australia there would be only enough seed to sow a little over one ounce of seed per acre over the area in South Australia to which Harbinger is well adapted. In the case of Jemalong barrel the relationship is not so wide, but even there we have as yet to produce as much as one pound of seed for every acre, particularly suited to Jemalong medic in South Australia. In the case of Demeter fescue we have now produced about three-quarters of a million pounds of seed for which something approaching 2 million acres are available in South Australia. Production of this is still only 1/10th of the potential market for seed of Demeter in South Australia. One could continue; in almost every instance of the seed that we produce in South Australia, the acreage available for sowing this seed greatly exceeds the amount of acreage for which seed could have been sown during the past decade, considering supplies which have been available.

While I am not in as good a position to predict the interstate areas to which the cultivars currently grown in South Australia are adapted, I would suggest that in most categories these are several times as large as the areas available in South Australia.

To me this indicates an opportunity for market development on a rather large scale. The question might be asked why have plants of such obvious merit been sown to such a limited scale? I think there is no one single answer to this particular matter, but I would suggest that there are several major factors involved.

I think perhaps the greatest of these is that despite all lip service paid to the role of the legume in southern Australian agriculture, this is not really well understood by the farmers in many parts of Australia, simply because it has been possible for a long time to grow crops, on a relatively low intensive type cereal production, on soil nitrogen derived from sources other than the legume.

The question of understanding the best cultivar for particular situations in also quite poorly understood in my view by very large proportions of farmers in South Australia.

If in fact the vital role of the legume was better understood I am sure more use of legume seed would be made. I feel, however, that while we believe that the legume has a vital role to play in much of our agriculture we do have a dirth of information which relates in strict money terms, the value of spending money on seed, in relation to output achieved from both pasture and the succeeding crop, in money terms. When we are in a better position to assess these relationships, as a result of carefully conducted experiments or surveys of commercial practice, we could be in a very much better position to press the farming community in a much stronger manner to sow these legume seeds.

In a few and only a few areas it is well documented that the sowing of a particular variety of seed has some likelihood of being a real economic proposition. In the case of Hunter River lucerne in the upper south east for instance, experimental evidence is quite clear that wool production per acre is quite substantially better at high stocking rates on Hunter River lucerne rotationally grazed, than on pastures in which Hunter River lucerne does not exist. The return from the investment in sowing lucerne and stocking at the higher rate possible, is of the order of 15% even at present wool prices. Although there are no particular experimental data available it is almost certain that the same state of affairs occurs in the Lower South East areas on which lucerne has been sown, I think particularly of the shallow soils over limestone, south of Mt. Gambier and deep sand areas in various directions from Mt. Gambier, where gross livestock outputs in the region of $50 per acre have been achieved on lucerne plus perennial grass pastures. Even on the heavy black soils in the Millicent area lucerne is performing surprisingly well and may in fact prove to be more economic in at least some areas than the traditional strawberry clover plus various perennial grasses.

It is also reasonable to conclude on the basis of farmer experience, that Demeter fescue is in a similar category to lucerne in selected areas of South Australia. In particular the high rainfall areas with good retentive soils enable Demeter fescue to express its full potential for summer growth which exceeds all the commonly available persistent varieties of perennial grasses we have currently available. This increased growth, and the quality of Demeter throughout the year, appears to substantially increase animal production over previous pastures in the 25-35" rainfall zone of South Australia.

However, despite the fact that there is some experimental evidence in favour of sowing lucerne and some farmer evidence in favour of sowing lucerne and some of the perennial grasses, it must be admitted that in the case of the majority of our perennial grasses there is no clear-cut experimental evidence of the value of sowing seed of pasture plants.

At the moment in South Australia we only have one thorough going type grazing experiment endeavouring to establish the advantage of having a perennial such as Medea and Victorian perennial ryegrass and Siro 1146 hybrid phalaris included in a pasture as against only having wimmera rye or volunteer annuals. This experiment is on Kangaroo Island but it will be some years before this experiment produces evidence which supports or rejects the idea of establishing a perennial in a pasture consisting of sub clover plus volunteer annuals. Until further experiments are established in other districts this initial experiment on Kangaroo Island, which will only be relevant to Kangaroo Island, is all we have to guide us.

Even in the case of the annual legumes particularly adapted to rehabilitating worn out cereal land there is very little precise information on the returns to be obtained in the form of heavier carrying capacity, bigger and higher quality cereal crops, and the possibility of more frequent cropping, from the sowing of seed of the various legumes now available.

I think from these remarks it is apparent that while the theoretical acreage available for many cultivars is very much greater than the total supplies of seed of these cultivars which have been produced to date, the problem of getting wider use of these rests very largely with the fact that there is no really persuasive financial argument in favour of sowing many of them.

However this is not all that unlike the position with many things which by active promotion and vigorous selling are widely used by farmers to no particular established financial advantage. I see reasons to believe that with an intelligent sales programme much more seed could be sold immediately and in the longer term when more farmer and experimental evidence is available a much larger market could be developed.

Apart from the varieties bred or selected in Australia there is a substantial importation of seed from New Zealand, Western Europe and North America, of seeds for use in our better rainfall areas.

There needs to be a vigorous approach towards replacement of these imports. This is partly in the hands of the Australian Breeders and herbage plant evaluators who could in many cases develop cultivars better adapted to the situations currently using imported seeds. The alternate approach is to organise the production of seed of these imported seeds within Australia. This will have some difficultires, particularly in the case of New Zealand varieties but no difficulties should be encountered with Western European varieties providing appropriate arrangements are developed to ensure that the European breeder gets his royalties to the same extent that he would have received had the seed been multiplied in Europe.

2. The Australian Market for Lawn Seeds.

The lawn seed trade in Australia is quite substantial and offers an opportunity for South Australian seed producers of a considerable magnitude because the great majority of the finer sorts of seed are currently imported from overseas. These are either sold as pure seed, blended with other fine seeds or very often blended with Victorian perennial ryegrass or other coarse inexpensive grass seed to make up the seeds mixtures which are commonly available on the shelves of supermarkets and garden stores.

The opportunity exists in South Australia to enter this market to a very much greater extent than that of the moment where there is little beyond O'Connor Strawberry clover being grown for the lawn market.

The Australian home gardener is not very fussy as far as his lawns are concerned and there would seem to be an enormous opportunity for encouraging higher standards which will lead to more intensive use of seed in the lawn situation.

One particular development which is occurring very widely in the United States and which is likely to follow in Australia when our affluence approaches the current U.S. level is the use of sodding to convert bare ground or run down old lawn into superior lawn virtually overnight.

For this type of trade very high seeding rates of very pure true to type seed are planted on areas which after the sward has fully developed, it is then cut up into rolls and transported to the site on which the lawn is desired.

Another North American and Western European development which is likely to follow in Australia to some advantage is the use of varieties of perennial ryegrass, specially bred for their superior lawn characteristics. A particular variety currently in demand in the United States is called Manhattan, but there are quite a number of perennial ryegrass varieties besides Manhattan which are superior as far as forming a turf is concerned in various situations encountered in North America and Western Europe. The value of these cultivars would need local evaluation before seed production could be justified.

I would envisage that with proper development there could be a market in Australia for at least several hundred tons of this lawn grass type of perennial ryegrass in the not too distant future. It being at this stage largely a replacement for Victorian perennial ryegrass.

General use of lawn seed on roadside verges, public gardens, playing fields, golf courses is possible with proper promotion in an increasingly affluent society. Without organised effort there will be some developments but with well directed pressure the rate of development in this area could be accelerated.

At the moment if we do nothing more than substitute improved varieties of rye grass for Victorian and grow the seeds of varieties which are currently imported from the United States or Europe we could expand our seed industry by the order of many hundred of tons of seed per year.

However I feel that merely replacing existing supplies that are imported from overseas is not going anywhere near far enough. The intensity of seed use in lawns in Australia falls far short of the intensity of use in North America and perhaps even in Western Europe so that there could be a great development of the Australian market providing the correct promotion is followed.

In North America it appears as if public institutions, particularly the state colleges of agriculture have been very active in promoting high quality turf, both in the way of breeding new varieties and demonstrating the superiority of these over the very common types of plants formerly used for lawns.

Similar type work properly directed in Australia could undoubtedly greatly increase the market for lawn seeds of all sorts and ultimately lead to the export of lawn seeds to other parts of the world.

While it is not possible to be dogmatic that all the seeds which are potentially lawn seeds are in fact used for that purpose, the tonnage of creeping red fescue, a widely used lawn grass, which is imported into Europe is very very considerable. In fact creeping red fescue after perennial ryegrass, and one or two other grasses is next in order of importance of all the species certified under the O.E.C.D. Scheme. In 1970 the last year for which statistics are available the tonnage of creeping red fescue certified under the O.E.C.D. Scheme amounted to almost 4,000 tons compared with other important grasses such as perennial ryegrass 13,000, Italian ryegrass 5,000 tons, Cocksfoot 2,500 tons so that you can see the lawn seed trade can be a very very substantial one when developed to the sort of intensity current in some other parts of the world.

3. <u>The World Market for Australian bred or selected herbage plant cultivars.</u>

The market for seed in the Mediterranean type climatic area of the world is potentially a large one, even though currently it is one of very substantial fluctuations in demand from year to year and hardly compares with the markets in countries with a more highly developed agriculture.

One of the most heartening features of the market in these Mediterranean regions is a recent development.

This particular development is being sponsored by the international group CIMMYT which was responsible for the so called green revolution in a number of under developed countries. This group was responsible for the breeding of Mexican dwarf wheats and miracle rice varieties now widely cultivated in Asia and Mexico.

It is perhaps the only international group aiming at radical improvements in underdevelopment areas of the world which has in fact had a noteably high level of success in its efforts to date.

Following up on successes in Mexico Pakistan and the Phillipines, this group has now taken unto itself the task of developing the agriculture of the middle Eastern regions along the lines of our Southern Australian type farming systems in regions of medium to low rainfall, namely the cereal annual legume type rotation.

Mr. J.B. Doolette, formerly of the South Australian Department of Agriculture has been hired by this group to set up demonstrations of the merit of this type of cereal pasture rotation. This programme is being adequately financed so that there is little doubt that it will be a success in the initial stages of demonstration and with the reputation which this international organisation has developed over the years I have no doubt that they will pursue the matter of the commercialization of these demonstrations on a very large scale in a most vigorous manner.

While initially the work is to be done in Tunisia there is little doubt that this organisation envisages expanding this programme throughout the areas of North Africa, Southern Europe and the Middle East to which this particular approach seems the most promising means of rehabilitating agriculture.

Because most of the soils in this region are alkaline it is envisaged that the legumes to be used in the rehabilitation programme will be dominantly the various medics, all of which will be those currently being produced commercially in South Australia.

While there is little doubt that ultimately and in fact perhaps in nor more than two or three years Tunisia would be capable of producing this seed for themselves, if our own local South Australian seed is produced along the most efficient possible lines for production, processing and marketing there seems to be little doubt that South Australian seed can be landed in North Africa quite as cheaply as the locally produced product for a considerable time to come.

However, it is a market which like all other important world markets will be very price conscious and every effort must be

continually made to keep costs of production to the very lowest possible levels if in fact the South Australian produced seed is to be able to hold its place in this market.

While developments envisaged in North Africa and later other areas in that general region, will be quite large users of seeds. there are still very great possibilities for further developing other regions of mediterranean type climate which have been spasmodic users of Australian seed for many years.

Development of markets by Australia in these areas can hardly be classed as vigorous. We seem to be unable to think big enough and involve a wide enough body of Australian expertise in getting programmes successfully developed. This results in many areas that marketing is nothing more than quoting a price for seed when tenders are called.

One cannot hope to get very far by such a half hearted approach.

Of the Australian developed herbage plants the annual legumes particularly medics appear to have the best immediate prospects. Many other Australian developed plants could have some potential on the international scene.

I feel that in the case Demeter fescue there is a variety which should be forthwith submitted to the various testing authorities in Western Europe for performance testing and possible exceptance as a cultivar by their Varietal Registration Authorities.

It would appear from recent investigations by the National Institute of Agricultural Botany in Britain that Demeter fescue while allegedly of North African origin has a very similar growth pattern and level of productivity to the Aberystwyth S 170 variety. If further work can confirm this it should be possible to find some market when registration and appropriate further testing has been done in Britain and other Western European countries.

The total market for tall fescue in Great Britain is quite small. Not because the species is unproductive, but rather that the species has a reputation for being very damaging to grazing

animals in that the leaves are so sharp that they cut the mouths of grazing animals quite severely.

This feature has been such that the main interest in Tall fescue in Britain is as a conservation grass, where its productivity matched with its ease and convenience for harvesting for silage or drying is such that the grass has a small place where conservation is the sole use to which the stand is put.

There appears to be an urgent need to examine whether in fact Demeter fescue grown in Britain causes damage to grazing animals as there appears to be no evidence that this damage occurs to grazing animals in South Australia. If in fact, Demeter Tall fescue is as productive as S 170 and does not have the shortcoming of being damaging to grazing animals then it is quite conceivable that tall fescue in Great Britain will move from a very minor role in total grassland to a very much greater role because it has great productivity, (much greater than most other grasses) coupled with longevity much greater than the commonly used varieties of pasture grasses in Britain.

The remarks made regarding tall fescue in Britain most likely apply in other parts of Western Europe and it would seem most desirable that Demeter fescue be submitted for registration and performance testing in the other Western European countries where it may surplant 'Alta' fescue a variety bred in Oregon which now appears to dominate the Western European market for certified tall fescue and which is produced under the O.E.C.D. Scheme to the extent of over 700 tons per year.

At the annual meeting of O.E.C.D. one of the Italian delegates said that of the Australian developed pasture plants Phalaris tuberosa was the one which they were most interested in. He was thinking at the scientific level rather than at the farmer level so that there may not be an immediate market available for tonnages of seed but it is certainly one worth close investigation.

Only recently I have been informed by a Tunisian of French decent that Hunter River lucerne is quite the outstanding variety of lucerne in some parts of Tunisia.

Undoubtedly many other openings for export will be found for Australian cultivars providing the necessary work is done to gain a foothold in a particular situation.

This will undoubtedly require more than a ciruclar letter to a seed merchant in the various overseas countries.

It will in the agriculturally most sophisticated areas require the following of procedures taking some years, involving registration, performance testing with the possible eventual rejection before the first seed can be legally sold. We must make the appropriate arrangements within Australia to ensure that these lengthy and costly procedures are correctly and expeditiously carried out to enable our seeds to have access to these markets.

4. The Export of foreign cultivars under the O.E.C.D. Scheme and other arrangements.

During season 1970 the O.E.C.D. Scheme was availed of by a total of about 105 breeders throughout participating countries who arranged for the multiplication of 378 varieties under the scheme.

Of the 105 breeders approximately two-thirds were private companies or institutions and one-third public institutions.

There appear to be about five major Seed Organisations actively participating in the scheme and between them probably contributing to a substantial proportion of the total seed produced under the scheme. There are perhaps in addition to the really big firms, 10-15 important breeders who between them contribute something of the same order to the total as the first mentioned group of breeders. The remaining 80 or 90 breeders, most of whom only have one or at most two or three different varieties in the scheme, organise the rest of the production of O.E.C.D certified seed.

With a great multitude of breeders it will be very difficult to know which ones should be approached seeking the opportunity of multiplying their varieties on their behalf in Australia. Examination of the breeding firms multiplying seed beyond their national borders reveals that the most promising group of breeders to approach would be several of the major Dutch breeding firms which both have large numbers of varieties and have already set up production of these in many countries beside their own. See Appendix IV and V.

I think it should be pointed out at this stage that the movement of this foreign multiplication of cultivars has been towards multiplication in areas which have had a traditional multiplication of the particular species involved. For instance Canada for many, many years has been a major source of supply of Timothy seed for Western and Northern Europe. The development since the advent of the O.E.C.D. Scheme has been that modern bred varieties of both European and Canadian breeding have been replacing the commercial Timothy seed formerly produced in Canada, so that overall the benefit to Canada has been relatively small, there being merely a shift from producing uncertified commercial seed to producing O.E.C.D. certified seed of bred cultivars.

A similar situation could be cited in the case of perennial ryegrass or cocksfoot; which have for a long time been produced in large quantities in Denmark. Since the advent of the O.E.C.D. Scheme these Danish varieties have been certified under the O.E.C.D. Scheme but increasing numbers of foreign cultivars of these species are now multiplied in Denmark. The total seed industry of Denmark has not been greatly expanded by the advent of O.E.C.D. These remarks could equally well be applied to the multiplication of lucerne in the Western States of United States and a number of categories of seeds in Poland.

This development in the Northern Hemisphere indicates that for Australia to become an effective participator in this scheme it will be necessary for us to make two steps where most of the existing big participants have only had to make one step in getting this O.E.C.D. trade underway. We will not be able to rely on a past reputation for producing good commercial seed, but we will have to establish our reputation in the process of multiplying O.E.C.D. certified seed.

Not all seeds are eligible for O.E.C.D. certification and not all European importers require seed multiplied on their behalf to be certified under the O.E.C.D. scheme.

The certification schemes of many countries are recognised as sufficient guarantee of authenticity. For instance the German seed law recognises the certification scheme of 9 States in U.S.A. Belgium, Denmark, France, Ireland, Yugoslavia, Canada, Luxemburg New Zealand, Netherlands, Austria, Poland, Portugal, Sweden, Czechoslavakia, Turkey, Hungary, United Kingdom. South Australia is currently taking steps for our certification schemes to be recognised by Germany.

The European Economic Community is endeavouring to establish a common agricultural policy for implementation commencing in 1973. Among the many aspects of this common agricultural policy will be one relating to certification of seeds for both genetical and physical quality.

As is provided in the current German seed law the E.E.C. regulations will provide for recognition of foreign (non E.E.C.) certification schemes where they reach acceptable standards. South Australian and other Australian certification schemes will probably be recognised as adequate perhaps with some minor modifications.

Not all categories of seed will be required to be certified. Where foreign cultivars are being multiplied the importer may specify some official supervision of the multiplication outside of a formal certification scheme. This may be no more than the issuance of a green or orange international certificate covering the physical purityand germination of the line. In addition some seed of foreign cultivars multiplied in Australia will continue to move in international trade for some time to come with a minimum or no official supervision.

Australia, or at least southern Australia has had very considerable experience in the production of a great variety of legume seeds and it is fair to say that production of many but not all legume seeds in this type of environment has proved to be extraordinarily easy compared with many other parts of the world.

Because of the difficultury of producing legume seed in Western Europe there is a considerable importation of seed from many parts of the world.

It is fair to say that much of the legume seed required in Europe is produced in Denmark where over 1,000 tons of white clover seed alone; the most important legume, was produced in 1970, but Britain, U.S.A and Canada are all important producers of legume seeds for Western Europe.

However, it is possible that if seed supplies in some categories were more readily available that there would be a greater use of legumes in Western European agriculture than

currently and it is conceivable that with the developments so far achieved in the South Australian seed industry as far as annual self pollinated legume seed production is concerned that we are as well placed as anywhere in the world to suddenly expand production and cope with the needs of the Western European market for this type of legume seed. Currently there is some interest in giant shaftal clover, but there should be opportunities for production of seed of all the various self-pollinated herbage legumes which find use in Western Europe without very much need for further intensive research. Such legumes as berseem, alsyke and black medic are three that come to mind immediately.

The demand for red clover is also considerable in Europe this being a cross pollinated plant which requires the services of, preferably the bumble bee for performing the cross pollination. If some research effort is expended into devising techniques for pollinating these red clover seeds in South Australia there could be a very considerable trade in seed of this sort developed quite rapidly.

Multiplying European varieties of lucerne at least in the next 5 - 10 years will be rather too difficult to be seriously considered due to our lack of reliable pollinators and our quarantine restrictions on importation of lucerne seed.

White clover should not be ignored, particularly the vigorous varieties which can compete effectively with heavily nitrogen fertilized grass.

A market for seeds to which we appear to have given virtually no serious thought in this state is the market for herbage seeds in Japan. While livestock husbandry has never been a major industry in Japan, and much of the livestock that is currently carried is not maintained on pasture to the same extent as animals in southern Australia, nevertheless, Japan regularly imports between 4 and 5 thousand tons of seed of perennial grasses and legumes each year.

So far virtually all this seed has been derived from North American and Western European sources, there being relatively little land available for seed production in Japan itself.

Japan is a member of the O.E.C.D. herbage seed scheme and had representatives at the annual meeting in Paris, although I

understand these were not technical personnel engaged in plant breeding or seed production activities.

However, Japan has submitted a number of their own bred varieties of a number of perennial grasses and legumes to the O.E.C.D. scheme and in 1970 seed of four of these cultivars was produced in the United States and Canada under the O.E.C.D scheme.

While I am unaware of just how this particular trade is moving I see no reason to believe that we could not obtain at least token contracts for multiplication of seed of a number of Japanese varieties almost immediately if approaches were made in the right quarter. See appendix IV and V for list of Japanese cultivars and breeders.

As Japan has traditionally obtained its seed from North America and Western Europe the price it will be prepared to pay will certainly be nothing very fancy, but if in fact we can build up larger scale production units and occupy our seed cleaning plants for a longer period of the year, it still may be profitable, if not initially, at least in the longer term for us to become actively involved in trading with Japan.

While the current market for seeds of the order of 4 to 5 thousand tons there is no reason to believe that if a lot of land which has been traditionally regarded as unsuitable for agriculture in Japan is converted into pasture a very large grazing industry could be built up in various parts of Japan and this could in fact become a major market for seeds of the order of many fold greater than the tonnage currently used.

While much of Japan is intensively farmed to crops these really do not amount to a very big proportion of the total acreage of the country, much of the country being virtually unused for Agriculture.

During the course of this essay I hope I have conveyed several ideas:

1. That our seed industry has very little future if it is not greatly developed in volume and diversity.

2. These developments must be towards more efficient

   a. Production units
   b. Processing units
   c. Marketing units.

3. To achieve these objectives carefully planned, hard and expensive work has to be undertaken by the whole range of the various participants in the industries. This will require much expenditure of money.

While I propose to deal with some of the research and promotional work in some detail later, at this point I wish to discuss briefly the financial aspects of developing the industry and particular where money may be found to carry out this work.

Few major industries in Australia have been developed without some financial incentives being offered to entice people into developing these industries.

Manufacturers have been granted protection from tougher competition by means of levying various percentages of import duties. On occasions they have been paid direct bounties and often they receive special treatment for supplies from public utilities and concessions from local governments.

Within the rural industries we have had examples of bounties (in the case of cotton) and heavy import duties in the case of almonds. I have no doubt other examples could be found.

I would suggest that rather than a levy on production to create a fund to support research and promotion, a levy which would increase the cost of production of an article already burdened by a high cost structure, that the industry should be both protected from foreign competition by a substantial tariff, and paid a substantial bounty for seed exported, both monies being largely or entirely devoted to a fund for use in the various avenues needed to develop the industry.

This would finance research, trade delegations, registration and testing of Australian cultivars in foreign countries to name three areas which immediately come to mind.

I now wish to speak about research in relation to developing our seed industry. We have spoken earlier fairly generally of the means of expanding our seed industry and where market opportunities exist. Much of this involved multiplications of seed in a situation in South Australia which is climatically very different to the area where the seed will ultimately be used.

The development of the idea that seed for particular regions could be multiplied in areas quite remote from these regions has only been developed and accepted as a workable proposition as the result of extensive research virtually none of which has been done in Australia.

In particular the research which led to the acceptance of the idea of multiplying European varieties in Western U.S.A. was conducted with funds made available by the United States Government and consisted of various experiments over 10 or 15 year period being conducted on either side of the Atlantic. This established the principle that as far as the majority of cultivars were concerned, with some well documented exceptions, it was possible to multiply seed in Western U.S.A. through one generation without significant shift in the genetical make-up of the variety.

Similar research of a less extensive nature has been done comparing the performance of seed produced in Northern Europe and the Mediterranean region.

In general it can be said that for many temperate plants to flower they must enjoy a period of low temperature and/or short days before the shoot apex of the plant changes from producing leaves to producing flowers and seed. It is possible that our winters may not be sufficiently long and cold for some plants to get their full cold requirement. If this occurs there must be a genetic shift in the seed produced from the flowering plants.

Having obtained the necessary prerequisite cold and/or short days the plants generally then require a particular length of day following this experience to enable them to start flowering. In some particular cases the minimum length of day is such that under southern Australian conditions these varieties would never flower because they never experience a day of sufficient length. These various factors of day length are to some extent modified by night temperatures and here again we believe that our night temperature situation is rather different from the night temperature position in parts of North America. If some plants are favoured and some plants prevented from flowering by our day lengths again we will finish up with seed with a genetic shift from the true to type seed.

Much of the seed producing areas of South Australia, and in fact Australia in general are at much lower latitudes than Oregon, Western U.S.A. Canada, particularly the seed producing areas of the Peace River in Northern Alberta, more or less exactly parallels the latitude of the intensive farming areas of North Western Europe.

Latitude of course in itself is not the factor concerned but rather the influence it has on the number of hours during which light is sufficient to effect plant growth.

As there have been some particular examples where multiplication at the lower latitudes has resulted in a significant genetic shift and where a series of alternative regions for seed production occur, it is reasonable that the importing country will select the most favourable regions from the genetical point of view, until such time as research in Australia has demonstrated that seed grown in Australia is not subject to genetical shift influenced by daylength or other climatic factors.

Apart from genetical shift problems it would seem that before we indulge in a spate of overseas multiplications we must firstly examine the yield potential of a range of foreign cultivars in comparison with our own, sown using conventional seeding times and growing techniques to see how yields of seed under these production systems compare with our own cultivars. If our existing locally developed cultivars are genetically poor seed producers we may be selling our seed industry short when we compare our yields with those obtained from different varieties grown in Oregon or Denmark. These tests to be followed if in fact some particular cultivars with a reasonably good reputation for seed production in other parts fail to yield seed in South Australia, with more detailed investigations, to gain a deeper insight into their various day length and cold requirements to see whether these factors are in fact the basis of the relatively poor yields.

Apart from these specific problems of multiplying foreign cultivars it will be necessary to maintain a vigorous general research programme on questions of cultural practices, fertilizers, herbicides, insecticides and all sorts of other grazing defoliation type cultural practices to enable us to keep within striking distance of the efficiency of production achieved in the areas of the world competing with us on various markets of the world.

It must be squarely faced that our research position is very much poorer than those of at least our North American competitors.

Unless special arrangements are made for the creation of research funds as outlined earlier the attitude of our State Treasury and other public bodies throughout the world would normally be one of relating expenditure for research from public funds to the size of the industry concerned.

Seed production in Oregon is a $30,000,000 industry and is appropriately supported by research. Until our seed industry hits the $10,000,000 mark we are operating at a level which is no better than the third most important cereal (oats) grown in this state for which virtually no research is undertaken. The cost of an adequate research programme is considerable even if we are content to adopt foreign techniques, which means we will always be behind the leaders. It would appear at the moment quite unrealistic to aspire to a situation where our research was on a scale likely to put us in a leading position.

Fortunately some of the expensive facilities needed for seed research (glass houses and growth cabinets) and considerable less expensive equipment has or will be financed by the wool research trust fund. At least for several more years salaries and expenses of some research staff will also be met for this source.

On promotion and marketing I will not dwell long. It is not a field in which I have special training or expertise.

My comments will be along the lines of indicating a little of the extent to which countries already participating in promoting their industries both at home and abroad are prepared to spend.

Oregon is perhaps the best example to take.

For the 1970-71 budget year the collective budgets of the various bodies engaged in promotion of Oregon seed amounts to $280,000 spent in the following way.

Promotion and public relations $150,000, research $32,000 Personal expenses $12,000, Materials and services $28,000 Special payment $10,000 and emergency fund $27,000.

Activities range from production of films to loan to interested bodies, advertising in appropriate journals for sending samples of seed to those requesting it, general interest articles in Metropolitan and country newspapers, supporting in conjunction with the U.S. Government through Agricultural Service and the American seed Trade Association a full time promotional office in Europe.

Teams of Agronomists, marketing specialists and trade representatives have been sent to Europe and Asia while foreign teams have been brought to Oregon to see the industry.

Appropriate pressure is placed on legislators to ensure that the seed industries point of view in contentious matters is adequately appreciated.

During my recent visit to Europe I found the Australian Trade commissioner service most helpful in both Paris and Bonn. It was emphasised to me by the Paris commissioner in particular the importance of the Australian principals being on the spot in Europe to make deals rather than passively relying on an agent in the various regions. Agents, I was told, look after their interests first and foremost for a variety of reasons perhaps the most important that they cannot appreciate the points of view of the organisations for whom they are acting anywhere near as well as the managing director of the firm is able.

In conclusion I hope I have not painted so many difficulties that excessive pessimism will stifle further development of our seed industry.

I have reserved one optomistic point for the end of my talk.

We have by virtue of being in the Southern Hemisphere an advantage over all our Northern Hemisphere competitors. This advantage must be exploited and may be a major force to gain a toe hold in a market which has not traditionally sought seed from Australia.

One of the major hazards of seed growing in Europe is winter killing. This could easily upset seed production arrangements and create a shortage of seed in particular categories.

By multiplying seed in Australia it may be possible to forestall a potential shortage in Europe and certainly we will have the possibility of achieving a multiplication ahead of Northern Hemisphere production.

Assume a winter kill in the 1971-72 winter in Europe has occurred and steps are taken to rectify this by sowing in Denmark, Oregon or Australia. The likely situation will be as follows although if all goes well in Denmark they will produce seed the year after sowing as in Oregon.

	Denmark	Oregon	Australia
1972	Sown under barley in April	Sown on clean seed bed April	Sown on clean seed bed - April
1973	Reserved for fodder production	First seed harvested July	First seed harvested January. Seed sown in Europe April onwards.
1974	First seed harvested July	Seed sown in Europe April onwards Second seed harvested July	Second harvest January. Second lot of seed available for sowing in Europe April onwards.
1975	First seed sown in Europe April onwards	Second harvest seed sown April onwards	Third harvest January. Third harvest seed sown in Europe April onwards.

After ten years of hard trying to get the seed industry as far as it has I am sure that we would be foolish to throw it all away in a fit of despair.

We have made real progress in every aspect. In many ways our industry has been soundly based. Properly directed effort in the next decade could see the emergance of a seed industry in South Australia of sufficient stature to count for something not only as it does as the moment in the Australian scene but in addition be a real force in the world trade in seeds.

APPENDIX I

Oregon State University

ORCHARDGRASS SEED Enterprise Data Sheet

Cooperative Extension Service

Based on:

1. 250 A. on a 600 A farm (all grass seed)
2. Spring planted
3. 6 year life of stand
4. 750# /acre yield (clean seed)
5. Labour @ $2.50/hr. (hand weeding $1.50/hour).
6. 4 plow tractor @ $4.00/hr.
   2 plow tractor @ $2.00/hr.

	INPUTS PER ACRE					
	Labour			Other		Total
ESTABLISHMENT YEAR	Hrs.	Value	Machinery	Qty.	Value	Cost
Cultural operations 1/						
Plow (Spring)	.5	1.25	3.15			4.40
Disc & Harrow (2x)	.6	1.50	3.60			5.10
Harrow & Roll (2x)	.5	1.25	2.70			3.95
Level (2x)	.5	1.25	2.45			3.70
Harrow & Roll (1x)	.2	.50	1.10			1.60
Chemical seed bed prep.2/				Custom	10.00	10.00
Seed & Fertilize	.3	.75	1.70	3#seed	3.00	
				fert.	8.00	13.45
Spray (24D) (Custom)				mt'l	1.00	
				appl.	1.00	2.00
Mow (2x)	.7	1.75	2.10			3.85
Fixed charges						
Interest on investment in land $400 @ 5%					20.00	20.00
Taxes on land					6.00	6.00
Interest on operating capital					2.00	2.00
General Overhead 3/					2.10	2.10
Establishment cash costs		3.00	6.70		33.10	42.80
Establishment non-cash costs		5.25	10.10		20.00	35.35
Establishment total costs		8.25	16.80		53.10	78.15
Costs amortized over 6 years @ 8%						16.90

These data were obtained and computed by country agents and farm management specialist in cooperation with Benton Country Farmers, October, 1969.

1/ Consult your county agent for recommendations on specific practices.

2/ $20/acre; required on about half the acreage.

3/ 5% of cash costs.

ANNUAL PRODUCTION COSTS	INPUTS PER ACRE					
	Labour			Other		Total
	Hrs.	Value	Machinery	Qty.	Value	Cost
Cultural operations 1/						
Spray (herbicide in fall)				Chem.	7.50	8.50
				appl.	1.00	
Spray (Broadleaf & insect control)				chem.	7.00	
				appl.	1.00	8.00
Fertilize (2x)				fert.	20.00	
				appl.	2.50	22.50
Hauling fertilizer	.2	.50	.45			.95
Spot weed control	1.0	1.50		chem.	.50	2.00
Harvest costs						
Swath	.3	.75	2.50			3.25
Combine	.8	2.00	10.35			12.35
Hauling seed	.8	2.00	3.60			5.60
Processing (3¢/# + 28¢/bag)				custom	26.70	26.70
Certification (60¢/acre + 4¢/50)					1.20	1.20
Field sanitation (burning)					1.00	1.00
Orchard grass commission (33¢/100)					2.40	2.40
Fixed Charges						
Interest on investment in land; $400 @ 5%					20.00	20.00
Taxes on land					6.00	6.00
Interest on operating capital					4.00	4.00
General overhead 3/					4.25	4.25
Cash costs/producing year		3.00	6.75		85.05	94.80
Non-cash costs/producing year		3.75	10.15		20.00	33.90
Total costs/producing year		6.75	16.90		105.05	128.70
Amortized establishment costs						16.90
Total cost: producing year + establishment						145.60
Cost/100# at 750#/acre						19.40
Cost/100# at 500#/acre						26.10
Cost/100# at 1000#/acre						16.20

APPENDIX II

Oregon State University | PERENNIAL RYEGRASS SEED Enterprise Data Sheet | Cooperative Extension Service

Based on:

1. 150 A. on a 600 A farm (all in grass seed)
2. 900 lb. yield (clean seed)
3. Spring planted
4. 6 yr. stand life (after estab.)
5. Labor at $2-50/hour
6. 100 h.p. tractor @ $5/hour, 2 plow tractor @ $2/hour

	INPUTS PER ACRE					
	Labour			Other		
ESTABLISHMENT YEAR	Hrs.	Value	Machinery	Qty.	Value	Total Cost
Cultural Operations 1/						
Plow (Spring	.5	1.25	3.60			4.85
Harrow & Roll (3x)	.5	1.25	3.50			4.75
Springtooth & Roll (3x)	.6	1.50	3.90			5.40
Level (2x)	.5	1.25	2.80			4.05
Seed & Fertilizer 3/	.2	.50	.80	seed-25#/	3.75	
				125#/ 16-20	5.00	10.05
Spray (2,4-D) 3/				1 qt.	.75	2.00
				cus. app.	1.25	
Fixed Charges						
Taxes on land					5.00	5.00
Interest on Investment in land $400 @ 5%					20.00	20.00
Interest on operating capital @ 8%					1.45	1.45
General Overhead 2/					1.85	1.85
Establishment cash costs		2.75	5.85		19.05	27.65
Establishment non-cash costs		3.00	8.75		20.00	31.75
Establishment total costs		5.75	14.60		39.05	59.40
Credit for grazing (sheep)						(2.00)
Establishment costs after grazing credit						57.40
Amortized over 6 years @ 7%						12.05/ yr.

These data were obtained and computed by country agents and farm management specialists in cooperation with Linn County farmers, October, 1969.

1/ Consult your county agent for recommendations on specific cultural practices.

2/ 7% of cash costs.

3/ Check with your county agent for specific fertilizer and spray recommendations.

	INPUTS PER ACRE					
	Labor			Other		
ANNUAL PRODUCTION COSTS	Hrs.	Value	Machinery	Qty.	Value	Total Cost
Cultural Operations						
Fertilizer (2x) 3/				120# N	15.60	
				30# P205	2.40	
				cus.app.	2.00	20.00
Spray 3/				1.5 atra.	3.75	
				Oth. chem.	1.00	
				cus.app.	1.25	6.00
Harvest Costs						
Swath				custom	4.00	4.00
Combine	.4	1.00	6.50			7.50
Hauling	.4	1.00	2.00			3.00
Processing (includes bags) $1.25/ 100 lbs.					11.25	11.25
Certification (60¢/acre + 4¢/100)					.95	.95
Field sanitation (burning)					.75	.75
Fixed Charges						
Taxes on land					5.00	5.00
Interest on land investment $400 @ 5%					20.00	20.00
Interest on average operating capital @ 8%					2.15	2.15
General overhead 2/					3.70	3.70
Cash cost/producing year		1.00	2.50		53.80	57.30
Non-cash cost/producing year		1.00	6.00		20.00	27.00
Total cost/producing year		2.00	8.50		73.80	84.30
Credit for grazing (sheep)						(1.00)
Producing year costs after grazing						83.30
Establishment cost/producing year						12.05
Total cost: producing year + establishment						95.35
Cost/100# at 900#/acre						10.60
Cost/100# at 600# acre						14.65
Cost/100# at 1200#acre						8.57

Average price received in cents (U.S.) per pound

1959	60	61	62	63	64	65	66	67	68
1.75	6.53	5.47	5.07	6.27	5.87	9.95	9.95	7.87	10.59

APPENDIX III

SOUTH AUSTRALIAN CERTIFIED SEED PRODUCTION.

	10 year total lbs. 1961-62 to 1970-71	Greatest Yearly Total lbs.	Year of Greatest Production.	Acreage to which cultivar well adapted in S.A.
ANNUAL MEDICS				
Jemalong	3429479	1004212	1968-69	5,000,000 - 10,000,000
Harbinger	2192718	419026	1964-65	20,000,000 - 30,000,000
Paragosa	221019	117685	1969-70	100,000 - 500,000
SUB CLOVERS				
Bacchus Marsh	88064	3164	1964-65	2,000,000 - Little now used.
Clare	1847235	815403	1970-71	1,000,000 - 2,000,000
Geraldton	52906	29726	1969-70	2,000,000 - 4,000,000
Howard	153288	66340	1964-65	4,000,000 - Not strongly recommended.
Mt. Barker	4509900	1709902	1968-69	3,000,000 - 5,000,000
Woogenellup	388139	111995	1965-66	4,000,000 - 6,000,000
Yarloop	230632	75174	1969-70	1,000,000 - Not currently recommended.
Daliak	700	700	1968-69	1,000,000 - Not strongly recommended.
WHITE CLOVER				
Ladino	902	480	1964-65	50,000 - Irrigation only.
LUCERNE				
African	61697	18003	1965-66	10,000,000 - 20,000,000
Cancreep	29594	25920	1970-71	Not currently recommended.
Du Puits	147066	46514	1970-71	500,000
Hunter River	6934402	1469149	1969-70	10,000,000 - 20,000,000
Siro Peruvian	91217	46588	1970-71	10,000,000 - 20,000,000
COCKSFOOT				
Berber	173	173	1970-71	Probably to be superseded by Kasbah.
Brignolles	5483	5483	1964-65	Not currently recommended.
Currie	1012542	306442	1970-71	4,000,000
PHALARIS tuberosa				
Australian	343254	98374	1966-67	4,000,000
Seedmaster	442677	98516	1967-68	4,000,000
Sirocco	27265	18956	1970-71	6,000,000

Appendix III contd.

	10 year total lbs. 1961-62 to 1970-71	Greatest Yearly Total lbs.	Year of Greatest Production.	Acreage to which cultivar well adapted in S.A.
TALL FESCUE				
Demeter	749960	376279	1970-71	2,000,000
PERENNIAL RYEGRASS				
Medea	37396	37396	1970-71	2,000,000
ROSE CLOVER				
Kondinin	6840	6520	1970-71	1,000,000
Sirint	1300	130(	1965-66	100,000
BRASSICA'S				
Stabil	1100	1100	1969-70	Grown
Midas	24986	24986	1970-71	for
Cavalier Rouge	4400	4400	1969-70	Export
Giant Emerald	43563	43563	1969-70	
STRAWBERRY CLOVER				
Oconnors	153857	39512	1969-70	Lawn Variety
Palestine	1224151	279179	1969-70	500,000 - 1,000,000
Yamoi	3066	2066	1970-71	Not determined
	24,460,971			

Note in many instances the areas to which particular cultivars adapted overlap.

APPENDIX (IV)

PRODUCTION OF SEED UNDER O.E.C.D. HERBAGE SEED SCHEME FOR 1970 SHOWING SPECIES VARIETY BREEDERS AND COUNTRIES OF PRODUCTION.

Species	Variety	Breeder See Appendix (v) for key to code.	Region of multiplication See Appendix (v) for key to Code. CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
LOTUS CORNICULATUS L.	Lot	PL7					52.5 *									
	Viking	USA5	1.2 *													
Total Production in tons			1.2				52.5									53.7
MEDICAGO SATIVA L.	Alfa	S1													x	
	Alfa II	S1									*				x	
	Altafranken															
	schmidt-steinback	D39 (D38)													x	
	Du Puits	F26, D62, NL1			*										x	
	Emeraude	F20, NL4			*										x	
	Europe	F6, NL3													x	
	Eynesford	GB11			x			*								
	Felu	D12			*										x	
	Flamande				*											
	Gamma				*											
	Gemini	F26			*											
	Isis	DK6, NL1			x										x	
	La Rocca														x	
	Luciole	F14,			*											
	Orca	F4, NL2,			*											
	Orchisienne	F2			*											
	Omega				*											
	Provence				*											
	Polesana	I8*													x	
	Polesana I.N.G. 19.21.13	I3													x	
	Prima	F19			*											
	Ranger	USA19													69.9 *	

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
MEDICAGO SALIVA L. Contd.	Vertus	S1									*				x	
	Von Arnim's Altdeutsche Bastardluzerne	D1													x	
	Warotte	F7			*											
	Production of cultivars outside country of origin				6.5										755.5	
	Total Production in tons				382.1										825.4	1223.0
ONOBRYCHIS VICIAFOLIA Scop.	Sk-48	PL7					27.5 *									
	Total Production in tons						27.5									27.5
PISIUM SATIVUM L.	E.F.B.-33	USA 3													99.3	
	Total Production in tons														99.3	99.3
TRIFOLIUM HYBRIDUM L.	Hytra	D59	x													
	Øtofte	DK1	x													
	Tetra 4N	S1	x													
	Total Production in tons		58.9													58.9
TRIFOLIUM INCARNATUM L.	Dixie	USA8													249.0 *	
	Heusers Ostsaat	D34 (D33)													1.7 x	
	Production of cultivars outside country of origin														1.7	
	Total Production in tons														250.7	250.7

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA
TRIFOLIUM PRATENSE L.	Aberystwyth S123	GB14	x												x
	Aberystwyth S151	GB14	x												x
	Apilles	F14			*										
	Altaswede	CDN3	14.1 *												
	Corona Øtofte	DK1		*											
	Crop	F28			*										
	Elbo Pajbjerg	DK2		*											
	Essex	GB4*												72.1 *	
	Flamande	F24			*										
	Hamidori	J4	x												x
	Heges Hohenheimer	D18 (D17)												x	
	Hungaropoly	GB16, D61 (H2)	x											x	
	Lero	D30 (D29)	x											x	
	Merkur	S4									2.9 *				
	Niederrheinischer Rotklee Remy	D29 (D28)												x	
	Obernhaunstädter Violettsamiger	D52 (D50)													x
	Odenwalder Rotklee	D46 (D43)	x											x	
	Ostsaat-Treu	D41(D9)												x	
	Rea 4N	S1	x												
	Reichersberger	A2	x											x	
	Renova	CH2										0.4 *			
	Resistenta	S1	x												
	Rotonde	D17	x												
	Rotklee Remy													x	
	Sapporo	J2	x												x

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
TRIFOLIUM PRATENSE L. Contd.	Tetri	NL4													x	
	Titus 71	D43	x											x		
	Tilo Daehn-Feldt	DK6		*												
	Vesta Daehn-Feldt	DK6		*												
	Violettsamiger														x	
	Violetta R.V.P.	B3, NL18			83.5 *											
	Production of cultivars outside country of origim													285.5	247.0	
	Total production in tons		91.4	87.1	108.4					2.0	0.4			357.6	247.0	893
TRIFOLIUM REPENS L.	Aberystwyth S100	GB14	x	x										*		
	Aberystwyth S184	GB14	x	x										*		
	Aria	NL8		x												
	Armada	NL8		x												
	Barbian	NL3		x												
	Beta	S3		x												
	Blanka R.V.P.	B3, NL18		x												
	California Ladino	USA4													*	
	Cultura	NL2		x		*										
	Esko			x												
	Fries-Groninger	NL16*		x		*										
	Gigant	D5, NL4 (D9)		x		x									3.0 *	
	Milka															
	Pajsbjerg	DK2, NL5		*		x										
	Milkanova	D58		*												
	Mira Øtofte	DK1		*												
	Morso Øtofte	DK1		*												
	Øtofte	DK1		*												
	Pajbjerg Smalbladet	DK2		*												

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
TRIFOLIUM REPENS L. Contd.	Pertina	NL2		x		*										
	Retor	NL1		*												
	Regal	USA1, D32													*	
	V.Kamekes	D5		x												
	Wild englesh Øtofte	DK1		*												
	Wilkla	NL1		x												
Production of cultivars outside country of origin				150.6		1.2									3.0	
Total Production in tons			12.2	1127.4		3.9								1.6	87.4	2029.8
TRIFOLIUM RESUPINATUM	Maral	P1						81.4 *								
Total Production in tons								81.4								81.4
VICIA SATIVA L.	Erzurum															
	Figi L147	TR1											10.0 *			
	Supra	NL1,D31 (D30)			10.0											
	Vico	S3								20.0 *						
Production of cultivars outside country of origin					10.0					20.0						
Total production in tons					10.0					20.0			10.0			40.0
VICIA VILLOSA Roth.	Casal	P1						0.3 *								
	Ostsaat-Dr. Baumans	D41 (D9)													0.8 *	
	Polyp	D55 (D24)												1.0 *		
Production of cultivars outside country of origin														1.0	0.8	
Total production in tons								0.3						1.0	0.8	2.1

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
AGROSTIS CANINA L.	Barbella	NL3					83.5 *									
	Novabent	NL4													0.6 *	
Production of cultivars outside country of origin							83.5								0.6	
Total production in tons							83.5								0.6	84.1
AGRESTIS GIGANTEA Roth.	Kita	PL2					*									
	V.Kamekes	D5 (D9)					30.1 *									
	Zygma	PL7					*									
Production of cultivars outside country of origin							30.1									
Total production in tons							293.2									293.2
AGROSTIS STOLONIFERA L.	Smaragd	S1					x									
	Prominent	NL10					x									
Production of cultivars outside country of origin							9.3									
Total production in tons							9.3									9.3
AGROSTIS TENUIS Sibth	Boral	S1					17.3 *									
	Highland	USA25													24.9 *	
	Holfior	NL1													x	
	Tracenta	NL4													x	
Production of cultivars outside country of origin							17.3								17.0	
Total production in tons							17.3								41.9	59.2

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
ALOPECURUS PRATENSIS	Polano	PL7					38.5 *									
	Wehrdaer-Rhona	D51 (D49)													6.8 *	
Production of cultivars outside country of origin															6.8	
Total production in tons							38.5								6.8	45.3
ARRHENATHERUM ELATIUS	Arel 41	D43 (D37)					x									
	Odenwalder	D46 (D43)					x									
	Remus	PL12					*									
	SK-5	PL7					*									
	Wena	PL2					*									
Total production in tons							254.0									254.0
BROMUS INERMIS	Anto	PL12					32.0 *									
Total production in tons							32.0									32.0
CENCHRUS CILIARIS	Molopo	ZA1							0.4							
Total production in tons									0.4							0.4

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	SA	E	S	CH	TR	GB	USA	
DACTYLIS GLOMERATA	Baraula	NL3, D2		x		*	x									
	Brage	S4		x												
	Dactimo	NL4		x												
	Daehnfeldt Hera	DK6		*												
	Dagoma	NL10					x									
	Dorise	NL1, D17		x												
	Fala	PL2					*									
	Esko			x												
	Ferdia	IRL1		x												
	Frode	S4		x											x	
	Hay King			x												
	Holstenkamp	D35, NL2 (D34)		x												
	L22 Dora	I6					x									
	Lemba R.V.P.	B3, D16		x												
	Modac	NL4		x		*									x	
	Mullus	D35		*												
	Nika	PL8					*									
	Pajbjerg	DK2		*												
	Pajbjerg Milka	DK2		*												
	Phyllux Daehnfeldt	DK6		*												
	Roskilde	DK1		*												
	Sildig Roskilde	DK1		*												
	Sterling	USA11													3.8 *	
	Tardus II	S1					x								x	
	Taurus	F28			16.3 *											
	Trifolium	DK5		*												
	V. Kamekes	D5 (D9)		x			x									
	XL703			x												
Production of cultivars outside country of origin			179.5				248.4								45.7	
Total production in tons			1816.5		16.3	119.7	646.7								49.5	2529.0

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
ERAGROSTIS CURVULA (Schrad). Nees	Ermelo	ZA1							9.3 *							
Total production in tons									9.3							9.3
FESTUCA ARUNDINACEA Schreb.	Aberystwyth S170	GB14	5.4 *											18.7 *	x	
	Alta	USA25													756.4 *	
	Ludion	F14			*											
	Manade	F28			*											
	Motall	NL4													x	
Production of cultivars outside country of origin															15.6	
Total production in tons			5.4		6.3									18.7	772.5	802.9
FESTUCA OVINA L.	Biljart	NL4				146.4 *										
	Novina	NL4				6.0 *										
Total production in tons						152.4										152.4
FESTUCA PRATENSIS	Aberystwyth S53	GB14	x													
	Aberystwyth S215	GB14												74.8 *		
	Barbarossa	NL3	x	x			x									
	Barenza		x													
	Barkas	NL3	x	x												
	Belimo	NL4		x		*	x									
	Bergamo	NL4	x	x		*	x									
	Bundy	NL1		x												
	Comtessa	NL9, NL8 (NL8-9)		x		*										
	Daehnfeldt Leto	DK6		*												

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA
FESTUCA PRATENSIS contd.	Dina	PL10					*								
	Cosmos 11= Dr.Von Schmeider's Steinacher	D43 (D37)		x											
	Dufa	NL2	x	x			x								
	Enbela					*									
	Ensign	CDN1	*												
	Fiola	B2, NL8		x											
	Garanta	NL10					x								
	Largo	NL2	x	x											
	Løken	N2		x											
	Mewa	PL8					*								
	Merbeem	B3, NL1	*												
	Mimer	S1	x								* 7.0				
	Øtofte	D41		*											
	Øtofte Fero	DK1		*											
	Pajbjerg	DK2, NL5		*											
	R.V.P.	B3	x	x			x								
	Rossa	NL11		x											
	Sequana	F28	x	x	22.0 *										
	SK-6	PL7					*								
	Trader	CDN1	*												
	Trifolium	DK5		*											
	Sceempier= Garanta		x												
	Wendelmoed	NL11		x											
Production of cultivars outside country of origin				185.7			94.7								
Production in tons			232.2	1429.9	22.0	197.6	1028.0							74.8	2984.5
FESTUCA RUBRA L.	Aberystwyth S59	GB14	x												
	Acho					*									
	Barfalla	NL3, D2				*									x
	Boreal	CDN 1	*												
	Cascade	USA25													*

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
FESTUCA RUBRA L. Contd.	Dasas	DK7		*		x										
	Dawson	NL1					x									
	Echo Daehnfeldt	DK6		*		x										
	Elco	DK1		*												
	Famosa	B5				*	x									
	Gracia	NL10		*												
	Golfrood	D17					x									
	Highlight	NL8				*									x	
	Illahee	USA25													*	
	Koket	NL4, D28				*										
	Kos	PL2					*									
	Liebenzeger	D30 (D29)		x												
	Novorubra	NL4, D28	x			*										
	Oase	NL8	x			*										
	Olds	CDN1	*													
	Pennlawn	USA26													*	
	Rainier	USA25													*	
	Rapid	NL10		x												
	Rasengold	D43 (D37)		x		x									x	
	Reptans	S1 D59	x	x												
	Roda	NL2				*										
	Roland21	D43, (D37)													*	
	Rubin	S3		x												
	Rubina Roskilde	DK1		*		x										
	Ruby	NL1, D17	x													
	Runo	PL3				x	*									
	Taca Trifolium	DK5		*		x										
Production of cultivars outside country of origin				41.3			206.8								218.1	
Total production in tons			212.6	211.9		685.7	504.2								460.6	3982.6
LOLIUM MULTIFLORUM Lam.	Avance					*										
	Barmultra	D2 (D4)				*										
	Barwoldi	D2				*										
	Barwoltra Westerwolds	D2 (D4)		*		*	x									

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA
LOLIUM MULTIFLORUM Contd.	Billion														
	Westerwolds	D17 (D16)			x		x								
	C.I.V.	NL11		x											
	Combita	NL8-9 (NL8)				*									
	E.F. 486														
	Dasas	DK7		*											
	Gulf	USA31													*
	Energa					*									
	Leda	Daehnfeldt DK6		*											
	Fat	F28					x								
	Lema	D30 (D29)												x	
	Levsens	D33 (D32)		x											
	Lomi														
	Trifolium	DK5		*											
	L17 Asso	I6					x								
	Magnolia														
	Ryegrass	USA17													*
	Milamo	NL4		x		*									
	Molto	NL4				*									
	Mowester														
	Wester	PL8					*								
	Oobahikari	J1													x
	Optima	NL10		x		*									
	Prima														
	Roskilde	DK1		*											
	R.V.P.	B3		x											
	Rina	F14			*										
	Rita	F14			*										
	Sceempta	NL10		*			x								
	SK-7	PL7					*								
	Sola	NL11		*											
	Tedis	F28			*										
	Tetelia	NL1,3,8,9,10,11 (NL1)		x		*	x							x	x
	Tetrone	D17		*	x		x								
	Tewemo	B8													
	Tewera (Westerwolds)	NL1,2,3,4,8,9,10 (NL1)		x		*	x			*	x				x
	Tiara	NL2		x											
	Tur	PL2					*								
	Vejrup M.B	DK4		*											

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
LOLIUM MULTIFLORUM Contd.	Vertas	(Westerwolds)NL8, D32													x	
	Wasehikari	J1													x	
Production of cultivars outside country of origin				827.7	100.7		729.8				0.5			48.3		
Total production in tons				3364	130.2	329.8	1147.3				0.5			48.3	958.7	5753.4
LOLIUM PERENNE L.	Aberyswyth S24	GB14												*		
	Aberystwyth S321	GB14												*		
	Agresso	NL8,D32				*								x		
	Animo	NL4		x		*										
	Argo	PL12					*									
	Atempo	NL8				*										
	Barenza	NL3, D2		x		*										
	Barlatra	NL3		x		*										
	Barlenna	NL3, D2		x		*										
	Barpastra	NL3		x		*										
	Barstella	NL3				*										
	Barvestra	NL3		x		*										
	Bocage	F28		x												
	Caprice	NL11		x												
	Combi	D32, NL9, NL8 (NL8-9)		x		*										
	Compas	NL8-9		x		*										
	Dasas	DK7		*												
	Delta	S3								11.5	*					
	Doublet	NL1		x												
	Dux Øtofte	DK1		*												
	Hora	NL2		x		*										
	Hooitype 42-27			x												
	Houba	NL11				*								x		
	Hunsballe	DK8		*		x										
	Lamora	NL4		x		*									x	14.1
	Lenta Pajbjerg	DK2		*												

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
LOLIUM PERENNE L.	Linn	USA25													129.7 *	
Contd.	Melino	B3, NL1		*												
	Melle	GB12		*												
	Mito Daehn-feldt	DK6		*												
	Naki	PL9					*									
	Pax, Øtofte	DK1		*												
	Pelo	NL1		x												
	Perma	NL2		x		*										
	Petra	B2, NL1		x												
	Premo	NL4		x		*										
	Presto Pajbjerg	DK2		*												
	R.V.P.Pasture			x		x										
	R.V.P. Hay	B3		x		*										
	Reveille	NL1 D17		x										x		
	Semperweide	NL10, D32		x												
	Spirit	NL10		x												
	Splendor	NL11, D29		x												
	Stadion	NL4		x												
	Taptoe	NL1, D17		x												
	Terhoy	NL2				*										
	Tetraploid			x												
	Terpas	NL2		x												
	Verna Pajbjerg	D35 (DK2)		*												
	Viktoria Trifolium	DK5		*												
	Weiris	D32 (D31)		x												
Production of cultivars outside country of origin				29376										44.6	14.1	
Total production in tons				10002.9		1068.6	969.5			11.5				1664.1	148.8	13865.4
PHLEUM BERTOLONII	Aberystwyth S50	GB14, NL2	x											20.0 *		
	Evergreen	S1								4.0 *						
Total production in tons			3.2							4.0				20.0		27.2

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA
PHLEUM PRATENSE L.	Aberystwyth S 48	GB14	x												x
	Aberystwyth S51	GB14	x											*	x
	Aberystwyth S352	GB14	x											*	
	Barenza (Hooitype)	NL3		x											
	Bariton	NL3	x	x											
	Barmoti	NL3	x	x											
	Champ	CDN1	*												
	Clair	USA14	x												
	Climax	CDN1	*												x
	Comet	NL8-9	x	x											x
	Drummond	CDN2	*												
	ErectaP[illegible]	B3, D17	x	x											x
	Erecta	D17, B3, NL1	*												
	Eskimo	NL4	x				x								x
	[illegible]	PL2					*								
	Evergreen														x
	Glasnevin Gem	IRL2	x												
	Heidemij	NL7, NL1													x
	Heilbrink	D34 (D33)	x												
	Intenso	NL10					x								
	Kampe II	S1	x												
	King	NL1													x
	Lansberger	D5 (D9)	x				x								
	Lofar	NL2	x	x											
	Mahndorfer Lieschgrass	D45, (D42)	x												
	Melusine	F14	x												
	Oakmere	GB5	x												
	Odenwalder	D46 (D43)	x												
	Olympia	NL8	x												x
	Omnia	S4	x												
	Pajbjerg	DK2		*											
	Para	PL2					*								
	Pecora	F28	x												
	Pergo	DK2, NL5, B	x												
	Phlewiola	D46 (D43)	x												
	SK45	PL7					*								

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
LEUM ATENSE L.	Taca															
	Trifolium	DK5 (D5)		*												
	Timo	NL4	x	x			x								x	
	Tiran	NL9	x													
	Topasøtofte	DK1	x	*												
	Vanadis	S3	x													
	Toro		x													
Production of cultivars outside country origin			1015.5	31.9			35.8								715.9	
Total production in tons			1779.2	283.4			271.3								715.9	3049.8
A LUSTRIS L.	SK-47	PL7					19.5 *									
Total production in tons							19.5									19.5
A TENSIS L.	Apoll31	D43 (D37)					x									
	Atlas	S4				*										
	Barkenta	NL3				x										
	Baron	NL3				x										
	Captan	NL10				*	x									
	Dasas	DK7		*												
	Delft	NL2		x		*										
	Dr. von Schmeider Steinacher	D43				x										
	E.F.	DK10		*												
	Fylking	S4													x	
	Golf	S3		x		x										
	Merion	USA6				x									*	
	Monopoly	NL4				*										
	Newport	USA37													*	
	Norma Øtofte	DK1		*												
	Otto's	D5 (D9)		x		x										
	Park	USA16													*	

Appendix (IV) contd.

Species	Variety	Breeder	CDN	DK	F	NL	PL	P	ZA	E	S	CH	TR	GB	USA	
POA PRATENSIS L. Contd.	Prato	NL1, D17				*	x									
	Primo	S1					x								x	
	R.V.P.	B3		x												
	SK-46	PL7					589.6 *									
	Soma Hunsballe	DK8		*												
	Späths Hohenheimer	D42 (D40)				x										
	Sydsport	S1					x				2.0 *					
Production of cultivars outside country of origin			145.3	177.7			281.2									
Total production in tons			582.0	374.4			589.6				2.0				752.4	2155.1
POA TRIVIALIS L.	Dasas	DK7		*												
	Omega Øtofte	DK1		*												
Total production in tons			39.4													39.4

First breeder listed is generally considered the best source of information on the cultivars. Breeders in brackets indicates breeders number in most recent (1971) list of cultivars where it appears to have been changed from previous number for the particular cultivar.

* indicates multiplication within country of origin.

x indicates multiplication in a foreign country to country of origin.

APPENDIX (V)

Names and addresses of Breeders whose varieties were reproduced in 1970 Under O.E.C.D. Scheme.

	BREEDER	ADDRESS
AUSTRIA = A in Appendix (IV)	A 2	Oberösterreichische Landes-Saatbaugenosenschaft, Schirmerstrasse 19, A-4021 Linz-Hart, Oberösterreich.
BELGIUM = B " " "	B 2	van der Have, D.J., Baverickstraat 2A, Waamunster.
	B 3	Rijksstation voor Veredeling der Landbouwgewassen, 57 Burg. Van Gansbergelaan, Lemberge-Merelbeke, (Oost-Vlaanderen).
	B 5	S.M. Labor, Kleine Dokkaai, 1-5, Gent.
	B 8	Mommersteeg's N.V., Zaadteelt & Zaadhandel, Oranjestraat 44, B-2000 Antwerpen.
CANADA = CDN " " "	CDN 1	Canada Department of Agriculture, Ottawa, Ontario.
	CDN 3	University of Alberta, Edmonton, Alberta.
DENMARK = DK " " "	DK 1	DanskeLandboforeningers Frøforsyning, 4000 Roskilde og Faellesforeningen for Danmarks Brugsforeningers Frøafdeling, 2600 Glostrup. (D.L.F. og F.D.B.)
	DK 2	Pajbjergfonden, Overbygaard, 7080 Børkop.
	DK 4	M. Brock, Vesterbro 3, 5000 Odense.
	DK 5	A/S Trifolium Frø, Taastrupgaard, 2630 Taastrup.

Appendix V contd.

	BREEDER	ADDRESS
DENMARK (Contd.)	DK 6	A/S L. Daehnfeldt, Faborgvej 248, 5250 Fruens Bøge.
	DK 7	A/S Dansk Frø-og Silo-Selskab, Nyropsgade 37, 1602 Kobenhavn V.
	DK 8	Frøavlscentret Hunsballe A/S, 7500 Holstebro.
	DK 10	Laur. Nielsen Nyborg A/S, Stradvejen 6, 5800 Nyborg.
FRANCE = F in Appendix (IV)	F 4	Carneau, 59, Orchies.
	F 5	L. Clause, S.A., Avenue Du Mesnil, 91 Bretigny-sur-Orge.
	F 7	Devaux-Chanu, Graines, 59, Orchies.
	F 14	I.N.R.A. (Institut National de la Recherche Agronomique) 149, rue de Grenelle, 75, Paris 7ème.
	F 19	Lasserre, 1, rue de la Charité, 31 Toulouse.
	F 20	Leoureur Freres, C et G., 27, rue J.J. Rousseau, Paris 1er.
	F 24	S.O.C. (Service Officiel de Contrôle et de Certification des semences et Plantes), 44, rue du Louvre, Paris 1er.
	F 26	Tourneur Frères, S.A., 44 rue de Melun, 77 Coulommiers.
	F 28	Vilmorin Andrieux, 4, Quai de la Mégisserie, Paris 1er.
GERMANY = D " " "	D 1	Arnim, Hermann Graf von 8022 Grünwald.
	D 2	Barenbrug's Saatzucht GmbH, 2 Hamburg 1, Frankenstrasse 35.

	BREEDER	ADDRESS
GERMANY (Contd.)	D 5	Deutsche Saatveredeling Lippstadt-Bremen GmbH. 478 Lippstadt, Landsberger Strasse 2.
	D 12	Freudenberger oHG, Feldsaaten S., 415 Krefeld-Uerdingen, Hochstadenstrasse 5.
	D 17	van der Have GmbH, D.J. 5104 Eilendorf (Kr Aachen), von-Coels-Strasse 38.
	D 18	Hege, Dr. h.c. Hans, 7112 Hohebuch Post Waldenburg (Württ).
	D 25	Levsen, Thomas P., 2257 Bredstedt (Schlesw), Gartenstrasse 32.
	D 28	Mommersteeg & Co. GmbH, 297 Emden-Borssum, Hachstrasse 6.
	D 29	Niederrheinische Klee- u. Grassamenbau-Genossenschaft eGmbH, 4179 Weeze.
	D 30	Norddeutsche Pflanzenzucht Hans-Georg Lembke KG, 24 Lübeck-Schlutup, Travehaus.
	D 31	Nordsaat Saatzuchtgesellschaft mbH, 2322 Waterneverstorf Post Lütjenburg (Ostholst).
	D 32	Nungesser, L.C., 61 Darmstadt, Bismarckstrasse 59.
	D 33	Oldörp & Jürgens, 24 Lübeck, Gr. Petersgrube 17/19.

	BREEDER	ADDRESS
GERMANY (Contd.)	D 34	O.S.G. Saatzuchtgesellschaft mbH, 3 Hannover-Wülfel, Eichelkampstrasse 24.
	D 35	Petersen, P.H., 2391 Lundsgaard Post Grundhof/ über Flensburg.
	D 39	Schmidt, Ernst, 8711 Gnodstadt/ über Kitzingen, und Steinbach, Karl, 8722 Obbach/über Schweinfurt.
	D 41	Schwiebuser Landwirtschaftliche Kreisgenossenschaft u. Trocknungswerke eGmbH Hannover, Geschäftsstelle Süpplingen, 3334 Süpplingen/über Helmstedt, Steinweg 20.
	D 42	Späth, Fritz, 7452 Seehof Post Haigerloch/über Hechringon.
	D 43	Steinach, Dr. M. von Schmieder Nachf. Saatzucht, 8441 Steinach/über Straubing.
	D 45	Stroetmann, Hermann, 44 Münster-Meeklenbeck, Albachtenweg 30.
	D 46	Süddeutsche Saatzucht-und Saatbaugenossenschaft eGmbH, 6931 Oberdielbach/über Eberbach (Bad. Neckartal).
	D 51	Wendenburg, Karl, 6419 Domäne Wehrda/über Hünfeld.
	D 52	Wittmann, Dr. Franz, 8071 Oberhaunstadt/über Ingolstadt (Donau).

	BREEDER	ADDRESS
GERMANY (Contd.)	D 55	Littmann, Harald, 2427 Timmdorf, Post Malente-Gremsmühlen.
	D 58	Lietzke, Jochen, 2331 Hohenlieth/ über Eckernforde.
	D 59	Weibull (Deutschland) GmbH, W. 2 Hamburg 13, Kielortallee 9.
	D 61	Agrimpex - Hungarian Trading Company for Agricultural Products, Budapest V/Ungarn, Nador-u 22.
IRELAND = IRL in Appendix (IV)	IRL 1	Department of Agriculture and Fisheries, Dublin 2.
	IRL 2	Plant Breeding Department, University College, Ballymun Rd., Glasnevin, Dublin 9.
ITALY = I " " "	I 3	Istituto Sperimentale per la Cerealicoltura, Roma
	I 6	Istituto Sperimentale per le Colture Foraggere, Viale Piacenza, 25, Lodi (Milano).
	I 8	All enquiries about local cultivars should be addressed to Ente Nazionale delle Sementi Elette, Piazza S. Fedele, 2 Milano
JAPAN = J " " "	J 1	Department of Grassland, National Institute of Animal Industry, Nishinasuno-cho, Tochigi-Ken.
	J 2	National Hokkaido Agricultural Experiment Station, Hitsujigaoka, Sapporo.
	J 4	Snow Brand Seed Company, Ltd., Misono, Sapporo.
NETHERLANDS = NL " "	NL 1	D.J. van der Have, N.V., Kappelle-Biezelinge.

	BREEDER	ADDRESS
NETHERLANDS (Contd.)	NL 2	Ets. Cebeco, 31 Blaak, Rotterdam 1.
	NL 3	Barenbrug's Zaadhandel N/V/, Arnhem.
	NL 4	N. V. H. Mommersteeg, Vlijmen.
	NL 5	Selectiebedrijf Luidenburg, Groningen.
	NL 7	Ned. Heidemaatschappij, Arnhem.
	NL 8	Gebr. van Engelen's Zaadteelt, en Zaadhandel N.V., 's-Hertogenbosch.
	NL 9	J. Joordens' Zaadhandle N.V., Venlo-Blerick.
	NL 10	Zwaan en de Wiljes, N.V., Scheemda
	NL 11	Stichting Kweekbedrijf C.I.V., Ottersum.
	NL 16	The General Netherlands Inspection Board of Seeds and Seed Potatoes, Bosrandweg 5, Wageningen.
	NL 18	N.V. Zaden Labor, Terneuzen.
NORWAY = N in Appendix (IV)	N 2	The State Experimental Station, Løken, 2942 Volbu.
POLAND = PL " " "	PL 2	Hodowla Buraka Cukrowego, Warszawa, ul. Smolna 14.
	PL 3	Instytut Hodowli i Aklimatyzacji Roślin, Stacja Hodowlano-Badawcza, Bartazek, woj. olsztynskie.
	PL 7	Krakowska Hodowla Roślin, Krakow, ul. Warszawska 19.

	BREEDER	ADDRESS
POLAND (Contd.)	PL 8	Lubelska Hodowla Roślin, Lublin, ul Leczynska 107.
	PL 9	Mazurska Hodowla Ziemniaka, Olsztyn, ul. Partyzantow 17/20
	PL 12	Poznanska Hodowla Roślin, Poznan, ul. Palacza 134.
PORTUGAL = P in Appendix (IV)	P 1	Estacao Agronomica Nacional, Oeiras.
SOUTH AFRICA = ZA " "	ZA 1	Department of Agricultural Technical Services, Agriculture Buildings, Pretoria.
SWEDEN = S " " "	S 1	W. Weibull, Landskrong.
	S 3	AB Hammenhögs Frö, Hammenhög.
	S 4	Swedish Seed Association, Svalöf.
SWITZERLAND = CH " "	CH 2	Swiss Federal Research Station for Agronomy, Zürich-Reckenholz.
TURKEY = TR " " "	TR 1	Prof. Dr. Sahabettin Elçi, A.U. Ziraat Fakültesi, Ankara.
UNITED KINGDOM = GB " "	GB 4	Eastern Region Clover Association, Lightwaters Farm, Panfield, Nr. Braintree, Essex.
	GB 5	Gartons Limited, Warrington, Lancashire.
	GB 11	Messrs. W. Alexander (Eynsford) Ltd., Home Farm, Eynsford, Kent.
	GB 12	National Certifying Authority for Herbage Seeds, The National Institute of Agricultural Botany, Huntingdon Road, Cambridge.

	BREEDER	ADDRESS
UNITED KINGDOM (Contd.)	GB 14	National Seed Development Organisation Ltd., The Granaries, White House Lane, Huntingdon Road, Cambridge. Agents for: Plant Breeding Division, Ministry of Agric., Loughgall. Northern Ireland. Plant Breeding Inst., Maris Lane, Trumpington, Cambridge. Scottish Society for Research in Plant Breeding, Scottish Plant Breeding Station, Pentlandfield, Roslin, Midlothian, Scotland. Welsh Plant Breeding Station, Plas Gogerddan, Nr. Aberystwyth, Wales.
	GB 16	Hurst Gunson Cooper Taber, Ltd., Witham, Essex.
UNITED STATES = USA Appendix (IV)		
	USA 1	Alabama Agricultural Experiment Station, Auburn, Alabama.
	USA 3	E.F. Burlingham & Sons, Forest Grove, Oregon 97116.
	USA 4	California Agricultural Experiment Station, Davis, California.
	USA 5	Cornell University A- Experiment Statio New York.

UNITED STATES (Contd.)	USA 6	Crops Research Division, U.S. Department of Agriculture, Plant Industry Station, Beltsville, Maryland.
	USA 8	Georgia Agricultural Experiment Station, Athens, Georgia.
	USA 11	Iowa Agricultural Experiment Station, Ames, Iowa.
	USA 14	Kentucky Agricultural Experiment Station, Lexington, Kentucky.
	USA 16	Minnesota Agricultural Experiment Station, St. Paul, Minnesota.
	USA 17	Mississipi Agricultural Experiment Station, State College, Mississipi.
	USA 19	Nebraska Agricultural Experiment Station, Lincoln, Nebraska.
	USA 25	Oregon Agricultural Experiment Station, Corvallis, Oregon.
	USA 26	Pennsylvania Agricultural Experiment Station, University Park, Pennsylvania.
	USA 31	Texas Agricultural Experiment Station, College Station, Texas.
	USA 37	Washington Agricultural Experiment Station, Pullman, Washington.