

AUSTRALIAN NUFFIELD FARMING SCHOLARSHIPS

REPORT

by

HUGH ROBERTS

**of a visit to the United Kingdom
21st February 1977 to 19th August 1977**

**TO STUDY BRITISH AGRICULTURE IN
GENERAL AND BRITISH SEED INDUSTRY
IN PARTICULAR**

**"Birralee,"
Cootamundra NSW
Australia.**

April 1978

R E P O R T

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the United Kingdom Seed Industry in particular.

"Birrale",
Cootamundra 2590 N.S.W.,
Australia

APRIL, 1978

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Nuffield Scholars are, indeed must be individuals in a world of Corporations and Co-operations - let us give them strength for we need them now more than ever.

They must be:

Penetrating in their analysis
Forthright in their reporting
Courageous in their practice
Provocative in their advocacy
And Adventurous in their forecasts.

JOHN CYSTA

U.K. Chairman
U.K. Farming Scholars Association
30th Anniversary Dinner
December, 1976

ACKNOWLEDGMENTS

The Commonwealth Scholars of 1977 were the first scholars funded from their own countries. I pay first and foremost tribute to the major contributors to my scholarship.

QANTAS and the RURAL BANK were the two companies who were responsible for my studies in the U.K. Both have made an enormous contribution to Australian agriculture in the past, and we look forward to their continuance in the future. I thank them both, and trust I do them justice.

To George Wilson - President of the Australian Nuffield Farming Scholars Association, I pay tribute. It speaks volumes that the returned scholars (all 56 of them) should believe that the concept is worth promoting and expanding.

Captain John Stewart and John Cysta of the U.K. Scholars Association as usual, proved that their Association can handle all the ups and downs involved in hosting Commonwealth scholars.

As explained, we were the first scholars not funded by Nuffield Foundation, but nevertheless we were under their patronage in Britain. So to Mr. David Younge (a fellowship adviser) and Mr. John Maddox (Director), I give my thanks.

To the 1977 scholars and ex-scholars wherever we met, I say thank you. This is truly a group of people committed to free exchange of ideals and ideas. Their knowledge shared was the cream of this scholarship.

Each Commonwealth Scholar has a "host farmer" in Britain. This unsuspecting family provides a basic knowledge of British agriculture as well as a haven from the storms of pursuing an agrarian education. I must pay glowing tribute to Andrew and Nancy Peddie at "Coal Farm", St. Monance, Fife for all they did and more. No one family made a greater contribution to my stay in the U.K., and although I know the perils of singling out one family to give thanks to, in this case I do it unreservedly.

Every farmer reading this could ponder how he could leave his farm and business for 7 months. In my case, this was made possible by my family who encouraged me at all stages of this scholarship. They took over the running of the property and this colossal hurdle that stops many would-be scholars, was thus made so easy for me. I thank them all.

My wife Jenny, and son Justin, virtually transplanted their lives from a home in Australia to a flat in England. By and large, they did this with few of the trappings that go with an overseas trip. They respected my feelings that I was there to work, and this helped and supported me all the way. I can only voice my thanks.

INTRODUCTION

Nuffield Farming Scholarships are awarded to practising farmers to study their profession, or aspects of it, in the United Kingdom. It is essentially in my case a farmer to farmer contact or a farmer to research worker contact. I have no degrees and my tertiary education consists of technical-type courses. All my comments are thus forthright, honest and frankly as seen through the eyes of one farmer.

I wanted to study two aspects of British Agriculture and my scholarship was awarded accordingly.

- 1) The utilisation of low cost fodder reserves when they reach the end of their life; and
- 2) The production and marketing of cereal seeds.

The choice of the first proved rather out of place, for although I learnt a great deal on the handling of big round bales, the rest of the fodder scene was so far removed from our situation as to render it completely irrelevant. The British farmer virtually must feed 6 months every year, and never has to feed for survival as we do. He thus never has low cost reserves stored outside for 2 and 3 years, and usually has to store forage for 2 to 14 months. So by and large, this report will concentrate on the cereal seed industry and its special relevance to Australia.

BRITISH AGRICULTURE

This should never be dismissed. It is perhaps one of the world's great industries. Powerful and progressive, it enjoys a respected place in the world. The National Farmers Union has the image of being aggressively vocal and has a staff and lobby second to none. As a nation of 55 million people, Britain is about 65% self sufficient in food as well as exporting quite a meaningful amount as well. The British public is fed on Esso advertisements on T.V. which claim that Britain produces more food than Australia and New Zealand combined and as much as Canada. This is of course nonsense, but it is perhaps worth looking at the figures from the U.K., remembering it is only the size of Victoria.

	<u>U.K. 1976</u>	<u>Australia</u>
Wheat	4,438,000 tons	11,357,000 (1975)
Oats	800,000 "	874,000 (1974)
Barley	8,440,000 "	2,513,000 (1974)
Sheep	28,770,000	136,500,000 (B.A.E. 1977)
Dairy Cows	3,242,000	2,325,000 "
Beef Cows	1,899,000	32,100,000 "
Sows	710,000	308,000 "
Total Pigs	7,000,000	2,173,000 "

Perhaps a better indication is to show that last year (a drought) Britain averaged 4.29 tonnes per hectare for wheat, while Australia had 1.37. The differences in the two countries are obvious, and to a certain extent the figures are meaningless, but the point to be made is that the technical skill of the U.K. farmer in my opinion, surpasses that of his Australian counterpart. If the Australian farmer had U.K. prices for his goods (very high) and U.K. prices for his labour (very low), the position would be dramatically reversed, but that can never happen. This is because the U.K. farmer is a manager first and a farm worker second. His management decisions are made soundly and with a lot of technical back-up. I suspect a large amount of the same type decisions in Australia are made late at night whilst pushing a tractor around a paddock, and I suggest that if we are to progress with our counterparts, this must change.

The other obvious point to make is that of subsidies. The U.K. farmer has money, and most sections of the community understand the significance in keeping food prices down. Some I find puzzling, but by and large they achieve the desired objective, that of as high a degree of self sufficiency as possible. Perhaps it's an oversimplification, but it seems to me that in the U.K. agriculture is wasted. In Australia, the nation takes it for granted that agriculture will survive as a low cost, low output industry there to feed the community for a pittance and not much else.

Subsidies on Beef Cattle in the U.K. are often more than our total gross receipts per head, and the same story exists for Hill sheep.

Prices at the market place are very high by our standards. Fat cattle are about 5 times the price, sheep likewise. Wool and wheat are about double, and labour and materials half, so even in simple terms the situation is greatly different in both countries. The big round bale equipment I wanted to buy in the U.K. was less than one-third the price of its Australian made equivalent, and it was a tariff of 40% and freight that made the exercise prohibitive.

This then, very quickly is the British agricultural industry and its differences from ours. I shall deal in detail with the cereal side because that is the specialised field for my study.

THE U.K. SEED INDUSTRY

This industry has been at the forefront of British Agriculture. The yield of wheat has gone up by 1% a year for the last 15 years and better maize varieties mean that the crop is grown 5 miles further north each year. These are a couple of ways to show the advances made by plant breeding. Let us look at what has been achieved.

Maris Huntsman. A 1973 variety now holds around 34% of the U.K. wheat area. It had 17% higher yield than any of its competitors when released but now suffers an 8% decrease compared with sister lines now earmarked for release. Waggoner, a hard wheat for release this year, has in fact the same yield as Huntsman (a soft feed wheat) so the changes are colossal. Because of both mechanisation and plant breeding, man hours per hectare have declined from 82 in 1950 to 16.2 in 1976 and yields have gone up by 60%.

Sugar Beet in 1950 took 445 man hours per hectare, now in 1976 it takes 81 man hours, principally because of the breeding of monogerm sugar beet. Likewise, potato yields have gone up 30% since 1960.

History has shown us that all over the western world, people are deserting agriculture as a means of employment, and it is really mechanisation and plant breeding that has enabled fewer labour inputs to produce much more food and fibre. Some of our plant breeding work gives us straight out yield increases, some disease resistant and others just adapt varieties for heavier fertilizer usage. All are important to man's survival. Some breeding work adapts plants for mechanical handling and easier processing.

Britain is at the forefront of the world in the new technology of plant breeding. I shall attempt in this paper to do a series of things :-

- 1) Explain the structure of the British Seed Industry.
- 2) Explain the structure of the International Group of Plant Breeders.
- 3) Explain the future trends related to seeds and agriculture.
- 4) Explain the summary of the Australian position.

BRITISH SEED INDUSTRY

BREEDERS

There are three distinct groups of breeders in the U.K. These are Public Institutions, Private Breeders and Overseas Agents. Some Private Breeders are also agents for overseas companies and governments and vice versa. In the absence of this sort of industry strata in Australia, it is important to look at all 3 groups.

(1) PUBLIC INSTITUTIONS

There are at the moment 15 Government-backed institutions doing work on plant breeding ranging through Plant Breeding Institutions at Cambridge and Edinburgh and a Welsh Plant Breeding Station at Aberystwyth, to Universities who have stumbled on a mutation or interesting cross. Permanent staff are hard to assess, but my surmise is that there are 100 fulltime plant breeders and 1,500 associated staff working for the Government on plant breeding in the U.K.

Some of these organisations are in direct competition with each other in the same way as plant breeding stations here could be if royalties are granted. Indeed, some States of Australia are believed to be against Plant Variety Rights because they believe the interchange of material would cease. This has not happened, basically because of the creation of the National Seed Development Organisation.

The Plant Breeding Institute at Cambridge enjoys world-wide fame. It was the source of the "Maris" varieties including Maris Huntsman winter wheat, a variety widely grown in U.K., France and Germany. This variety passed the one million pounds (£1,000,000) mark in royalties last year, and has set the pace for varietal development in the U.K. As well as Huntsman, The Plant Breeding Institute had the widest selling spring wheat (Maris Dane) winter oat (Maris Quest) as well as well-received varieties in Spring and Winter Barleys and Spring Oats.

Work there is highly sophisticated, particularly in the field of durable disease resistance. Wheats are screened for resistance to yellow rust and mildew, Septoria and eyespot, and Barley is tested for yellow rust, mildew and Rhynchosporium.

The P.B.I. has a staff of 270, about 20 of whom could be called Plant Breeders. Senior staff visit Aberystwyth and Pentafield every third year so all breeders see what their colleagues are doing. Breeding material is freely interchanged.

The P.B.I. is currently looking at dwarf wheat varieties from Belgium and Tibet, as well as the Mexican types which we have in wide use in Australia. It is interesting that the first dwarf variety has only just been released in U.K.

Other work at the Plant Breeding Institute is in the field of Timothy, Lucerne and Perennial Rye Grasses with minor work being done on sun-flowers, soya beans, lupins, linseed and sorghum.

Potato breeding is done at Cambridge and at Scottish Plant Breeding Institute at Pentafield near Edinburgh. It is interesting to note that now potato royalties are only £6 a tonne and no private work is being done in this field.

It is hard for the layman to detail this Institute. Perhaps if I said that they have 2 Winter Barleys, 2 Spring Barleys, 7 Winter Wheats, 2 Spring Wheats, 4 Oats, 3 Potatoes, 3 Beans, 2 Red Clovers, 1 Maize and 1 Kale variety on the U.K. Recommended list, it would serve to show the excellence of their work. They also have varieties on the National lists in Italy, Belgium, Denmark, Ireland, France, U.S.A., Germany, Iceland, Switzerland and Canada, all nations of course, giving the protection of Plant Breeders Rights.

The Scottish Plant Breeding Station has developed Raphano-brassica, the second of the world's new plants (the first of course, was Triticale). This is a high-yielding, disease-resistant palatable substitute for Rape. As Triticale was a wheat-rye cross, so Raphano-brassica is a radish-kale cross.

It now seems that Raphano-brassica will join Triticale as another of the very rare examples of new crop species synthesised by purposeful breeding.

I have made mention of the work on potatoes by the Scottish Plant Breeding Station, which also does work on Barley, Oats, Swedes, Brassicas, Rye grasses, Cocksfoots, both from a varietal and disease point of view. Special work is done in the field of Malting Barley. This Institute has 16 potatoes on the market as well as 3 Oats varieties and other grasses.

The Welsh Plant Breeding Station at Aberystwyth is well known throughout the world. Their charter is for seed technology and research into Plant Breeding and Seed Production, and this is best shown up by the release of new and improved varieties. Their work concentrates on forage grasses and legumes and on those arable crops which are important in livestock systems in the west of Britain, but varieties produced have proved valuable on a national scale and overseas. The whole approach on Herbage Breeding, Testing and Seed Multiplication is one that could and should, be followed in Australia. This Station also has departments looking at disease loss, chromosome manipulation and nutritive value of plants.

Some of the work from this station will be reported on later in this report, such as the programmes on Naked Oats, Hybrid Barley, high-digestibility Cocksfoot, Clubroot resistant Rape and rust resistance in Oats. Other work is in the form of herbage seed production, something that little work is done on in this country. Isozyme studies for identification of new or potential varieties could have paramount importance to Australia, and work in this regard is progressing at Aberystwyth.

Present varieties in use on the Recommended lists are 1 Italian Rye Grass, 3 Perennial Rye Grasses and 1 Tetraploid Hybrid Rye grass, 3 Cocksfoots, 3 Timothy, 2 Tissue, 3 Red and 3 White Clovers, 2 Oats and one variety of Beans, Forage Rye, Forage Rape and Fodder Radish, a most impressive portfolio. As in its sister organisations, many plant varieties are also in use around the world. Indeed, the variety S24 Perennial Rye, was known in Australia as "Aberystwith".

The John Innes Institute, although not visited, has discovered and developed the "leafless" pea and from this discovery it will possibly be remembered for decades to come. Hailed as the temperate crop to rival Soya Beans, it so far looks impressive. Other work there is centered on vegetable and flower seed work.

These four organisations and another eleven as well are all involved in plant breeding. It is the responsibility of the breeder to have on hand at the start of official testing 5 Kilos of seed plus 500 heads. For one year of testing this seed is grown on so that for the next year of testing there is around 2 tonnes of seed. This seed from all Government Breeding Stations becomes the responsibility of the National Seed Development Organisation (N.S.D.O.), who then grow it on. This organisation is vital in the Seed Industry of the U.K. and if Australia is to recognise Breeders Rights in our country, it will become essential that we have a similar organisation here. I must show its role carefully because for a Government-sponsored organisation, it is unique in its competitive and aggressive selling policies and its business approach.

N.S.D.O. (National Seed Development Organisation Ltd.)

The principal activities of the Organisation are the multiplication, processing sale and distribution of plant varieties from Government Plant Breeding organisations.

(a) Multiplication

N.S.D.O. take the seed from the breeder - hopefully 200-300 kilos or even up to 2 tonnes; but sometimes as little as 10Kg - and start getting supplies grown. This usually happens at year 7 of a breeding programme. For the three years of testing the N.S.D.O. build up seed stocks so that, if at the end of year 10 the variety has passed all tests and is entered on the recommended list, the N.S.D.O. has enough seed to supply merchants. This could mean 50 tonnes of seed for oats or 300 tonnes for a promising wheat variety.

The N.S.D.O. is also charged with maintaining a variety for as long as it is on the National list, so this procedure is carried out every year until the variety is dropped. So they supply the trade with Pre-Basic seed every year, production costs are met by pricing Pre-Basic Seed accordingly. At the moment, Pre-Basic Wheat seed is around £300 (\$450) a tonne.

The Breeder aims to have $\frac{1}{4}$ to $\frac{1}{2}$ acre of seed at the start of the 3 year test. This seed is then sown on 6 to 150 acre blocks by farmers under supervision. These farmers are paid a premium of 20% to 25% and the seed is harvested by the N.S.D.O. Farmers are charged a realistic contract price for harvesting. The Organisation insists on a 2 year break from similar crops, but this could be achieved by a N.S.D.O. Rape or Bean crop. Farmers must have 2 metres between varieties. Thus, the N.S.D.O. gets pre-basic seed for around \$170 a tonne for the grain and sells to merchants for \$500 a tonne. This year, they will contract out 2,000 acres for basic seed production. Small seed lots are harvested into 1 tonne boxes.

For herbage seed crops the procedure is much the same. Of course, all crops are strictly maintained for disease and weed seeds.

At the moment, the N.S.D.O. are multiplying 63 cereals and pulses, 66 grasses and legumes, 30 root and forage crops, 57 vegetables, 23 fruit and 16 ornamentals, a huge task for the basic staff of 50.

(b) Processing

Most seed is grown near the headquarters in Cambridgeshire, and is processed at their own seed cleaning plant. This is a most meticulous operation and a credit to the organisation. Seed has to be proportioned to whomsoever the breeder wants to have it, and in some cases this could be many hundred companies. There are upwards of 1,000 companies in Britain who grow on pre-basic and basic seeds (through contracted farmers) to sell seeds for commercial production. The N.S.D.O. probably trades effectively with 300 of these companies.

(c) Sales

The N.S.D.O. is perhaps let off the hook a little because merchant companies must decide whether they want it or not, 6 months before a variety is recommended. However, they do a remarkable job in assessing market prospects.

The N.S.D.O. balance sheet really shows how well it operates. In the year ended 30.6.1976 the following figures emerge :-

	<u>Sterling</u>	<u>Aust. Dollars</u>
Sales	£ 917,000	\$ 1,440,000
Royalties	1,401,000	2,200,000
Other Income	22,000	34,000
	<hr/>	<hr/>
	£2,340,000	\$3,674,000
Profit before Taxation	672,000	1,055,000
Taxation	348,000	\$ 546,000
Dividend to Treasury	250,000	\$ 393,000
Balance Carried Forward	504,000	\$ 791,000

The N.S.D.O. paid out to the Ministry of Agriculture Fisheries and Food or Treasury the following amounts :-

	<u>Sterling</u>	<u>Aust. Dollars</u>
Payment for or in lieu of seed	£ 626,000	\$ 983,000
Taxation	348,000	546,000
Dividend	250,000	393,000
	<hr/>	<hr/>
	£1,224,000	\$1,922,000
	<hr/>	<hr/>

The N.S.D.O. has 8 Directors or Governors and these each hold nominee shares on behalf of the Ministry of Agriculture, Fisheries and Food. This is quite an enterprise by anybody's standards and one that should be studied by the seed industry in Australia. It is worth noting that in the 1975-76 year N.S.D.O. sold seeds to the value of £29,000 (A\$466,000) overseas, and gained royalties of £139,000 (A\$218,000) from these sales. This is a significant sale to a country having trouble keeping its balance of payments in order.

These export sales are to countries that recognise Plant Breeders Rights because the N.S.D.O. will not sell to a country where their products cannot be protected. This simply means that Australia at this stage, can get none of the improved plants coming from the 15 Government stations in the U.K. This includes Cereals, Vegetables, Fruit, Ornamentals or Forage Crops, and it will be disastrous to our future if the situation is allowed to go on.

The sales policy of N.S.D.O. is fairly similar to Private Breeders - aggressive, timely and lavish compared to our country. N.S.D.O. gives a detailed programme of advertising before seed is sold to merchants so the merchant knows that the seed he holds will be well advertised in the future. Every gimmick is used. The Huntsman 3 Tonne Club is a classic. Every field of Huntsman that yields over 3 tonnes per acre makes its owner a member. The club has outings (widely publicised) and elitist atmosphere about it. Nett result is that most farmers know that "Huntsman can do 3 tonnes often and 4 tonnes per acre sometimes." Crop competitions are also sponsored with prizes that are appropriate. (The F.A. Cup Grand Final for Maris, Sportsman etc.)

It is interesting that although the Plant Varieties Rights Act 1964 was introduced by the Government to stimulate private breeding, it was decided that varieties from State Stations should be protected from unfair competition with commercial breeders. Likewise, the N.S.D.O. ensures a return to the taxpayer on the public investment in this aspect of research.

The N.S.D.O. must act absolutely within the law; they can only sell varieties that have passed all tests, have a licence, rights if applicable and fit into E.E.C. legislation. All varieties must be on the National list and in fact, virtually have to be on the Recommended list to be commercial.

The N.S.D.O. are fortunate that they have had a new winter wheat variety each year for the last 5 years, and 2 this year. They can only remain profitable by exploiting the commercial potential of the wide range of plant varieties produced by Government Stations and by efficiently marketing them. The N.S.D.O. is also charged with patenting the techniques involved with plant breeding and licensing their use.

(d) Distribution

The N.S.D.O. market to any company in U.K. holding a Plant Royalty Bureau licence to purchase basic seed. A limited number of companies, usually large, are licensed to produce their own basic seed from pre-basic supplied by N.S.D.O. The pattern abroad is usually different;

there an agent with technical and commercial expertise is appointed and given the responsibility of developing a market in his country for a crop, or group of crops. In many countries one agent may handle wheat varieties, another oats, and barley and so on.

"Major constraints and considerations in developing overseas markets are:

- (i) The extent to which agriculture is developed in the country concerned,
- (ii) The level of its technical expertise,
- (iii) Whether it has an adequate form of market and/or distribution structure,
- (iv) The presence or absence of a certification system, and
- (v) Of particular relevance in view of its ministerial brief, whether there is any form of plant breeders protection.

Without protection, it is unlikely that any form of investment in developing crop varieties in the country can be justified commercially. These considerations mean that the major overseas market now, and in the immediate future, is in Western Europe. This is not to say that N.S.D.O. are discounting the prospects in many other parts of the world. Few things stand still and many of the developing countries are conscious of the need to introduce new and improved crop varieties. It follows then that many countries are introducing the means, including property rights, where they can encourage foreign involvement and investment, and we will see in the course of the next 10 - 20 years a very rapid growth in agricultural business and its associated research in many countries which are now little developed. "

The above is a Quote from N.S.D.O. News Spring 1977.

I have spent a deal of time explaining the National Seed Development Organisation because it is essential in the United Kingdom. The concept of one marketing body for all the state-aided breeding stations is one that in my opinion, must be applied to Australia.

PRIVATE BREEDERS

This is a group of fastmoving breeders who have developed and been stimulated by the allocation of Breeders rights to plant varieties in 1964. The Plant Breeding industry is being recognised as one of the fastest growing industries in the world, and one of the most important to humanity. The world's multi-nationals are all moving into the field. Shell, Unilever, Ciba-Geigy, I.C.I., Bunge, Hovis are a few who are either in the market for breeding companies or have already entered the industry.

One consortium of plant breeders (International Plant Breeders) has been formed. This also has the support of Shell in funding and marketing. This consortium produce their own varieties as well as those from over 100 of the world's finest plant breeders. Its members include Rathmell Plant Breeders of U.K., one of the better known U.K. private breeders. This International breeding company has trials in 66 countries in the world. Australia is not one of them and if that doesn't make the Australian farmer sit up and take notice, nothing will.

In the United Kingdom there are five or six private breeding companies in the cereal seed breeding line. These range from small companies with perhaps one breeder and a couple of lines on the market to Nichersons, who are huge breeders and promoters. Some sell second generation seed to growers,

some sell basic and 1st generation. All have been stimulated and in most cases generated, by Plant Breeders Rights. British agriculture would be much poorer without them. In the Barley trials of 1975-76 there were 5 barleys from private breeders recommended and 3 of these from Nichersons are destined to be around for a long, long time.

The promotion of varieties by private companies has come under criticism by some farmers. The "washing machine salesman" technique used by a few breeders has created a change in the merchandising of seeds. Because of this hard sell approach however, the average British farmer is very conscious of varietal differences, in his crops, spray resistance and disease susceptibility. Thus I believe the selling strategies of these private breeders has resulted in British farmers being very much better educated in this field than their Australian counterparts.

The stimulation of Private Breeders is urgently needed in Australia, and should be undertaken as soon as possible. Why farmer bodies in this nation have not pressured the powers that be before this, defeats me. I mean no disrespect to our Government and University Breeders, far from it, they have laboured extraordinarily well on a pittance for years, but the private sector can also stimulate the agricultural sector (and indeed, the amenity sector) with improved varieties at no cost to the State at this stage.

The herbage sector has an even greater proportion of private investment in Perennial Rye Grass. Varieties on the National list include 9 from Government Breeders and 9 from Private Breeders. In the Red Clover seeds, there are 4 from the Government and 7 from Private Breeders. In this case, some of the Breeders are in fact Grower co-operations. Should we in Australia get to a stage of recognising Breeders rights in the more common agricultural fields, then this sort of seed varietal development could be expected here.

The role of private breeders in Vegetable, Ornamental and Fruit enterprises is already reasonably well developed. If the unbelievers doubt what private breeding can do, they could do well to reflect the colours and magnificance of the rose industry without private breeding.

We had, for a tragically few short years, some breeders and growers recently in the field of tropical legumes and grasses. The loss of these has probably put our northern development back 15 years in lost material, and when the time comes for us to realise our loss, we shall in all probability be just followers rather than world leaders. Private plant breeding will be dealt with later again in many aspects, but I simplify for Australian readers. Would T.A.A. be as effective as Ansett if the latter was not there? So Government transport, or Government Insurance, or in fact any Government Industry is to be used with the exclusion of private industry alongside, because this is what we decree in Australia. I must say that if a breeder comes up with a new variety that is economically viable, and suitable to our conditions, fitting in with our laws and wanted by our farmers, then we should be able to grow it. I rather suspect that these varieties are around and only want the required legislation to make them available.

The field of amenity grass is almost entirely dominated by the private breeder. Some are only producing one or two lines, but one firm in particular is very heavily committed to this field. The fact that they have supplied turf for Wembley, makes them able to sell around the world.

But amenity grasses are now much more than that; lawns for subdivisions are still important too, but a huge area of investment is in the

realm of easy-care swards for estates, grassed areas around homes, golf clubs and parklands. Advice on varieties, fertilizer requirements and spraying is in most cases very professional, as the market by and large is one for professional greenkeepers and gardeners.

To cater for a changing world, I found one company very successfully selling wild flower seed. This is a rapidly growing field as the environmentalist lobby shows no sign of decreasing. Some of these seeds sell for up to £50 (A\$78.50) a kilo, so they have more political than practical appeal. The amenity field is well developed, sophisticated and competitive, the sort of situation well suited to private breeders and agents.

AGENTS

If a variety is to be grown in any country, the breeder must have an agent. It is his responsibility to make available seed, for sale and testing, to collect royalties and arrange marketing. This is a huge section of the U.K. trade.

There are 23 Agents operating in the U.K. Some of these are Private Breeders who add lines from overseas breeders to their stable. Some are agents for Government Breeders in other countries and vice versa. The N.S.D.O. always uses agents in other countries and never another Government Institution. Even the Hungarian Government uses a private agent to supervise its British operation.

Because of the similar climate, there are a great number of overseas varieties used in the U.K. Some still are there from the pre-breeders rights days and do not attract a royalty. Many others are sold and maintained by an agent on behalf of the breeder. Some agents are in fact breeders in the U.K., some agents are merchants and some companies encompass the field.

If Australia follows the rest of the world, we could expect agents for overseas companies proliferating rapidly and, unless quickly supervised, doing untold damage.

LARGE NATIONAL SEED HOUSES

We have looked at the U.K. as far as breeding new varieties or importing them and maintaining them in the U.K., so we now come to the merchants who get the seed to the farmer. Just as Nichersons are the most quoted name as far as Plant Breeding goes, so R.H.M. is the dominant National Seed House, followed by Dalgety and Kenneth Wilson (Bunge).

These larger seed houses purchase pre-basic seed from whomever they choose. They must make an assessment of a variety before it is recommended and invest in it. This they do with care, caution and a great deal of hard-won experience. The variety will then be grown as basic seed for a year, and if all goes well it will then be provisionally recommended and then grown on as 1st generation and 2nd generation seed.

This is done by selected farmers being paid a premium (usually 10%) for the extra care and expertise involved. R.H.M. in this case, grow a small plot of seed sampled from every transaction they make in a year. A sample of seed supplied to every farmer is sown; the next year a sample of the farmer's seed is sown. This year, their farm has 3,900 plots representing over half a million acres of crop. These large companies of course, use the best varieties coming on the market and have only an allegiance to the market. Thus they carry

a portfolio of say, in the Winter Wheat line, 15 varieties from 8 different plant breeders. Some of these breeder's lines are in fact going to be sold in competition with the breeder's merchandising company in two years time.

So the seed is sown and maintained in the field. The seed company's own licensed inspectors look at the crop and pass or reject it. They may enforce roguing to rid the crop from black oats or they may reject it altogether. Remember, it takes only 0.1% of an admixture to cause a variety to be rejected for multiplication, so the conditions are really quite stringent.

It is fair to say at this point, that an increasing number of seed producing farmers interviewed, were unhappy about some aspects of this system. They argued that the growing contract only bound them, and not the seed company, and in fact, all it was good for was to give the seed merchant exclusive rights to a paddock of seed. The N.F.U., so good in most respects, could perhaps be a little lax in the realm of cereal seeds to allow its members to be unprotected. It is not typical of the normal protection the British farmer gets, and indeed expects.

To market the crop, no effort is spared. R.H.M. in particular, have developed a "Bardex" machine. This is used to test 10 Kg of seed from each lot. The machine for which they have the patent can, it is claimed, take out any black (wild) oat seed in a sample. Indeed, in public demonstrations, a guest is asked to put a designated number of wild oats seeds into a sample. The sample is processed and the operator then quite confidently announces the count in public without knowing the number put in originally. This machine is used this year on all Winter wheat and Spring Barley seed, but I understand it will work as well on ordinary white oats. This company sells seed with nil tolerance of wild oats and also enforces twice the restrictions on the other certification criteria. For example, they claim and guarantee 99.9% varietal purity, 99.995% species purity and 99.97% loose smut control. All other allowable weed tolerances are half that of the most stringent standards allowed.

This company offers an interpretation of the "Get Up and Grow" factor with its seed, avoiding the use of the word vigour, and I shall deal with this aspect later.

The large seed houses come in two forms. The Nicherson type who breed and sell either basic or 1st generation seed, or the "National" R.H.M. type who have 14 processing plants and sell 1st and 2nd generation seed to farmers.

The size of the markets, the approximate prices and the royalties attracted are approximately as follows :-

Seed	Size of Market	Sold to	Price/Tonne	Royalty/ Tonne
Pre Basic)	2%	Sold by Plant Breeders	?	--
)		to other Plant Breeders		
)				
Basic)		Sold to merchants &	£400	£55
)		wholesaled between	A\$628	A\$86
		merchants		

Seed	Size of Market	Sold to	Price/Tone	Royalty/ Tonne
1st Generation	18%	Sold to Merchants and Farmers	£180 - £320 Delivered A\$282 - \$502	£15 A\$23.50
2nd Generation	80%	Sold to Farmers	£140 - £180 Delivered A\$220 - \$282	£8.50 A\$13.50

The companies in the list include some farmer co-ops as well, and it is fair to say all are reputable. All have to be licensed with the Plant Royalty Bureau and have to collect out of sales, the Breeder's royalty. I believe there are few seed houses in Australia who have the same standards or who are prepared to go to the same lengths to ensure the quality of their product. In the case of herbage seeds yes, as there is a degree of control, and in some cases self-imposed quality control. In the case of cereals, only the registered seed growers with the Department of Agriculture have made any effort to produce a high quality product to self-imposed standards and keep it that way. It is apparent to me at this stage, that a great deal of time must be spent ridding the industry of these pirates who buy any type of seed and sell it as uncertified seed, with no control, quality test or guarantee year after year.

Some of the seed houses offer buy-back contracts. R.H.M. will give a linseed contract with their seed and for high milling quality wheats they offer ready markets with a price advantage. Two large seed houses are run by feed processors and they have a large team of men in the field, either selling seed or buying feed or both. Many farmers of course do both, grow the seed, resow it, and sell the grain, then purchase it back, as a dairy meal etc. The industry is quite highly integrated and the competition really intense.

OTHER PROCESSORS

There are about 210 other processors in the seed industry. These are all smaller regional companies processing seeds and selling them locally. Some will buy basic seed and grow it with contracted farmers for two years, others will buy 1st generation seed. They have their own inspectors and do a fair deal of business. They are mostly agricultural trading companies selling seed, fertiliser and chemicals to an area. A fair part of their trade is wholesale with others of their ilk, they will swap and change varieties hopefully to diversify and given them a broader approach to the market.

MERCHANTS

There are about 400 merchants in the United Kingdom. These too, are in small companies in the agricultural trading area. They are largely supplied in plain bags by either the latter type processors or the large National Seed Houses. The seed sold is all certified and traceable and all is of high quality. Non-certified seed and non-licensed traders are of course, not permitted under the E.E.C. regulations that govern Britain at the moment.

This then, is the structure of the United Kingdom Seed Industry with one exception - that of Farm Saved Seed.

FARM SAVED SEED

The British crop is dependent on 620,000 tonnes of seed each year of which 450,000 tonnes of seed is purchased. A large part of the 170,000 tonnes that is not purchased each year is in fact 1st generation seed grown by the farmer for one more year or in some cases, 2 more years. My assessment is that probably only 5 - 10% of seed is in fact illegal and of poor quality. It is an offence under the Act (E.E.C. Regulations) for farmers to sell, give away, barter or swap seed. They can keep it for their own use, but that is all.

I found in 7 months two seed companies that would in fact process a farmer's seed, as long as it was his own that he was retaining i.e. 1st generation being kept for 2nd generation, and in each case they wanted £23 (A\$36) a tonne to process it, plus cost of chemicals.

Some people in the industry expected the amount of home saved seed to go up when Britain went into the Common Market, but this has not happened. The degree of farm saving appears to be traditional, depending on the sophistication of the seed industry. West Germany who had Breeders' rights before 1936, and Holland who gained them (and little else) in 1940, both have a high degree of purchased seed (90%). France, has 50% of purchased seed, but to be fair, most of that is of the protected varieties, and the majority of home saved seed is of the older pre-Breeders' rights days. The one exception is Ireland which has no Plant Variety Rights legislation but, as it is in the E.E.C., has the regulations prohibiting the sale of uncertified seed. Royalties are paid by the certifying authority to the company or agent. Thus, although Ireland has no Plant Variety Rights regulations, it maintains the highest acceptance of bought in seed in the E.E.C., that of over 90%.

The figures for the U.K. are interesting because they reflect the different trends in the industry.

<u>Crop</u>	<u>Acres</u>	<u>Sowing Rate</u>	<u>% of Seed Sold</u>
Spring Barley	4,500,000	130 lb/acre	65%
Winter Wheat	3,250,000	150 lb/acre	70%
Winter Barley	900,000	130-150 lb/acre	60%
Spring Oats	400,000	160 lb/acre	60%
Spring Wheat	250,000	180 lb/acre	95%
Winter Oats	200,000	160 lb/acre	60%

Spring wheat is difficult to dry, store and keep. There can also be up to 200,000 acres of winter wheat sown up to and during the spring in difficult years.

The other fluctuations at the moment are, that Winter Oats is increasing 15% this year and Winter Barley has gone up a dramatic 38% in the last two years. Spring Barley depends on how much Winter wheat is put in. Spring Oats is decreasing for one very good reason - people don't eat porridge any more, so it is just for horses now.

Two other sections of the industry spend a great amount of time and money to convince the farmer that he should not keep his own seed. The seed trade itself publishes a brochure and wall poster that is quite good and sensible. It points out that the farmer who sows his own seed must :-

- (a) Commit himself in advance to the varieties he must sow.
- (b) Thoroughly clean his harvesting and storage equipment, including header (combine), trucks, elevators, augers and bins.

- (c) Store separately a number of different varieties to provide the necessary diversification.
- (d) Divert scarce labour at harvest to handle relatively small quantities of grain.
- (e) Organise his own chemical and disease tests and chemical treatments.

The farmer who buys his seed :-

- (a) Has complete flexibility in deciding what varieties to grow.
- (b) Can order the precise quantities of his selected varieties with the required seed treatments efficiently applied.
- (c) Does not waste storage space and other valuable resources.
- (d) Does not waste time because the seed is ready to sow.

Obviously, it makes no mention of the cost of bought in seed as against farm kept seed, so it is perhaps worth looking at this exercise. A farmer must look at the cost of the following :-

- (a) Separate storage for each variety he wants or thinks he wants.
- (b) Grading expenses from a visiting grader.
- (c) Chemical treatment.
- (d) Labour to get seed from paddock to shed, out of shed to grader, back into shed, then out of shed for sowing.
- (e) Bags.
- (f) Bank interest.
- (g) Means of getting rid of seconds and waste.
- (h) Means of storing leftovers, unwanted lines etc.
- (i) Elevators, bag trolleys, needles, twine etc.

Most farmers in the U.K. will not entertain the thought of home kept seed, and an increasing number of their Australian counterparts are tending to agree.

The second reason for the non-acceptance of farm saved seed has resulted from a series of surveys conducted by the Ministry of Agriculture, Fisheries and Food. These surveys were conducted on 36 mobile cleaners working throughout the country and samples were taken at the beginning of the run, middle of run and end of run, a run being several hours. At the same time, a sample of the seed being supplied to be cleaned was taken, as well as chemicals supplied, and atmospheric pollution was measured. Machines operated mostly in the open and throughput was less than 2 tonnes per hour (27%) 2 to 3 tonnes per hour (43%) and over 3 tonnes per hour (30%).

Purity

The results were 21% of tests failed to reach 99% and 9% failed to reach 98% (the E.E.C. Regulation). This is important as impurities in variety cause problems with frosting, disease, harvesting and spray damage. The other obvious fact is, if the impurities are of another species, then sale of grain is subject to dockages.

WEEDS

45% of seeds failed the E.E.C. standard for wild oats and only 75% of seeds would have passed for other weed impurities. This is very serious and it is interesting to note that many of these restrictions are now heavier than was the case when the trial was done (1973).

Germination

About 7% of seed failed to reach 85% and 17% was below 90%.

CHEMICAL TREATMENT

Mercury In all but 1 of 30 mercury powder formulations the application was adequate, but in liquid applications none were even and 7 were inadequately treated.

In fact, when further analysed only 70% of machines had more than 75% of target treatments, and 27% of the liquid treatments had over 125% of their targets.

INSECTICIDE

Only 8 of the 27 operations put on insecticide within the 75% - 125% range one treatment exceeded 125% and 18 had less than 75% of the target treatment. Of these 5 had actually less than 50% of target.

The real significance of this trial is that although, except in the case of chemical treatments, some discrepancies of standard were quite small, the fact remains that few samples were up to scratch in all features. Purchased certified seed of course, is always up to this standard or in excess of this. Perhaps this line of research should be pursued posthaste in Australia.

POLLUTION

Operators using facemasks for 20 minutes near the bagging off point collected air pollutants in the mask. In seed cleaning and treating establishments, a level of 0.01 per mg/m³ of air is normal. Of the 18 analyses only 11 passed this test.

MERCURY

Following the banning of mercury dressings in Australia 3 years ago, I was fascinated to find that now only Sweden is talking about banning it and no other European country has banned it. In Britain about 28 tonnes of pure metal mercury are used in agriculture, about 5% of the nation's total usage. In fact, a Government working group on heavy metals and environmental pollution has just stated "The use of organomercury compounds as cereal seed treatments over the past few decades has greatly improved cereal yields." I wonder, did we act prematurely?

The last point I make about home saved seed is that, despite predictions when the E.E.C. Regulations came in that of course increased the cost of seed, the U.K. did not in fact alter its buying habits. As farmers in Australia use more pallet-loaded fertilizers and 1 tonne bags I would expect the use of properly grown seed, well marketed with the best guarantee that independent certifying authorities can give, to increase. Indeed, when one looks at the fine margins that exist between certified seeds and its inferior counterparts, pricewise it is incredible that so many farmers are content to take the risk.

It is important to note that the E.E.C. Regulations have helped, to put pressure on farmers to buy fresh seed each year. I believe we should look at the statutory bodies who direct both the seed industry and the Plant Variety Rights legislation.

GOVERNMENT ACTS AND REGULATIONS

SEEDS ACT 1920

This Act mainly provided protection to users and seedsmen against misrepresentation of factors affecting seed quality. There were no statutory restrictions on the commercialisation of plant varieties and any variety could be introduced and promoted.

There followed a period of voluntary restraints and pre-1964 up to 50% of cereal seed in the U.K. was supplied under voluntary schemes. The National Institute of Agricultural Botany (N.I.A.B.) started to release leaflets around 1930 and in 1944 a first list of Recommended Varieties was released. This list started for winter cereals and then was extended to spring cereals and later to varieties of other crops.

PLANT VARIETIES AND SEEDS ACT 1964

When this Act was introduced, seed usage surveys showed that 90% of the wheat and barley and 80% of the oats grown consisted of recommended varieties and 50% of all cereal seed sown was certified. This Act followed a report of a committee set up in 1950 which presented its report to Parliament in November 1957. This report, made twenty years ago, makes the following points :-

- (1) That buyers should be informed on what they were buying and be able to rely on the information. This information should apply to genetic quality as well as physical quality.
- (2) That variety name should be declared since it provides the key to distinctiveness and economic value of a plant.
- (3) An official list of variety names be kept to stop doubtful varieties and synonyms.
- (4) There should be restrictions only on importation, sale and sowing of seeds which were susceptible to disease, or unsuitable to U.K. conditions
- (5) The decision to commercialise is left solely with the breeder, and that growers should be able to determine commercial success or failure, provided they got correct information as to physical characteristics and were not confused by different names.

- (6) It was recommended that wherever possible authoritative and unbiased information on performance should be provided by variety testing organisations, and it proposed there should be a statutory requirement for new cereal varieties to be submitted for performance trials at least two years before they were marketed.
- (7) On Plant Breeders' Rights the Committee concluded that breeders should be encouraged to expand to meet changing markets and economic requirements and user preference as well as new methods of husbandry and processing.
- (8) It was felt that growers in the U.K. should continue to have access to the best varieties from other countries on a reciprocal basis.
- (9) The committee recommended that to enforce rights a variety would have to on official examination, be shown to be distinct from others, uniform and stable to remain distinct during the period of protection.
- (10) The granting of rights should not be dependent on the cultural value of a variety; rather that this value be left to the market place.
- (11) On the basis of this report, the U.K. signed the "International Convention for the Protection of New Varieties of Plants" (1963), under which it accepted a commitment to introduce legislation to protect varieties of certain crops in a specified period.

It is interesting and distressing to note that the above items (1) to (10) were accepted in Australia broadly this year 20 years after the U.K. and 40 years later than Germany.

E.E.C. DIRECTIVES

With the entrance into the E.E.C., further refinements continued and these were, by our standards, quite severe. They broadly were :-

- (1) Marketing of seeds is restricted to varieties on the National list.
- (2) All seeds marketed must be certified.
- (3) Certification of seed is limited to two generations.
- (4) There are compulsory minimum standards of purity, germination and freedom of weed seeds.
- (5) Official control of certification to E.E.C. Standards.
- (6) A standard control of labelling and sealing.

H.V.S.

The old scheme of Higher Voluntary Standards is a non-obligatory U.K. standard for all seeds and is identified by labels. It calls for, as will be seen below, a higher standard of seed, purity and quality.

The standards for the U.K., for a selection of crops, and the Australian counterparts are shown below (for 500g sample).

Crop	Scheme	Purity	Germination	Other Seeds	Wild Oats
Wheat	Official	98%	85%	10	0
	H.V.S.	99%	85%	10	0
	Australia	97.5%	80%	0.5% Weed 0.5% Other Agri-cultural seed. 2% inert material.	5
Cocksfoot	Official	90%	80%	1%	
	H.V.S.	90%	80%	0.5%	
	Certified	80%	65%	0.5% Weed seed 5% Other Agri-cultural seed. 15% Inert material.	
Lucerne	Official	97%	80%	0.5%	
	H.V.S.	98%	80%	0.5%	
	Certified	98%	80%	0.5% Weed Seed 0.5% Other as seeds 1.5% Inert material	

N.B. There are of course, some totally prohibited seeds not allowed in the Australian Scheme.

I need not point out that the generation requirement of E.E.C. is quite tight by Australian standards for self-fertilized crops such as wheat, barley and oats. There are good grounds for generation restriction on grass fertilized crops such as herbage crops, since a shift in characteristics can occur over unlimited generations of multiplications. In theory, wheat, oats and barley should be able to be generated for ever, but in practice it has been found that because of human error in handling, sowing, harvesting, storing and processing the crop, rejections take place from the fourth generation onwards.

I was told, and I have no reason to disbelieve it, that if a 3rd generation of cereal seed was allowed in the U.K., the 27% of farmer saved seed would disappear, as it is essentially 1st generation seed sown two more times by the farmer who grew it.

The above Acts then, have led to the following bodies being formed :-

(1) NATIONAL INSTITUTE OF AGRICULTURAL BOTANY (N.I.A.B.)

This Institute is administered by a council of Government Nominees (12), Industry Nominees (9), Fellows of the Institute (4) and 5 co-opted members. Its prime role is that of an independent testing faculty. It undertakes tests in 15 regional centres with a range of soil types and weather conditions.

This body is vital to the success of the British Seed Industry and it carried out the following roles

- (a) Statutory and advisory seed testing.
- (b) Statutory seed certification.
- (c) National list and Plant Breeders Rights tests for distinctiveness, uniformity and stability.
- (d) National List trials of new varieties for value for cultivation and use (V.C.U.), and variety performance trials to give rise to Recommended lists and their later publication.
- (e) Training of persons from the Ministry for particular branches of the industry.
- (f) Dissemination of information by publications, lectures, conferences, demonstrations and through a fellowship scheme.

If a variety comes along it goes on a variety list of all known varieties.

The N.I.A.B. will test a variety for 2 years and if it is found to be distinct, uniform and stable (D.U.S.), it will go on the NATIONAL LIST. Only plants with National listing can be sold for seed. The variety must pass the test for value of cultivation and use as well (V.C.U.). A variety that is distinct uniform and stable goes on to the Plant Breeders' Rights PROTECTED LIST and is afforded protection under the scheme.

The best varieties are tested for a further 12 months and those that are the top of their field go on the RECOMMENDED LIST and it is fair to say that a variety must be on the N.I.A.B. Recommended List before it has a hope of being commercially attractive. Last year, only one-half of the varieties on the National List were propagated for seed. In winter wheat, 96% of seed sold was from the recommended list while in spring barley 79% was recommended. (17% of the non-recommended barley is "Golden Promise" which is recommended and widely grown in Scotland for malting. It is susceptible to mildew and is not recommended in England or Wales).

The N.I.A.B. also provides a CLASSIFIED LIST which lists the basic qualities of herbage plants such as yield, persistence, winter hardiness etc. It also lists the agent and maintainer of each variety.

The N.I.A.B. is a huge undertaking, well run and fiercely keeping its independence, although to survive it has to have Government funding. Its equivalent in Australia would have to be the State Departments, who do merit testing very well and should continue to do it.

(2) PLANT VARIETY RIGHTS OFFICE

This office was set up under the Act. Its function is to receive, consider, and reach decisions on applications for the grant of rights in new varieties of plants. It publishes all applications and rights granted, names of new varieties and other matters of interest.

This office has the power (the Chairman) to issue a compulsory licence to a breeder to make the breeder issue breeding material to the outside trade. This power has never been used yet.

National listing costs vary. In the Netherlands they are free, but in U.K. they cost about £1,000 (A\$1,500), and cost that annually. A high cost

keeps out the rubbish and makes new variety applications realistic and reasonable. There are still 39 Spring Barleys on test in 1977 and 47 Winter Wheats.

(3) PLANT ROYALTY BUREAU

Some time ago, breeders agreed that a central body to collect fees and to licence merchants was required. Indeed, a body such as this was recommended by the Report on Transactions of Seeds. This Bureau really works as a clearing house and as such, is essential to the U.K. seed industry. The alternative is to have different fees, different dates for collection, payment methods etc. Royalties are in fact, allowed to be set by the breeder but in actual effect, except for potatoes and peas, they appear to be the same amount.

The Plant Royalty Bureau is in some ways a spokesman for the British Association of Plant Breeders (B.A.P.B.). It is interesting to note that the Royalty Bureau even collect fees and licenses for the N.S.D.O. which is, in effect, the Government Breeders.

This Bureau has on their books at the moment 80 cereals on the U.K. list, of which some 30 or 40 are in large scale use. An interesting point, as we try to get unanimity in our country, is that the nation we call the U.K. is really England, Wales, Scotland, Northern Ireland, Jersey, Guernsey and the Isle of Man. All these territories are co-ordinated and looked after by the Plant Royalty Bureau.

The mechanics of the Bureau's operations are recorded here for interest.

February, 1977. Gave notice of royalty to take effect 1.5.1977.

This royalty is payable on seed produced from the harvest 1977 (June, July, August, September) for seed sold either Autumn 1977 (September, November) or Spring 1978 (March, April). This amount is payable to Plant Royalty Bureau Spring and Summer 1978 (15 months later).

The Plant Royalty Bureau has a respected position in Britain and provides a service to the industry. Its expertise could be borrowed and studied by Australia.

These are other bodies worth mentioning in the U.K. :-

(1) U.K.A.S.T.R.A. (United Kingdom Agricultural Seeds Trading Association)

It is, as it suggests, an organisation of merchants, both large and small. They hold annual conventions and keep up very nicely with the industry trends, as well as being spokesmen on an industrial basis.

(2) N.F.U. SEEDS COMMITTEE

As their name implies, they represent the growers in most cases. The margin for seed producers appears to be of the order of 10 - 15% over milling price. The N.F.U. also is the body who has a great deal to say over the setting of royalty levels and their opposition to increases is becoming very vocal.

I have tried over the last few pages, to demonstrate the strata of the British Industry, to show how it works, and why it works so well. I should make brief reference to International Organisations, because as Plant Breeding becomes universal, so the importance of International Agreements increases.

There are in effect two factions in the world today and this is regrettable.

U.S.A. (and perhaps Canada, Japan and New Zealand)

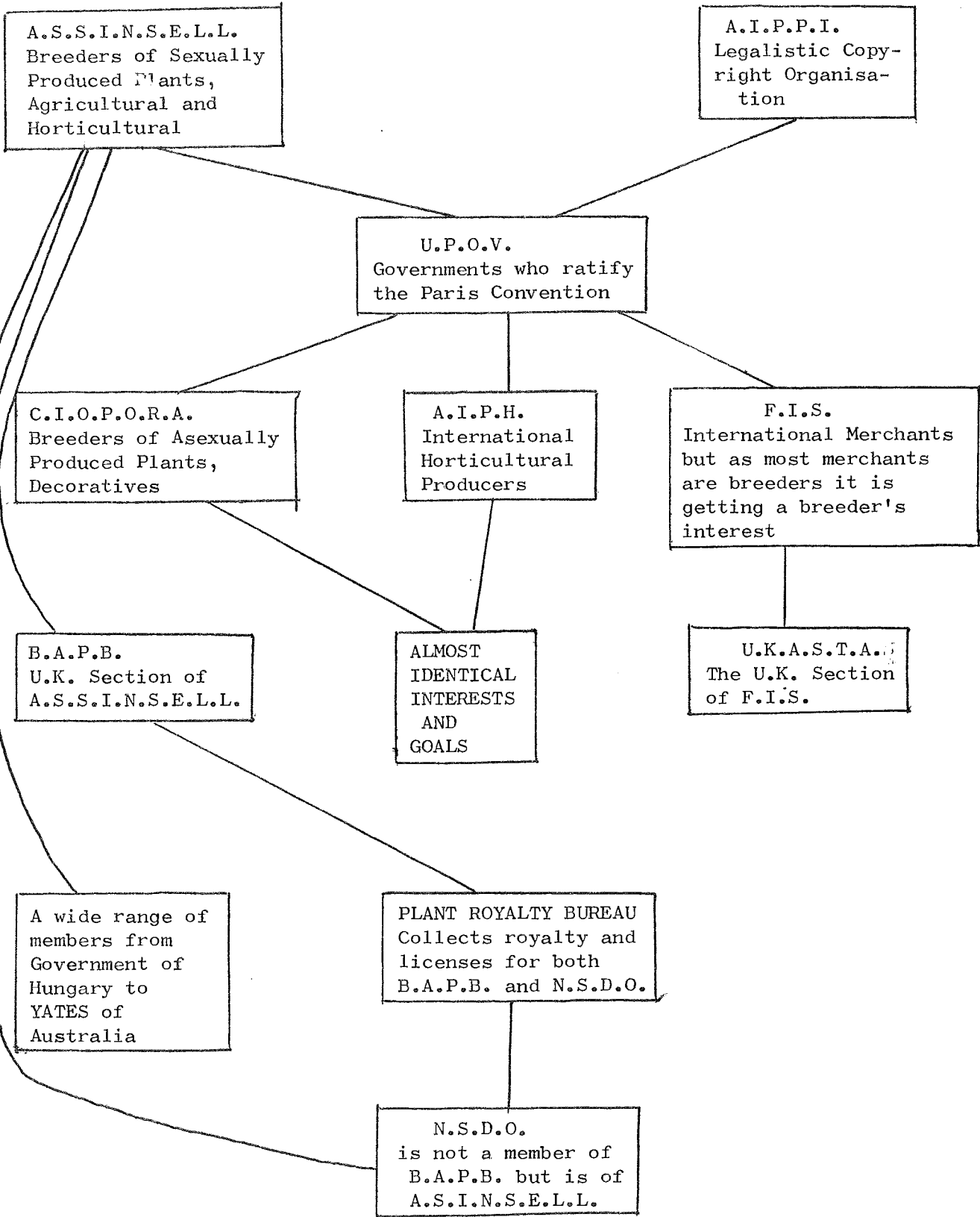
Are on their own. They recognise Plant Breeders' rights, allow over the fence sales, do not test varieties by growing them for 3 years, and only allow reciprocal rights, i.e. if you let us have your plants we'll give you some of ours. I believe the course these countries are taking is expedient, only in the short term, and that by not testing varieties (they rely on computer description), they will in a short time create a paradise for lawyers, and the judicial system. The system these three countries use is paramount to a patents office working by description rather than drawings. If Australia has to choose between the above system and no breeders' rights, I believe we should choose the above but the system operated in the U.K. has a better control on the industry. It is :-

U.P.O.V. (International Union for the Protection of New Varieties of Plants)

The countries that belong are United Kingdom, West Germany, France, Denmark, Sweden, Belgium, Italy, Switzerland, South Africa and Spain. Countries enacting Plant Variety legislation include New Zealand, Poland, Hungary, Senegal, Iréland and Austria and Luxemborg and most of these will join U.P.O.V. The advantages of a country joining U.P.O.V. are that this is a truly international body offering free exchange of breeding material, subject of course, to national quarantine. It guarantees the full spectrum of expertise in the field and even perhaps offers facilities for D.U.S. testing, i.e. Germany could test say wheat, France maize, Holland now tests amenity grasses for the rest of the U.P.O.V. world. The difference with U.S.A. is basically that while U.P.O.V. look at a plant from 164 different characteristics for distinctiveness, the U.S.A. will agree on a description alone.

The Breeders of a U.P.O.V. State have a guarantee that they are protected by the International obligations of the treaty and they will continue to spread the idea of protection on an international scale. I believe we should indicate to U.P.O.V. that we intend to join them if we can get Plant Variety Rights recognised in Australia, as they have much of the expertise available to smooth our way into the fold. They only problem is whether we recognise or outlaw farm sales of seed.

U.P.O.V. is made up of many bodies and the structure is best done by a family tree type set up.



GLOSSARY

<u>U.P.O.V.</u>	International Union for the Protection of New Varieties of Plants
<u>A.S.S.I.N.S.E.L.L.</u>	The International Association (for Sexually Produced Plants) of Plant Breeders for the Protection of Plant Varieties.
<u>C.I.O.P.O.R.A.</u>	The International Community of Breeders of Asexually Produced Ornamentals.
<u>A.I.P.H.</u>	The International Association of Horticultural Breeders.
<u>F.I.S.</u>	Federation Internationale da Commerce des Semences.

All in all, Plant Breeders' Rights is a fast moving world movement with a very clean face to the world. The rights will probably be most valuable for those breeders who are lucky or businesslike enough to get the correct varieties. We must eat and we must produce more. As one breeder said to me, "Our objective is to make money by feeding the world, so that we may continue to feed the world."

SEEDS EDUCATION

The F.A.O. indicate that around 50,000 seed technicians are required throughout the world and there are only three universities in the world providing courses to supply them. These are at Mississippi, U.S.A., Palmerston in New Zealand and East of Scotland at Edinburgh.

At East of Scotland they receive about 90 applicants a year, of whom 16 are selected for either a Diploma in Seed Technology (9 months) or an M.Sc. in Seed Technology (12 months). Both courses are Post Graduate and dominated by graduates from U.S.A., Middle East, East and West Africa, Asia and Central and South America.

This course has incredibly never had a British student as it is of a long duration so the College is endeavouring to run short courses in association, with the educational arm of U.K.A.S.T.A. during off-peak times and this should overcome the time factor that has prevented British graduates studying this course. An Australian graduate has been accepted for this course in 1978-79 so in that respect, it should put us on a par with Sudan, Nicaragua, Kenya, Bangladesh and other like countries whose nationals I have the pleasure of meeting.

QUARANTINE

The Australian Quarantine Laws come under fire in the United Kingdom. As a farmer, my first reaction is to endorse our stand. The law states that consignments of crop seeds can come into Australia for "processing" as prescribed by the Director. However, "for sowing" the law only permits "under specific conditions a minimum quantity of seed to establish a variety or strain of the particular species or genus in Australia." This seed shall be subject to any treatment the Director directs. All seed imported

under a permit shall be grown for at least one season, and during that period shall be examined as the Director considers necessary.

However, Government and Private Seed marketing companies both believe that a huge market for seed could be established in Australia, in growing on White Clover and Lucerne in particular for the British market. Apparently, New Zealand will not allow White Clovers that may "bastardize" their "native" clovers and as this is not the case in Australia, a trade could exist. The situation on Lucerne is that there appears to be no other country outside the Iron Curtain that could grow lucerne seed for the U.K. except Australia. The current price for lucerne seed in the U.K. was over 5 times our prices, and one would imagine a trade could develop. I suggest that there must be areas where specialist seed producers in special areas could gain larger seed lots to grow on, varieties or conditions of special entry and compulsory export of the entire crop. While I don't even vaguely pretend to be an expert, I believe the trade is there and it looks attractive to a nation that frankly could do with a lot more market diversification.

We have all witnessed the introduction of exotic breeds of cattle and shall, if Cocos Island ever sees the light of day, see the same in sheep. Current research in U.K. states quite equivocally that "scrapie" (a fatal disease of sheep) has shown up after 9 years and 2 generations in quarantine, so that worries me. Likewise, research in the U.K. has shown that exotic cattle have the same weight gain per unit of feed eaten (Charalais put on twice as much as Angus and eat twice as much food) and have the same killing out and cutting out percentages (within 1%). This being the case, we still appear to be trying to add to our importations.

I believe then, that with the colossal advances that have taken place and will take place in the field of plant breeding, we must mark out ways to firstly expedite the entry of desirable genetic material and secondly, to help generate new viable agricultural industries.

I qualify what I saw with the obvious proviso that if we have Plant Variety Rights, we could get smaller parcels of seed and grow them on for more generations for sale abroad.

Also of course, with the advent of International Plant Breeding and the ability of private companies to fill market demands quickly, we must devise a way of combining commercial expediency with strict security. At the moment our stand is not conducive to a commonsense commercial industry.

There must be areas where whole industries could be created such as South West West Australia, Victoria or Tasmania for seed production, likewise on specialised irrigation areas.

I hesitated to broach the subject of Quarantine as it is very specialised and restrictive, but I do so to report on :-

- (a) What I discovered to be the reaction overseas;
- (b) What has become my opinion as a result of it;
- (c) My acknowledgment of the complexities of the situation.

AUSTRALIAN ATTEMPTS TO ESTABLISH PLANT BREEDERS' RIGHTS

A SAD HISTORY

- 1935 P.V.R. introduced in Germany
- 1940 P.V.R. introduced in Holland
- 1950 P.V.R. investigated in United Kingdom
- 1964 P.V.R. introduced in United Kingdom
- 1971 Plant Variety Rights brought to notice of Australian Standing Committee on Agriculture by the Australian Plant Breeders' Conference.
- 1974 Seed Industry Association of Australia and Australian Nurserymen Association express concern at rate of progress
- 1977 21 Countries at least have breeders' rights and others enacting legislation of one form or another.
- 2.2.1977 "Australian Agricultural Council approve in principle the outline of a Plant Variety Rights Scheme."
- 2.8.1977 "The Australian Agricultural Council request the Commonwealth Government to prepare legislation to establish an Australian Plant Variety Rights Scheme."
- 2.3.1978 "Legal wrangles between some States and the Federal Attorney General have to be resolved before patents protecting plant breeders can be introduced.
- N.B. Inert material is not allowed in certified seed but it is quite apparent in the Seed Industry.

The hardest part of this report is to clarify the Australian Seed Industry. It is divided, fragmented and amateur. Most growers are amateurs who treat seeds as a cash crop that happens on an accidental basis. Administrators are only now starting to even attempt to get the industry on a professional basis and farmers and commodity boards, as the end users, are ignorant of the incredible risks they run using cheap, dirty, disease-ridden seed.

To look at the National Industry I find :-

- (a) Every State, and the Federal Government is in favour of Plant Variety Rights, yet seven years have elapsed since the industry asked for it and the experts are still arguing.
- (b) The Industry Assistance Commission into Rural Research recommended that Plant Variety Rights establishment be expedited - and that recommendation has apparently been ignored by most rural pressure groups.
- (c) Two States are against the inclusion of cereals and field crops, one of these because of the "extra work for their public servants".
- (d) New South Wales and South Australia operate some semblance of a registered grower scheme for cereals, and this is being referred. Some States have only a rudimentary scheme for cereals. Tasmania has a scheme where 70% of seed is registered or one generation removed from it. Queensland boasts a scheme run by the Wheat Board where top crops are inspected and retained for seed. Yet this scheme supplies less than half of the seed needs of the State. There is no rational policy.

- (e) The same applies to pasture seeds and, I presume, other fields. No State even knows how much seed is sold because it is still not policy to have all seeds tested by compulsion.

PLANT VARIETY RIGHTS - WHY?

Why should a farmer campaign for P.V.R. when the first result is more expensive seed? The answers are manifest and include:-

- (1) The rest of the world is far in advance of us in the field of Plant Breeding. Most of this work is being denied to us. We have been refused:
- (a) Dwarf fruit trees (U.K. has cherry trees that outyield ours growing on orchards under wire to keep out birds).
 - (b) Apples
 - (c) Cotton
 - (d) Perennial Rye
 - (e) Rapeseed
 - (f) Beans
 - (g) Barley
 - (h) Many other fruits
 - (i) We were granted lucerne from U.S.A. mainly because of the fact that they have many varieties and importers paid a royalty; and also that Mexico devalued and that left U.S.A. stuck with 250 tonnes of seed they shoved on Australia.
- (2) The existing varieties are not covered by P.V.R. in Australia. So if a new variety is 10% better than the old and costs 5% more the farmer is 5% in front. If the new plant is no better then no one buys it, they grow the old. It is nonsense to say that seed is more expensive. A case in point, brussel sprout seed costs \$40.00 a kilo and gives 3½ tonnes per acre of crop. Hybrid seed costs \$20.00 a kilo and yields 5 tonnes per acre (U.K. prices). The extra cost of seed is ½ tonne of sprouts, and, as a result, only hybrid seed is used.
- (3) The only varieties we get at the moment are ones that the rest of the world not covered by P.V.R. develops, or those that were protected and have now been discarded because better varieties exist. The greatest development in breeding in Australia post-war has been Dwarf wheat. These genes would have been denied to us if they had been developed in U.K. or any other protected country.
- (4) The only private breeding done in Australia is in the field of ornamentals and hybrid work. Hybrids are protected because only the breeder has the parent breeding stock. There is evidence that Russian sunflowers out-produce our hybrid ones and they are open polinated, but without breeders' rights there is no incentive to sell them to the Australian Market.
- (5) Much of the development in the rest of the world is done by huge multi-national companies who screen millions of plants to find a few. I have not seen any comment on this field of the industry in Australia because most conventional type breeders have no comprehension of it. This work

is now going on in 66 countries of the world and our lack of it this year will cost Australia hundres of millions of dollars. The Alfalfa Aphid cannot be blamed on anybody in Australia. It is one of 16 $\frac{1}{2}$ global type diseases, plagues etc. on the face of the world at the moment. Dutch Elm disease and Poplar rust are others. But the fact that no one can tell us what variety of lucerne to grow next is scandalous. As a farmer in southern New South Wales, I am being asked to grow varieties that survived on irrigated pasture 200 miles and 2 weather districts away from me, or on irrigated pasture in Maffra, Victoria some 400 miles away. The descriptions of the American varieties are only relative and no one really knows what variety is what. If one reads the agronomic characteristics of the "New American lucernes" they read much the same as African Cancreep and Siro Peruvian types which don't grow here. The truth is NO ONE KNOWS which lucerne is best because no one has invested in the industry. This mistake will cost our wool and meat markets hundres of millions of dollars.

- (6) I have explained the lack of National Policy. If we developed an N.S.D.O. type group in Australia to protect and develop all State bred varieties, the petty jealousy between States would disappear as well.
- (7) Whole new industries in other countries are not available here, i.e. pick your own fruit where all the fruit is within reach.
- (8) We are the laugh of the plant breeding world and we will continue to be until we realise what developments are taking place in the outside world. Some, just some, are :

Leafless Peas - a temperate crop rich in protein and easy to harvest.

Naked Oats - the most perfect feed grain in the world.

High Lysine Maize - suitable to fatten pigs with no added protein.

Salt tolerant Barley - grows on sand and irrigated with sea water.

Some of these developments must be considered way out to some, but 3 of them are now commercial in parts of the world and we are out of the fame through our own ignorance.

- (9) Wheat growers in this State contribute \$15 each to fund a wheat breeding programme. Much of this work is aimed at disease control and good results are achieved. I can see what would be the result if all this work is expanded on a National scheme and funded from a Plant Varietal Rights Legislation.

WHAT AUSTRALIA SHOULD DO

I have explained the British Seed Industry and its Australian counterpart. I have explained why, as a farmer, I believe we should have Plant Variety Rights legislation immediately in Australia. I am going to attempt, and I am admitting I am ill-equipped for the task, to try to show step by step what we as a Nation must do to achieve parity with the world.

- (1) I will admit that as a Nation we could not afford the U.P.O.V. Scheme, but I believe in the future we will have to achieve its standards. So we must adopt quickly, a scheme based on New Zealand type legislation.

- (2) We should, as is expected, only recognise P.V.R. for fruit and ornamentals but quickly get pasture and field seeds as well as cereals into a situation that they too can be protected - Rice could be done tomorrow.
- (3) We should have the closest possible exchange with the National Seed Development Organisation and Plant Royalty Bureau to have equivalent organisations developed in Australia as soon as legislation is passed. This is essential.
- (4) Commodity boards must recognise and PROMOTE seed improvement schemes.
- (5) Departments of Agriculture must do the same. The 1978 Wheat Sowing Guide for New South Wales does not even mention registered seed. Not enough work is done to show farmers the dangers of off-type seed, diseased seed and weed ridden seed.
- (6) Almost half the seed advertised in a current agricultural journal is uncertified. Much of it carries a "Department of Agriculture test". This only shows weed contamination and germination but many clients believe this is certified seed. Our Departments must clear up their descriptions and attempt to outlaw uncertified seed.
- (7) Our testing laboratories must update. In the U.K. most of the seed is cleaned and tested in 2 months (harvest June and sow September). We don't have that throughput but we must attempt to achieve it. A lot of clover in New South Wales is uncertified because growers just can't wait for results.
- (8) Farm bodies must lobby for increased breeding with protection because improved varieties will make farms better and more productive.
- (9) To get cereals to a point that they can be afforded some protection State Departments must weed out seed growers who are sloppy, unproductive and non-professional. The thought of seed producers using secondhand bags, unbranded bags and no varietal description is horrendous and should be policed rapidly.
- (10) Alter quarantine requirements (but not standards) to allow a whole new seed industry to develop in Australia. We could supply the world.

CONCLUSION

Such is the way I see our seed industry as well as its British equivalent. We must update and put ourselves back on the world map. In a nutshell, my conclusions are :-

- (1) The British Seed Industry is 15 years in front of the Australian Seed Industry and probably this gap is increasing annually.
- (2) My reading confirms the rest of the developed world is as advanced as U.K.
- (3) Our industry is bogged down by legalistic type arguments that must be solved.
- (4) Our Government-orientated breeders have no conception of Private Breeding advances in the rest of the world.

- (5) Our farmers have less conception.
- (6) I thank all who have helped me both in the U.K. and Australia. I hope I have provoked thought and action. As a farmer, I find the Australian industry just not good enough.