AUSTRALIAN NUFFIELD FARMING SCHOLARS ASSOCIATION

REPORT OF STUDY TOUR TO THE UNITED KINGDOM AND EUROPE

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1989 Queensland Nuffield Farming Scholar

SUBJECT: LEGUME CROPS AND PASTURES, ANIMAL WASTE MANAGEMENT AND FARM MACHINERY

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2. INTRODUCTION

Having been on the family farm for twenty years I was keen to broaden my farming knowledge by taking the opportunity offered by the Nuffield Scholarship to study British and European agriculture. The study tour provided a unique opportunity to look at the European agricultural scene from the farm level through to Government and EEC levels.

To the Australian farmer, EEC policy decisions may not always appear correct, but having seen agriculture from a European perspective I now have a clearer understanding of their actions.

The original aim of my study was to observe plant nutrition, taking into account the use of crop and pasture legumes, and animal waste management to provide cheaper crop nutrient bases. I was also keen to observe European farm mechinisation, and bring home any new ideas that may be of use to Australian farmers.

Following is a summary of how I perceived the various sections.

3. THE EUROPEAN ECONOMIC COMMUNITY

Twelve European countries have combined to form the European Community and build a future together. Despite cultural and historical differences, they have one thing in common - a desire to live in peace and improve the living and working conditions in the community. It must be remembered that during the war and as late as the early 1950's, many people in the European Community experienced food shortages, and they do not wish this to happen again. The Community has set itself a target of creating a people's Europe and a large market, free of internal frontiers, by 1992.

On May 9, 1950 the (then) French Foreign Minister, Robert Schuman, proposed co-ordinating the coal and steel production of countries which had waged war for centuries. He placed it under the control of a common institution called the High Authority. The Treaty established the European Coal and Steel Community (ECSC). This was signed in 1951, followed in 1957 by treaties establishing the European Economic Community (EEC) and the European Atomic Energy Community (Euratom), and known as the European Community. In 1986, the Treaties were amended and extended by the Single European Act. There were six founding members of the community - Belgium, Germany, France, Italy, Luxembourg, and the Netherlands. These were joined in 1973 by Denmark, Ireland and the United Kingdom, with Greece following in 1981 and Portugal and Spain in 1986.

The whole structure is now covered by four institutions: the European Parliament, the Council, the Commission, and the Court of Justice, with the support of the Court of Auditors.

The Parliament comprises 518 members who are elected by the people from individual member countries.

1992 is the year set down where barriers between the Community countries are removed and the principles of solidarity apply. This, for example, should mean the free movement of goods, people and capital between the EEC countries. A common currency is aimed at by the community, but this is unlikely by 1992.

i) How will this affect the Australian farmer?

Since Britain joined the EEC, Australian and New Zealand farm products have slowly been squeezed out, largely due to Britain trading more within the Community. This has meant that Australia has had to seek new markets, mainly with the Asian region.

The future of Australia selling to the EEC market is not very bright, but there may be small openings for specialist goods like organically grown products, some fruits, woollen and other products which cannot be supplied by member countries of the EEC.

To take advantage of any available markets within the EEC, the Australian farmer must supply only the best product of the highest standard, as he is competing with some of the world's best farmers. Any decline in quality will soon lose these markets. He must also be able to offer continuity of product when the market requires.

ii) Subsidies in the EEC

The original aim for subsidies (or price support), was to encourage agricultural production because of shortages during and after the World Wars. This created a problem of over-production in some areas, for example, dairying.

The over-production was brought into line with quotas or levies applied to some industries. Quotas are applied to the dairy industry to give a steady guaranteed supply of milk products onto the EEC market, throughout the year. Other industries, such as wheat, which is currently over-produced, have a levy applied to every excess tonne. This aims as a disincentive for the farmer to over-produce. If the over-production continues to increase above the EEC production level, the levy also increases, thus discouraging the farmer to produce.

Subsidies also encourage production of goods which are under-produced within the community and price supports encourage farmers to market produce at a particular time of the year which traditionally, would not have been marketed.

For example, traditionally lambing is done in spring, and the fat lambs are marketed approx. 14 or 15 weeks of age. Nowdays, farmers who choose to market fat lambs during the winter months, receive a good subsidy. The subsidy is based on a sliding scale to encourage a more even supply of lamb onto the market throughout the year.

iii) Subsidies - Social Effects

Subsidies are not only an economic support, they are also a social support. Because a large number of farms within the EEC are very small, the cost of enlarging the farm size would become an enormous financial burden to the nation. Redundant farmers would find it difficult to relocate in the cities and find new jobs, thus becoming dependent on the social security system.

It is much cheaper therefore to pay these farmers an increased subsidy on their production and have them continue farming, than to become too heavily dependent on the government. At the same time farmers are given support by way of education, cheap finance or subsidies, to become more efficient and to enlarge their production units.

iv) Environmental Concerns and Land Care - looking after the environment by way of subsidy or grants.

Land and environmental care has become an important issue within the EEC countries. Most of the countries have their own regulations concerning land care, however EEC guidelines are set down and give an umbrella cover for member nations.

a) Agriculture and its place within the environment

Agriculture has provided sufficient food for a growing population, owing to productivity improvements. With improved fertility of the environment, agriculture has contributed to a wide diversity of landscapes and ecosystems in Europe. Farming techniques have changed since the war, but the land is still a reflection of nature and, as such, an area of recreation badly needed in a modern, essentially urban and industrial society.

If farming were to stop, the environment would suffer. If the fields were no longer ploughed, meadows or pastures no longer cut or grazed, terraced, small drainage and irrigation networks neglected, then scrub would develop sporadically and be ecologically weak, encroaching on the diversity of the wildlife in the field and facilitate the spread of fire with resulting erosion and desertification.

In mountain areas, cessation of farming would lead to avalanches, mud slides and rapid erosion. Water levels also suffer. In areas of hostile nature unattractive to industry, the departure of farming would mean the whole area would become rundown, and then less accessible for the town dweller or tourist.

Good agricultural practices help to protect the countryside, but some farming techniques do represent a threat. Agriculture also has to contend with pressures exerted by other economic activities on the environment, for example, industry, transport and urbanisation, all of which have to be monitored.

b) The threat of agriculture on the environment

WATER The problem of keeping a high water quality. Over-use of nitrogen fertilizers and organic waste may increase nitrate levels in the water, making it a threat for human consumption. High pesticide levels in the water may cause problems just as organic wastes from food processing can cause damage to water organisms. The same applies for liquids released from agricultural product stores such as silage effluent and other food process wastes.

SOIL Having soil uncovered for long periods in certain farming systems, may lead to severe erosion; even on the very flat areas of land in northern Europe. Over-grazing can cause erosion particularly in the Mediterranean area. Today's use of heavy farming equipment can compact the land

and the long term use of fertilizers, chemicals, animal and urban wastes can build up to dangerous levels.

QUALITY OF AIR AND NOISE Air and smell pollution caused by intensive stock farming. Excessive noise of agricultural machinery.

THREAT ON WILDLIFE AND COUNTRYSIDE Any large or sudden change in the landscape like tree or hedge removal can have dramatic effects on native wildlife. Alterations of earthworks where land is drained or streams diverted, has a major effect on plant or animal life in that region. Farm buildings or roadways can spoil the appearance of the landscape, if not planned correctly.

c) The possibility of damage to farmland from the management of the environment.

The control of urban and industrial pollution and the use of land for industrial, urban and inter-urban operations have a direct impact on the quality of farmland. Pollution of farmland and crops by atmospheric 'fallout' from urban and industrial activities raises two types of problems:

Urban and industrial pollution: Farming areas near industrial or urban centres suffer the immediate effects of dry or wet 'fallout', especially acid compound (acid rain), but also heavy metals, lead, cadmium, mercury and metalloids. Such pollution also affects the soil, reduces yields, threatens the health of livestock and can contaminate crop and livestock production. Farming areas removed from urban and industrial areas can also suffer 'fallout' with long-term effects.

Major technological accidents: An example is the explosion at the chemical plant at Seveso in 1982 which released into the atmosphere quantities of dioxin, poisoning the soil over a radius of several kms. The explosion of the nuclear energy plant at Chernobyl (USSR), in 1986, left a radioactive cloud (iodium, cassium, strontium) which within a few days, spread over much of Europe, contaminating certain crops, livestock and even the land.

d) Allocation of land and the quality of farmland.

In all the member states, schemes are now underway, designed to ensure organised location of urban and industrial activities; communication networks; and land allocation for farming, forestry, recreation and nature protection. Depending on the countries and the geographical level, the schemes include:

- land occupation plans
- regional development and town planning guide schemes
- land improvement
- regional planning
- regional development.

These schemes, which would achieve rational use of the land in terms of real economic needs and land potential, tend to neglect the needs of agriculture. Thus, since WWII the 'market garden belts', of many cities have disappeared under concrete, regardless of the quality of the farmland improved over many years by generations of farmers.

The best farmland is sometimes used for factories, new towns, motorways or airports, forcing the farmers onto poorer land.

Improved management of the environment and natural resources could avoid many of these cases. In this area, Australia should be taking heed and arrest this problem that is already upon us.

4. IMPRESSIONS OF EUROPEAN AGRICULTURE IN FOUR COUNTRIES

A) UNITED KINGDOM

Great Britain and Northern Ireland has an area of 244,046 km^2 Nowhere is further than 120 km from the sea. In general, a line from Bristol to 'the Wash' on the east coast, divides mainland Britain into a hilly north-western zone and the lowlands of the south-east. The Pennine Mountain chain stretches 240 km from the Cheviot Hills on the Scottish border to the Midlands. North-western England is dominated by the Cumbrian Mountains of the Lake District and the highest point here is Scafell Pike (977 m.) To the north-west of London lie the chalk hills of the Chilterns, while south of the River Thames, the North and South Downs stand between London and the English Channel. To the west lies Salisbury Plain and then the ancient moorlands of Somerset, Devon and Cornwall.

Wales is dominated by the north-south range of the Cumbrian Mountains (Snowdon 1085 m). Scotland is also mountainous, with the Grampians (Ben Nevis 1342 m) lying north of the central Forth-Clyde lowland. The north-west highlands are deeply indented by sea locks. About 77% of Britain's land surface is used for agriculture. There is little heavily wooded country (9%), but large areas of heaths, moors and common land abound.

With a population of almost 58 million, one soon becomes aware of their presence. With short distances between towns and villages, the dense population is much closer than we are used to in Australia. Similarly, the density of traffic on the roadways is enormous.

This high population density forces agriculture to use every available piece of land for production. It has also had the effect, in recent years, of forcing up real-estate values to a point where the high price sale of old (especially stone or brick) farm sheds for renovation and conversion to dwellings, has become popular and has been a real saviour for many farmers to restructure or develop their farms. Because the rail services are very fast and efficient it is not uncommon for many people to travel long distances every day to work in London.

Tramlining

Almost all crop farming uses 'tramlining', for spraying and post plant fertilizing. Tramlining is where the farmer drives over the same tracks, usually 18 or 20 metres apart, and in-crop operation is carried out. The tracks are made at planting time by cutting off two sowing runs of the planter at whatever distance the farmer chooses to have his tramline. This is governed by his sprayer or fertilizer spreader width. Most farmers like to have 24 metre tramlines. This gives an accurate guide for the spraying and fertilizing operation, which can account for up to twelve passes during one growing season. It is also common for the farmer to use wide flotation tyres on tractors and sprayers in the early stages of crop growth, particularly when ground conditions are wet.

Crop Spraying

All the crop spraying uses ground rigs, either self propelled or tractor mounted. Wheat crops for example may be sprayed as many as eight times with herbicides, fungicides or pesticides. Farmers regularly monitor crops for any impending problem.

Fertilizing

Most fertilizer is applied using spray rigs. This is done by removing the spray nozzles, and fitting a small bar which dribbles the mixture onto the crop and onto the ground. There doesn't appear to be any crop burn with this method, even when applying up to 20 units of nitrogen per pass.

Spinner application of fertilizer is still popular but the use of pneumatic spreaders have largely taken their place, as they are more accurate and can spread widths up to 24 m.

The pneumatic spreader works on a similar principle to the common air seeders. It has a central hopper and fertilizer is carried by air in tubes along a lightweight boom similar to a boom spray. These tubes terminate approximately every

The pneumatic spreader works on a similar principle to the common air seeders. It has a central hopper and fertilizer is carried by air in tubes along a lightweight boom similar to a boom spray. These tubes terminate approximately every 18 inches, with the fertilizer hitting a deflector plate to give an even coverage. After use, the boom can be folded so that the whole unit is no wider than about 8 feet. This is the case also for most farm equipment in Europe, so that the machinery can be transported along narrow roads and lane ways. In many places the country lanes are only wide enough for one vehicle. Passing an oncoming vehicle becomes an interesting exercise when one vehicle has to reverse to a spot wide enough to squeeze past.

Hedges

In many parts of Britain, the hedges are a very common part of the landscape. They are protected by law and removal permission is almost impossible. Farmers have the added job of trimming them every autumn and winter with a tractor-mounted extended arm flail mower. Whilst they do add beauty to the countryside and also serve as stock restraints, they are a problem in some areas with small paddocks, a legacy from the past.

Grain storage

Most farms have on-farm storage for their grain. These consist mainly of large flat-floored sheds, some with a perforated false floor to allow for grain drying. Because of climatic conditions, the grain is harvested at 18-20% moisture and brought in by farm trailers to the central farm storage where it is dried and put into storage. It is then held on-farm until the buyer requires it. Weevils are not the same problem as here in Australia, as they have a long cold winter. Most of the grain is retrieved from storage by front-end loaders with a large grain bucket. These loaders are used extensively for all other farm material handling operations.

B) FRANCE

France has an area of 547,026 km^2, with seaboard on the English Channel, the Mediterranean and the Atlantic is 3120 km. long, and land frontiers extend roughly 2170 km. The Pyrenees in the southwest, the Western Alps in the south-east, the Ura and the Vosges in the east are also natural frontiers. France offers a wide variety of landscape and scenery, including the plains of Beauce and Brie, the Causses plateaux and mountain ranges. The country is watered by four main rivers - the Seine, which flows into the English Channel, the Loire and the Garonne, which flow into the Atlantic; and the Rhone, which flows into the Mediterranean.

Fifty-eight per cent of French land-surface is given over to agriculture. The most important crop is wheat, followed by oats and maize. Fruit and vegetables are grown in all regions, but mostly in the south. Vines cover extensive areas, especially in Languedoc and Burgundy and around Bordeaux, areas famous for French champagne. Woodland covers 27% of the country.

France has a population of 56 million people, of which 8% work in agriculture. There are 1.05 million farms with an average area of 27 hectares. Cereal farming, using similar methods to Australia, occurs on gently rolling countryside, mostly of fairly light soil.

Agricultural Advisory Services

Advisory work was done by staff of the Ministry of Agriculture, however this has now changed to a predominantly industry-funded body with some government assistance. The funding is by levy on agricultural products.

Co-operatives

French agriculture uses the practice of co-operatives in a number of their operations. Businesses such as 'Credit Agricole', their banking service, slaughter houses and drying facilities. This enables the smaller producers to have strength of purchasing power on the input side, and seller strength in the market place.

Impressions

France, with its large land mass, is not as densely populated as Britain, allowing farms to be less concentrated. In an attempt to become more efficient, many French farms are being reconstructed and use modern farming techniques. Additional assistance is given to the young farmer by way of low interest loans (average 4-5%) plus management training, to help him become established. Farmers could borrow up to full asset, provided the project was agreeable. Ordinary bank loan is 9.92% and 4.88% being subsidised. Average agricultural rate is 6.77%, with average cost to the government being 6%.

The French farmer feels confident of political support because as farmers, they represent approximately 15% of the vote, with another 15% of voter support from people who in some way are still connected with the land. This political strength gives him confidence that the government will look after him, particularly in relation to their position within the EEC.

Cereal Production

Over the last few years, cereal production has declined by about 25%, with price reductions of up to 33%. As cereal areas decrease, more pea, sunflower and oilseed cultivation has taken place. As milk producing areas have declined, farmers have turned to cereal growing.

Farm Organisations

France has four main farm organisations similar to the NFF and young farmer organisations. They are joined together by what is called A.N.D.A. (National Association for Agricultural Development). The farmers pay a fee to operate the organisation, either by farm size or income.

Chambers of Agriculture: This organisation is similar to Australia's Department of Agriculture. It has 94 departmental chambers in France and 21 regional chambers. Members are elected by farmers, farm workers and retired farmers, in all 4000 elected members. It has a staff of 7000 who are paid by the Chambers of Agriculture. There is a public tax levied on the farmers by the State, this being a land tax (average of 22 Francs/Ha.) and subsidies from sale of services i.e. agricultural advisors.

C) DENMARK

Denmark has an area of 43080 km^2. It consists of the Jutland Peninsula, which has a 67 km frontier with North Germany and 483 islands of which about 100 are inhabited. Copenhagen, the capital, is the largest city in Scandinavia. Denmark is a flat country with the highest point rising to 173 m. 66% of the area is agricultural land with some 11% being wooded. Oil and natural gas deposits in Danish waters of the North Sea are becoming important industries. Most of the soil type in Denmark is of a light loam to very sandy (almost beach sand). No irrigation from streams is allowed and the longest river, The Gudena, is only 160 km long. The irrigation that is carried out is from underground supplies, this is mostly used on potatoes and pastures, using travelling irrigators. Denmark has a population of 5.1 million, of this 7.1% work in agriculture producing enough food for some 15 million people.

Impressions

Denmark has beautiful countryside with rolling fields, dotted with wind generators, standing some 25 m. high. The people are proud to be Danish, with almost every second house flying a Danish flag. The good roads are not busy and make for pleasant driving.

Farms

The farmers are efficient and environmentally aware and they use less hired labour than British or French farmers. A look at their machinery tells of the hard times agriculture has had. On the west coast, where strong winds prevail, there are tree lines every 200-300 m. to protect the crops from strong winds.

Despite the land being very sandy in many areas, high-yielding crops are grown, largely by the correct use of fertilizers and crop rotation (rotating legume crops with cereal crops). The main forms of agriculture are wheat, barley, oilseed rape, potatoes, peas and beans, dairying and pig production. Almost all cereals grown are used locally for cattle and pig food.

Agricultural Department

As well as being used as an advisory service, the Agricultural Department also provides an

accounting and financial service to the farmer. This is done on computer and relieves the farmer of much of his office work.

Rural Women in Denmark

In recent years, the size of individual farms has increased and the arrival of mechanisation in agriculture has reduced the number of farm workers. So the farmer and his wife are often the only ones working on the farm. Most farmer's wives today have to work in the stables and fields, as well as traditional tasks. A survey of the working condition of farm housewives shows that 58% normally help with work on the farm without having other occupations. There are 14% with jobs outside the home who also help with farming activities. Another 12% do not help with farm work, but instead have paid work outside the home. The last 16% take care of their homes without having other work.

Farmers' wives in Denmark belong to three women's organisations:

i) The Federation of Danish Farmers Union, the Home Economics Committee;

ii) The Federation of Danish Home Economics Association;

iii) Danish Family Farmers' Association, the Home Economics Committee.

These housekeeping and domestic science organisations have about 130,000 members. Most of whom are rural women married to farmers. The remainder are consumers resident in rural areas or smaller provincial towns.

They carry out an active informal programme in domestic science, social and cultural affairs.

The organisations employ 75 housekeeping consultants, available to members for personal and collective assistance. This activity is financed by membership fees and a State grant. The organisations work actively to improve the educational and social status of women, particularly rural women and each is a member of ACWW, the world organisation of rural women, which represents 8.5 million women throughout the world.

D) GERMANY (FEDERAL REPUBLIC)

Germany covers an area of 248,687 km^2, stretching from the Baltic sea in the north, to the Alps in the south, with the highest mountain being Zugspitze of 2963 m. 48% of the land is used for agriculture and 29% is wooded. 5% of the population is involved with agriculture, with an average farm size of 16 Ha. Germany has a population of 61 million.

Impressions

On the whole, German farms are small, especially in areas where land is handed down and properties keep being divided. In some cases, a person may own a strip of land 200 m. long and 3 m. wide. Many farmers have jobs off-farm and do their farming after work or on weekends ('moonshine farmers'). As one travels the farmland one notices few houses on the farm. The farmer often lives in a central village and travels out to his farm every day. Often the dairy cows are brought into the village at night, milked, then taken out to graze on the farm during the day. In some cases, if the farms are further away from the village mobile milking machines are taken to the cows.

The German is a very 'particular' person, with everything to be done correctly. This was pointed out to me on more than one occasion, for example when inspecting Mercedes-Benz tractor plant, the saying is 'If the job or product cannot be made 100% correct, it is not worth doing at all'.

Fodder Conservation

Haymaking

Some hay is field-dried and put into large round bales, while other hay is baled into conventional small bales (loaded into bale wagons via bale throwers, on the back of the baler). Some hay is brought semi-dried in hay wagons and blown up into a shed or barn and fan-forced air dried to the correct moisture level. This hay is retrieved from the shed by large hay grabs. In one southern area, hay is field-dried by stooking the hay and fed to cows whose milk is used for cheese with holes. If silage was fed, the chemical balance in the cheese would be wrong and the holes would not be the correct size.

Silage

Most silage is made from semi-cut grass collected with wagons with a pick-up front and then put into above ground clumps and covered with plastic sheeting.

Agricultural Returns

The German farmer receives more for his products than the average EC farmer. This is due to the extra support given by the government to the agricultural sector. It must also be remembered that most farms are very small.

Lingering fear

Despite no war for over forty years, the German people still have a fear of being over-run by war. Possibly the presence of French, British and American armed forces who carry out a caretaker role, serves as a daily reminder of the years of war. A visit to the East/West dividing fence near Kobach, was an 'eerie' experience, which I will not forget in a long while. Germany is however taking its place amongst the other nations of the EC, with past experiences being put behind, and a new and peaceful future being sought.

5. LEGUME CROPS AND PASTURES

Legume crops and pastures are now an important part of farming programmes. With the cost of nitrogen rising and the environmental problem of high nitrate levels in the soil and water being blamed on agriculture, farmers are looking at better alternatives. For the livestock farmer, this has meant increased use of legumes in his pasture, namely clovers. For the cereal farmer, the area of peas and beans has increased and found an important part within a crop rotation plan.

A) Pasture legumes

The main reason that forage legumes are looked at is for their nitrogen fixing ability by root nodule bacteria, thus having the saving of using added nitrogen for grass production. The high feeding value of forage legumes is often overlooked. It is well established through tests that the performance of cattle and sheep fed on legumes will be higher than that of those fed only grass. Comparing production from white clover with that from grass experiments, liveweight gain with lambs on clover is as high as 65%, and for beef cattle the average advantage was 30%.

Added feed value of clovers

The main reason for the improved performance is the consumption level of forage with clovers compared with grass. Legumes have a lower cell wall (fibre) content and less bulk in the rumen per kilo of forage consumed, thus facilitating a higher total intake. In addition, legumes are broken down more readily in rumen than grasses, again promoting high forage intake. This also promotes a greater protein and mineral uptake. This better growth uptake of clover over grass is not only found with grazing but also with zero-grazing and the feeding of silage or hay.

Trials

The West of Scotland Collage Crichton Royal Farm is currently doing comparison pasture trials using two identical dairy herds, one grazing on grass-based pastures using up to 350 kg of nitrogen/hectare. The other uses a high white clover-base pasture and no added nitrogen. Despite the clover-based pasture producing a little less feed, the end result showed that the nett return was almost identical. This has the advantage of less work applying the nitrogen and a system that is more environmentally friendly. Other trials were conducted at the North Wyke Research Station using white clover-based swards and silage to fatten Hereford-X Friesian steers. They grew at 0.7 kg/day on grass-clover silage up to turn-out, at 0.8kg/day during the grazing season, and at 1kg/day whilst finishing on silage. The overall stocking rate was 3.3 cattle/hectare.

Varieties White Clovers -

Small leaf	-	Kent Wild White
		AberystwythS184
		Gwenda
Medium leaf	-	Grassland Huia
		Menna
		Donna
Large leaf	-	Blanca, Olwen
		Alice, Siwan.

Medium and largeleaf varieties are the most popular in the cutting/grazing system because they have a greater survival ability under harsh conditions. A plant density of 150-200 plants/ square metre should be aimed at.

Soil pH

Clovers generally do not thrive in soils with a pH below 5.5 and a pH of about 6.0 should be aimed at. This can be done by liming the soil and the soil can be regularly checked to maintain a pH of 6.0.

Fertilizers

It is essential that adequate levels of phosphate and potash are available and providing the other elements are near the correct levels, no nitrogen will be required to establish a good stand.

Lucerne

I only saw one stand of lucerne in England in the Wareham District in Dorset. This crop was grown to be cut and processed for cubing for which they receive $100/tonne, yielding 3-4 tonnes a year dryland.

Lucerne in France

Of interest was a look at lucerne growing in France. Lucerne has long been regarded as the champion leguminous plant. Its properties make it a top value feed, meeting all the requirements of a modern livestock unit. Lucerne is rich in well-balanced proteins, containing a wide variety of minerals and vitamins and is a source of natural pigments. It is dried by the dehydration process and is now one of the foremost industrial crops in France. The Co-operative 'France Lucerne' is the world's leading producer of dried lucerne. It is an association of 180 co-operatives operating a total of 14 drying plants.

Lucerne is a protein food and in the EC, because proteins are underproduced, they receive a generous subsidy. (In this case around 48%). While I believe their production system is an ideal one, costs in Australia would make the system unworkable - but it is worth sharing the operation.

Area and soil type

France Lucerne has its head office in Champagne. With chalky soil of the Marne and Aube grown in large fields. Four thousand growers supply lucerne to the 14 drying plants comprising some 450,000 tonnes of dried lucerne from 40,000 hectares. The lucerne is grown for three years then rotated with other crops. The residual nitrogen left by the lucerne greatly benefits the following crop.

Production cycle:

The grown lucerne crop is direct chopped with 420 hp self-propelled harvester which, like a prime-mover, tows a trailer while filling. Once full, the trailer is disconnected and a truck prime-mover is attached to take the lucerne to the closest drying plant. These high-capacity units operate 24 hours a day, and the lucerne is dried less than three hours after cutting. Drying is carried out in rotary drums with air heated to 900 ° C. Past energy source was oil, but now coal, electricity or natural gas are mainly used. After drying, the lucerne is compressed into different size pellets or blended with other foods to be fed to rabbits, poultry, pigs, cattle, sheep or goats.

Conclusion:

This would be a beneficial system to use in Australia, provided the economics were right. Lucerne grows well in many areas and would lend itself to a crop rotation, but unfortunately we do not receive that large subsidy.

B) PEAS AND BEANS

The EEC is only about 36% self-sufficient in proteins, therefore crops of oilseed rape, sunflowers, soybeans, peas and beans receive subsidy. The UK imports nearly 5 million tonnes of soybean meal and imported proteins to incorporate into animal feeds. The moderate, temperate climate of the U.K. is unsuitable for many proteinaccous crops, but are more suited to oilseed rape, protein peas and beans. Protein peas require no special treatment before incorporation into animal feedstuffs. Oilseed rape requires crushing for oil extraction, beans require micronisation for reducing anti-nutritional substances.

Peas:

There are two main markets for harvested protein peas - human consumption and animal feedstuffs. Human consumption peas are used for canning, packeting as dried peas, mushy peas and soup peas. The animal pea market has rapidly increased over recent years, with more being used in compound mixes.

Harvest pea types:

There are many different types of harvested peas classified by their different grain characters - large blues, small blues, marrowfats, browns and whites. In general, the white type is highest yielding, and the most widely grown for animal feedstuff usage.

Field Beans:

are principally used for inclusion in animal feed, although there are minor markets in export for human consumption and pigeon feed. Winter and spring types are available. Winter beans do not have any vernalisation requirement although they are more winter-hardy than spring types. Winter beans have traditionally ripened two to four weeks earlier than spring beans, although the introduction of earlier maturing spring varieties has narrowed the gap. Winter beans usually have longer straw and are more liable to 'chocolate spot' than spring beans. Average yield of winter and spring beans is very similar.

Flower colour:

Beans without flower pigmentation are tannin-free. Multi-coloured flower varieties contain tannin, and can only be used in limited quantities for compound mixes, as the presence of tannin in rations produces serious deficiencies in non-ruminant animals.

Conclusion:

It is becoming more evident that pulses and legume-based pastures are very useful crops to the farmer. They not only provide the opportunity to have a crop rotation, but also the ability to rebuild the nitrogen levels of his soils without having any adverse effect on the environment. This, in the long term, will create sustainable agriculture.

While some of these crop varieties would not suit our farming scene, we must take note of the principles used and the agronomic benefits to our farming practices.

6. ANIMAL WASTE MANAGEMENT

Animal wastes

The importance of using animal wastes (muck) to benefit the growing of crops and pasture has long been known. It is full of minerals and nutrients beneficial to the growing plant. As much as 35% of Nitrogen (N); 65% Phosphorous (P); and Potassium (K) can be contained in fresh animal manure. To many people, these wastes are seen only as a nuisance problem which often builds up causing environmental problems including pollution of waterways or unpleasant smells. However, with proper management, these wastes can be utilised as a cheap nutrient supply to crops and pastures.

Types of muck

There are several types of muck, ranging from the liquid slurry to the dried out types of straw and manure. Fresh manure or slurry can burn growing crops if used as fertilizer because they are chemically very active. If the manure is stored prior to being used, the risk of burn is reduced because of some nutrient loss. It is important to have good management practices in collection, storage and application of animal wastes to obtain the full nutrient benefit value. Manures can have large nutrient loss if left exposed to wind and rain:

- Nitrogen in the form of ammonia gas
- Leaching of soluble salts of NP and K.

About two-thirds of N can be lost if exposed, compared with one-third if correctly stored. Storing manure in large covered heaps or in slurry tanks can reduce these losses.

i. SLURRY

Slurry and dirty water effluent is mainly collected where concentrated dairy, broiler or pig farming occurs. These often create unpleasant odours, causing major problems of smell for residential areas.

Nowadays, all the slurry and liquid wastes are collected in large slurry stores or slurry lagoons which filter solids out of the liquid enabling the liquid to be pumped out.

Putting manures and slurries back onto the land is the logical and sensible option of disposing of these wastes and putting them to good use.

Slurry treatment

In order to get the best out of a slurry system, it may be necessary to consider treatment in one form or another. Separation is a useful technique which will convert raw slurry into products more easily handled: a low, dry matter liquid which is easy to pump, and a fibre which can often be stacked and perhaps composted to be sold off the farm. Separated liquid reduces crusting and sediment problems in slurry stores and is easier to spread evenly onto paddocks. It will also soak into the soil better than raw slurry and leave less dry matter on crop foliage.

Pumps, pipelines and irrigators are less likely to become blocked with low dry matter (small particle size) liquids. A separator has to fit into a system which is suitable for the slurry on your farm. This may require a separate reception pit where the liquids can be drained off and the fibre removed regularly. Other treatments may apply. Anaerobic digestion can reduce odour and water pollution potential, releasing biogas which can be used as an energy source. Aeration will also reduce odour and water pollution potential and is particularly useful for dilute slurries.

Environmental pressure may require some farms to use slurry treatment depending on their location.

Disposal can come in two ways:

a. Tankers

After the stored slurry is agitated with large propellertype agitators to break up any solid or crusted slurry, it is pumped into large vacuum or pump tankers which transport it to the field where it is sprayed or injected into the ground. The latter is the option where odour will cause problems to residences, or where nutrient losses are to be prevented. This is particularly evident when pig slurries are spread.

b. Irrigation

Some farms use a low-rate irrigation system whereby the slurries are pumped to the fields and irrigated out using different types of 'dirty water' irrigators. These are mainly travelling irrigators. Irrigation has to take place at suitable times, depending on weather conditions or crop growth stage, to get the full benefit of waste, as well as no environmental pollution.

ii. SOLID MANURES

Muck

These can range from semi-liquid much to a more dry type, such as chicken litter. In many cases, this muck will contain old straw or timber shavings which have been used for livestock bedding. Muck from yards and sheds is stored outside and left to rot and await spreading. Lumpy manure or poorly chopped muck can cause problems with spreading on grassland areas. More even spread of manure will result in improved nutrient uptake.

Disposal and choice of spreader:

There are a number of different types of muck spreaders available which are designed for handling different kinds of muck. They range from rotary spreaders, rear discharge spreaders, front/side discharge spreaders and dual spreaders.

a. Dual and front/side discharge spreaders:

These have 'V' shaped bodies and can spread farmyard manure or liquid slurry. A large internal auger draws the muck forward to discharge at the front where it is picked up by a high speed beater and flung out up to 20 m to one side.

b. Rotary spreaders:

Cylindrical in shape with a part-open top for discharge. A central shaft supported at the front and rear of the body, has flail chains attached along its full length. Driven from the tractor PTO, the flail chains throw the manure out by centrifical force to one side. These are suitable for both solid and liquid manures.

c. Rear discharge spreaders:

This type of spreader is becoming very popular, as they can be used not only for muck spreading, but also to carry forage. Consisting of a flat-floored trailer which has moving slats, manure is drawn to the rear where two horizontal beater shafts tear the muck apart and throw it behind in a pattern a little wider than the spreader. To achieve a greater spread width, some makes fit a spinner deck, which consists of four small spinners which give a spread width around 8 m. A slurry door can also be fitted to the rear to hold wet muck or grain during transport. These doors are supported on forward pivoting arms which are pushed upwards by hydraulic arms on either side to lift the door out of the way during unloading. The horizontal beater shafts can be quickly removed if the spread is used as a forage wagon. Spreaders fitted with spinner decks have the added benefit of successfully spreading lime and gypsum.

Grants for waste handling systems

Concern about environmental issues such as water pollution and smell nuisance have prompted the need to improve and update waste handling facilities. The Ministry of Agriculture, Food and Fisheries (MAFF) has recently announced improved rates of grants for waste handling systems under the new Farm and Conservation Grant Scheme. These grants currently stand at 50% for installation and improvement of waste handling facilities. These days there are very strict controls on pollution entering the waterways and grants help encourage the livestock farmer to install the expensive waste management systems.

Laws covering discharge into streams or waterways are very strict. It is illegal to let polluting matter enter any sewer, drain or watercourse, or underground strata. Of particular concern is pollution from silage liquor, as this can be 100 times stronger than crude domestic sewage. If discharged into a stream it can extract all the oxygen, kill fish and animal life and make water unfit for further use. To this end it is very important for a farm to have a properly designed and managed waste handling system.

Conclusion:

Animal wastes are a valuable source of plant nutrient but no one type or system can supply all the nutrient requirements of a crop. Additional amounts of chemical fertilizer, particularly nitrogen, may need to be applied. Soil analysis will indicate the elements required. If operating a dairy, piggery or feedlot, care for the environment must be equally blended with making good use of this valuable resource.

7. FARM MACHINERY

Listed below is a brief look at some farm machinery used on the British and European farm.

Standard method of land preparation

Because of long, cold winters, the land fallow period is very short. Stubble from previous crops is either baled into large square bales or burnt prior to moulboard ploughing. Following this, some farms use subsoilers to work their land to around 3400 mm, followed by power harrowing. Power harrows appear to be very popular in the land preparation programme. Many farms incorporate the power harrow with their planting operation. Whilst they do a good job of preparing a fine seedbed, they are very slow and consume a large amount of horsepower.

Planters

Small combine-type planters and air planters are used for cereal planting. The seed is placed into a well-prepared seedbed by a lightweight trailing sowing type, which has a coulter like a sowing boot about 150 mm^2, and about 40mm wide, with small attached spring harrows to cover the seed. Sugar beet and other row crops are planted with a precision planter, similar to those available in Australia.

Fertilizer spreaders

a) Conventional spreaders

Are still widely used to topdress pastures and crops. The most popular is the twin disc spinner type because of its ability to give a wide-spread pattern up to 12 m. for granulated fertilizer and 10 m for agricultural lime. I observed an interesting spreader design whilst inspecting the Bredal fertilizer spreader factory in Denmark. Their standard spreader, which has been produced for more than 20 years, consists of a flat conveyor belt in the bottom of the hopper with a variable bulkhead opening for application rate adjustment and two counter-rotating spinner discs, which spread fertilizer up to 12 m.

A new addition to their spreader range was the introduction of a twin flat conveyor belt floor spreader for granulated fertilizer. The narrow twin belts convey the fertilizer to near centre of forward turning spinners and flung out by stainless steel channel shaped vanes. This action achieves a spread width of 12-15 m. Bredal produce two drawn models up to 5.5 tonnes capacity and a three-point linkage model with a capacity up to 2200kg.

b) Pneumatic fertilizer spreaders

This type of spreader is widely used in broadacre farming to spread granulated fertilizer in a very accurate spread pattern. The working principle of this spreader is similar to that of an airseeder with a centrally mounted hopper, fertilizer carried by air along a boom up to 24 m wide, then distributed through outlet jets placed approximately every metre along the boom. The outlets have an attached deflector plate, which disperses the fertilizer in an even pattern across the length of the boom. Booms can be folded for transport.

Crop Sprayers

Crop spraying is an important operation for the European farmer, hence the development of sophisticated sprayer units, which are used for the application of chemicals and fertilizers. Most farmers use the nozzle-type sprayers, with a few using the micro droplet types. For liquid fertilizer application, low pressure dribble bars replace the spray nozzle. The dribble bar which fits onto the standard nozzle holder, has four outlets about 100mm apart. This allows the concentrated liquid mix to dribble onto the crop and to the ground. The liquid, being in big droplets and not a fine spray form, passes straight to the ground without giving foliage burn on the crop.

a) Tractor mounted

(used for smaller operations). As with all the boom-type sprayers, the boom is well suspended and there is self-levelling support to keep the boom at an even height above the crop. Most booms can be hydraulically folded without the driver leaving the tractor seat.

b) Dawn sprayers

Probably the most popular type of spray units with capacity around 2500 litres. They are fitted with tractor wheel rims, wide flotation tyres for earlier operations when ground conditions are very wet and soft, and narrow tyres when the crops are taller and ground conditions are firmer. Boom height, adjustment and folding are done from the tractor. Pumps are mostly diaphragm types and spray shut-off valves are solinoid, controlled with switches on the operator panel. Some also have a speed and output indicators. Some farms use four-wheel motorbikes pulling a tandem trailer-mounted tank and boom. These are used when ground conditions are too wet for heavier equipment in an attempt to spray fungicide onto the crop. It has to be remembered that aerial spraying is not allowed, and all the spraying is carried out by ground rigs.

c) Self-propelled sprayers

These are popular on large farms. They can be very expensive units and only the farmer with large areas can justify these units. Several variations of the self-propelled sprayer can be found, ranging from four-wheel drive truck mounted units (Mercedes-Benz Unimog type), to purpose-built units which are high clearance four-wheel drive and four-wheel steer. Most of these units have hydrostatic drive. The operator sits in a forward control cabin followed by the engine, spray tank and rear-mounted boom. These units can be fitted with wide flotation or narrow tyres, depending on the ground conditions. High clearance is required as many cereal and rape seed crops are sprayed near maturity for insect control.

Farm chemical regulation

The British farm has to abide by strict chemical regulations which are set down by the Ministry of Agriculture. Some of these include:

1) Every farm must have a licenced operator who does all the farm spraying. This person must attend courses and pass an examination before he can obtain a licence. He must also attend regular 'refresher' courses.

2) The operator must wear correct protective clothing while handling chemicals.

3) Every farm must have an approved lockable chemical storage shed. This shed must have a closed surround to collect any chemical spillage in the event of an accidental spill or container leak, so that no chemical can enter runoff water or streams.

4) Record of all chemicals used on the farm must be maintained.

Farmers feel that a number of these regulations infringe on their rights, but with education most have come to accept the laws and see the benefit of having them.

8. SUMMARY

Whether we like it or not, the United Kingdom and Western European countries are working together under the umbrella of the EEC. It appears that not even all British farmers realize the strength and influence wheeled upon them.

The EEC is now a big influence over farming within the EC, having controls on agricultural production levels, commodity pricing, production incentives (subsidies), and a whole range of environmental questions and problems. This has direct impact on all the farmer does. We, as Australians, must be aware of what is happening overseas, as many of the laws and practices, especially those dealing with environmental questions, will gradually be forced upon us. It is up to us to take the initiative and formulate our own practices to suit our environmental situation. This is now starting to happen within Australia. As farmers, we need to heed the strengthening power of the green vote. People are becoming more aware of their surrounding environment and with increasing numbers, can sway government policy. We must endeavour to work together with the green supporters as the farmers are already environmentally aware, and a common cause will be achieved.

Agriculture continues to have changes put upon it and the farmer must keep abreast of this change, if he is to survive in this competitive world. In Australia the farmer needs to aim at having a balance in his crop and pasture-stock production by utilizing crop rotation, combined with legumes and animal wastes where possible. The lesson to be learned from intense farming, as in Britain, is that farming and urban areas can live together, if designed and managed correctly. U.K. Farmer Organizations are importantly looked upon to ensure that a strong lobby is maintained at all Government levels. The Women's Farming Union is also playing an important role in Britain by improving public awareness of the high quality of food produced by farmers.

It is obvious, after looking at agriculture overseas, that Government support and planning of agriculture in Australia is sadly lacking. If the Australian community wishes to continue to have a high standard of living, encouragement of agriculture must be high on the list. Failure to recognize this, will see few young men wanting to continue with agriculture and the wealth traditionally derived from the land will drastically drop away. Deregulation of labour and industry has to be across the board not only in selective industries if Australia's economy is to improve. High interest rates and tariff protection must also be addressed.

CONCLUSION

The Nufffield Farming Scholarship has been a key to obtaining a close look into overseas farming and gaining a better understanding of the British and European farming community.

The material I have written in this report is my view of agriculture as observed from my travels overseas, and I hope that my observations will be of interest and some benefit to the reader.

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