



Australian Nuffield Farming Scholars Association

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Report of the Study Tour to the United Kingdom and Europe

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1991 Tasmanian Nuffield Farming Scholar

**Subject: New Directions in Farming with
Particular Attention to Soil Treatment.**

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1. Introduction

After farming on my own for some twenty years, I found the prospect of applying for a Nuffield Scholarship a very exciting one. The family farm had traditionally been grazing and cereal growing in the Northern Midlands of Tasmania. I could see potential for the growing of irrigated crops some years ago, and tentatively diversified. Using the light basically sandy soils to grow crops such as canning peas, onions, potatoes, poppies and a range of others, Kathy and I worked our way into a position where cropping became a major part of our income, in what was not traditionally a cropping area.

It was with this background that we became vitally interested in learning techniques which would help us to sustain, and indeed improve production levels, with particular interest in the structure and general health of soils.

The Australian Nuffield Farming Scholars Association has given us no better opportunity than one could hope for, to pursue our interest and we are very grateful.

Sustainability is two edged. One has to be able to maintain economic viability to be able to maintain environmental balance. This of course can also be said in reverse.

My studies therefore were quite broadly based, and this report contains only a broad overview of the general topic.

2. Agriculture in the Economic Community

The stated objective of Agricultural Policy in the UK Agriculture Act 1947, was that of promoting and maintaining "a stable and efficient Agricultural industry capable of providing such part of the nation's food and other agricultural produce as in the national interest it is desirable to produce in the UK, and of producing it at minimum prices consistently, with proper remuneration and living conditions for farmers and workers in agriculture, and an adequate return on capital invested in the industry."

This masterly piece of drafting, with its obvious delight in the unspecified and untested, and its inner contradictions proved itself capable of a wide range of interpretations. However, it bears a close resemblance to both the terminology and the content of the stated objective of the Common Agricultural Policy as given in Article 39 of the Treaty of Rome 1957:

"The Common Agricultural Policy shall have as it's objectives -

● To increase Agricultural Productivity by promoting technical progress and by ensuring

the rational development of Agricultural production, and the optimum utilization of the factors of production, particularly labour. Thus to ensure a fair standard of living for the Agricultural Community, particularly by increasing the individual earnings of persons engaged in Agriculture.

● To stabilize markets.

● To ensure the availability of supplies.

● To ensure that supplies reach consumers at reasonable prices."

While the Treaty is elsewhere also concerned with the harmonious development of trade and protection of the environment, these items do not feature among this most discussed list of Agricultural objectives.

Agricultural support costs in the Economic Community continue to rise, despite the Commissions attempts at control. The budget rose steadily from \$15.4 billion in 1980 to over \$50 billion in 1991. But the vast sums spent on support have not stopped the decline in the number of the Communities farmers. Neither has it prevented incomes from falling for those left in the Industry. In the UK, for example, farming income is forecast to have fallen 217 million pounds in 1990 to 1296 million pounds. When allowance is made for inflation, real farm income has fallen 22 per cent in 1990. This reduction is part of a continuing decline, falling about 9 per cent a year, leaving real farm income at its lowest level in over 40 years.

The Common Agricultural Policy has created a farming structure geared towards over production of several major commodities. Supply is exceeding demand to such an extent that stocks of some produce are mounting rapidly, in particular cereals, beef and milk. Surplus production for cereals is currently 15 to 20 percent above market requirements.

The size of the problem has been masked over the past few years, by big exports of surpluses. The Economic Community is currently the second largest cereal exporter in the world, largely through the granting of restitutions, which subsidize every tonne of exported wheat. From October 1990 to May 1991, restitutions for UK wheat exports varied between A\$176 per tonne, and A\$202 per tonne.

There is no easy solution to the problems facing the Common Agricultural Policy. Already the Economic Community forecasts an expenditure for 1991 of A\$.77 billion above budget.

Most people agree spending must be controlled. Unless the Common Agricultural Policy is reformed, funds will eventually fail to meet existing commitments.

It is unrealistic for farmers to think nothing will happen. Common Agricultural Policy reform means either reducing the amount of support paid on production, or reducing the volume of production that remains fully supported - or a combination of the two.

2-1 General Agreement on Tariffs and Trade

The current round of General Agreement on Tariffs and Trade talks aimed at freeing International Trade, is increasing the pressure on the Common Agricultural Policy. One of the main reasons for failure to reach agreement, is the United States of America's objection to the Economic Community using the export restitutions to dump surplus production on World Markets.

The basis of the Commission's proposals is a 30 percent cut in support for the period 1986 - 1996. To this has been added a series of statements by the Council of Ministers, which comment on, clarify, or modify the original text.

In relation to imports the Commission has now stated that an essential element of its offer is that there should be "An appropriately adjusted article X1 of General Agreement on Tariffs and Trade". This is a crucial addition to the Economic Community position on which the UK's National Farmers Union has been pressing the Commission. Without article X1 (which allows a quota on imports where there are domestic restrictions on production), it might have been impossible to operate supply management Policies, because of the risk they would be undermined by imports.

In response to French pressure, the Economic Community offer on tariffication has been significantly modified. In the original proposal there was an offer to reduce support and protection by 30 percent. However, there appeared to be a risk that the cut in import protection would in practice reduce domestic support by more than 30 percent.

In the revised offer the Economic Community no longer speaks of cutting tariffs by 30 percent, but "by an amount which reflects the incidence of the supply management reduction".

The essentials of the United States offer to General Agreement on Tariffs and Trade are a 75 percent reduction in Internal Support, 75 percent cut in protection, and a 90 percent cut in export subsidies, over a ten year period, starting in 1991.

The Cairns Group offer is very similar to that of the United States, a 75 percent reduction in support and protection, and a 90 percent cut in

export subsidies, over 10 years. The major difference is, that the Cairns Group classify deficiency payments as an export subsidy, not as internal aid.

Canada, even though a member of the Cairns Group, has submitted a different offer. 50 percent cut in some internal support measures, a reduction in import protection according to a formula with a maximum cut of 38 percent and the elimination of all export subsidies, over 10 years.

Japan, a country with a very high level of farm support, has proposed a cut in domestic support of 30 percent over the period 1986 - 1996. Also a reduction in tariffs according to a request/offer negotiation procedure.

The proposals by all these participating powers, show a reflection of the level of support currently available domestically.

2-2 Single Market

In 1987, the Community took a major evolutionary step, when the twelve heads of State signed the Single European Act. The Act mandates the removal of internal market barriers to the movement of goods, services, labour and capital, by January 1, 1993. While the world is supportive of greater integration between member states, and views the internal market exercise as generally positive, close attention must be paid to ensure continued access to the Economic Community Market, for world agricultural products. The movement towards a "fortress Europe" is a danger.

2-3 The State of Agriculture in the UK

In this time of World recession, three to five of the driest years on record globally, and in Australia's case the collapse of the wool industry, agriculture in the UK is going through its toughest time for decades. Since the "heady" years prior to joining the Economic Community in 1973, and up to 1978, there has been a steady decline.

As I mentioned earlier, inflation adjusted farm income fell by 22 percent in 1990, to the lowest level for 40 years.

Input prices rose by five percent with machinery costs, (including fuel), rising especially strongly. Despite continued shedding of labour - another 3,600 full time hired workers in 1990 - the industry's labour bill rose by 7.7 percent. High interest rates through 1990, led to a 13 percent increase in the industry's interest bill, now more than one billion pounds.

Cereal yields increased, but the planted areas fell, leaving total harvest and receipts virtually unchanged. Oilseed rape receipts were up 23 percent, due entirely to an increased area, while revenue from other arable crops rose modestly. The value of beef production fell by 7 percent. Poultry meat shows a significant increase. Overall the value of the industry's gross output rose by 3.3 percent.

Over the five years to 1989, farmers' annual investment in fixed capital fell by 40 percent. Estimates suggest a further fall of about 15 percent occurred in 1990. The slump in investment is further evidence of the gravity of agriculture's economic crisis. It is of special concern as 1992 and the Single Market approaches.

2-4 Environment and Conservation

I have chosen to write a paragraph or two on this particularly sensitive topic, as there was a common and genuine interest in this area, shown by all nine of the participating Scholars.

Environmental problems in Europe, are appearing simply because of sheer weight of population, and the subsequent demands. In Australia, we have vastly different environmental problems, related more to the fragility of our soils and flora, brought about by unforgiving climatic conditions, not by the demands of a large population.

For example, the increased loss of nitrate from farm land to water, is an unforeseen result of the drive for increased production. It is popularly thought that the problem is caused by run-off from fertilizers. It has also been shown that most nitrate in water comes from humus in the soil. It will require major changes to farming to reduce nitrate losses to low enough levels to meet the Economic Community's standard of 50 P.P.M.. In the UK, not only are farmers supported at production level, but also in the form of grants to safeguard the environment against pollution. Assistance is available to farmers in "nitrate sensitive areas", to change farming methods in an effort to combat high water nitrates. There are "environmentally sensitive areas", which offer contracts to farmers to farm in ways helpful to the environment. Farmers are released from the commercial pressures of more efficient and cheaper production, so that they can give greater priority to the environment.

In Australia, farmers are coming under unprecedented financial pressure. Pressure groups are popping up everywhere watching the environment. Governments are claiming to be under too much pressure to offer great assistance, and so farmers are expected to be

"guardians of the environment", at their own expense.

Whilst in the UK, I spent most of my time studying farming techniques in the sandy soils of Suffolk, Norfolk, Lincolnshire and Nottinghamshire.

These soils have basically the same limitations as the light soils around the northern midlands in Tasmania. Wind erosion, water erosion, structural problems and water holding abilities.

Most of these areas have varying amounts of stone occurring through the profile, and in virtually all root cropping situations, stone or clod separators are used prior to planting. The main emphasis is on reducing damage to the crop at harvest, particularly in the case of potatoes.

2-5 Potato Growing

In the UK there is a large variety of markets each producing different final products. There can be up to half a dozen different varieties, which will suit any one market. Potatoes can be grown for -

- (a) early ware - sometimes started under polythene for an early start in frosty areas. Usually harvested with green tops and yielding as low as four tonnes per acre. Can bring three hundred to four hundred pounds per tonne.
- (b) Salad potatoes - small, round, low yields
- (c) early skin set reds - fresh market
- (d) low fat crispers
- (e) early crispers
- (f) Starch potatoes - high in dry matter, require little irrigation, produced for powder for mars.
- (g) chip potatoes
- (h) pre-pack - supermarkets
- (i) late scrapers
- (j) Seed - mainly grown in Scotland, certification done by the Government run Advisory Service.

As mentioned, most ground is clod or stone separated for skin quality, and to allow minimal manning of harvesters when potatoes are dug into "on farm" storage, and graded out of the storage at time of sale.

Heavier ground is formed up with a bed former, and over wintered. This is the start of a controlled wheeling system from which all subsequent passes are done, which would normally be power harrows, followed by the separator, then planting and finally power moulders. One operator in Norfolk, with a later model machine, was able to achieve all this with one pass.

Only round seed is used as the climatic condition cause breakdown in cut seed.

Very few farmers use fertilizer at planting. This is normally spread prior, and at similar rates as in Tasmania, according to soil test results.

Most seed is chitted prior to planting with the use of fluorescent lights, to harden the sprouts. New planters are being developed to lessen the damage to sprouts at planting.

Some crops are grown in 68 inch beads, to reduce the surface area exposed to the atmosphere, and therefore reduce moisture loss. Most harvesters are twin row, and in large operations two rows are pre-lifted, to allow four to be harvested at once.

Trial results from Terrington Research Farm, in Norfolk, have shown increased yields of "saleable product" from increasing mould spacings from 32 inches to 36 inches. Increased spacings also reduce the time needed to re-mould and harvest.

Dam dykers are used on hilly light ground to reduce water erosion in the compacted wheel marks of the planting tractor.

Deep ripping, (up to 18 inches), between moulds with winged points is successfully done to increase root penetration and improve moisture retention. This also removes any pan caused by "smearing", done by the lifting blade on the separator, in the root zone.

This is only a brief summary of some of the techniques practised in the UK, which I felt were of relevance.

2-6 Onions

The main difference in onion growing is a recent and widespread trend towards growing spring onions from sets, in preference to seed. Prior to the use of sets, seed was precision planted, but the technology for set planting has not kept up with its widespread acceptance. Sets are all produced in Holland and typical sizes are eight to fourteen millimetres and fourteen to twenty one millimetres.

Many onions are "over-wintered", or early winter planted. These are the first harvested and have to be marketed before spring planted onions reach maturity, as they will not keep as well. Bolting can be a problem with winter grown onion.

Most onions are sold through quite large co-operatives. The same co-operatives which import southern hemisphere onions from Australia, New Zealand and Chile; onions which when in large enough quantities, replace locally grown product on supermarket shelves, at twice the price.

2-7 Supermarkets

The European public is paranoid about the risks involved in eating foodstuffs, which may contain contaminants, harmful to their health. This was most evident when egg sales fell away dramatically because of an ill informed comment made by a Parliamentarian, regarding Salmonella in eggs. Similarly beef sales plummeted with the B.S.E. or "mad cow" scare. Currently "Blue Ear" disease in pigs, which was found in England in June 1991, causing abortion in sows amongst other things, pig farmers are worried about possible public reaction.

Supermarkets now have their own laboratories where tests are done for such things as chemical residues etc., in the produce they offer for sale. The supermarkets are ever powerful in the marketing system. They control what the consumer buys, by having complete control over what she sees.

In "Public Risk Perception", (W.K. Hock, Penne St. U. University PK., P.A.) the author says "One of the major misconceptions in contemporary society, is the widespread belief that our food supply is unsafe. Public perception of risk is quite different from scientific assessment of risk. Scientists see microbial contamination as the key issue, (100 - 10,000 times greater risk than from pesticide residues); consumers are most concerned about effects of synthetic pesticides and fertilizers, in the food they buy. Consumers equate synthetic with harmful, and natural with safe or good, yet ignore the fact that 99.9% of all pesticides humans consume, are naturally occurring. Americans eat about 1.5 grams of natural pesticides per person per day - about 10,000 times more than synthetic pesticides. Few plant toxins have been tested for carcinogenicity, but half those tested, are rodent carcinogens. Contrary to public perception, environmental pollution account for two per cent of all cancers versus seventy five per cent from smoking, diet and personal lifestyle choices."

2-8 Organic Farming

The Soils Association run an inspection scheme on standards, which may be used in the growth of organic food. Land has to go through a two year conservation period, in which no inorganic sprays or fertilizers can be used. The produce from this two year period is not recognized as organically grown.

Organic farming is not market driven. Five percent of food consumed in the UK, is organically grown, and recently one large supermarket chain withdrew completely from the sale of such products. Another announced it was reducing shelf space.

Organically grown onions have to be planted in modules, (very expensively) to facilitate hand weeding, which by mid growth stage had been done five times. Each module has four seedlings so the plants grow in clumps hindering natural growth patterns. Last year's crop had yielded four tonnes per acre compared to a "normal" yield, of around twenty tonnes per acre. Price received was four hundred pounds per tonne, or three times the average market price of one hundred and thirty pounds per tonne, for conventionally grown onions.

Wheat yields were down from three and half tonnes per acre to one and half tonnes per acre, with the one hundred pounds per tonne premium bringing the price received up to two hundred and thirty pounds per tonne.

There is a very strong movement in the UK, and Europe, towards Integrated Crop Production (ICP), which looks more towards lessening the use of pesticides and fertilizers, by looking more for suitable varieties, biological control of pests and other such aspects of crop husbandry, to maintain yield and quality from lower levels of inputs. Careful consideration of rotations, varieties, husbandry techniques, fertilizers and crop protection products, and their interaction, is the key to ICP. It is basically a trend towards "Green" agriculture with the main aim being to care for the environment, while still maintaining profits.

2-9 Outdoor Pigs

Having been involved in outdoor pig farming, during my first 10 years in agriculture, I was very interested to see the latest developments in outdoor pigs in the UK. For obvious reasons, this is concentrated mainly on light well drained soils.

An outdoor unit averages around three hundred sows, which is run by one man with help once a week to wean. The sows are run at about seven per acre, and live in small moveable huts called arcs. The better units are "radial flow" with wedge shaped paddocks. The farrowing paddocks have between six to twelve arcs each. All feeding and watering is done from a road surrounding the unit, onto which every paddock makes contact. All paddocks also meet at a central "working" pen. This is used for cutting out, vaccinating, tagging, nose ringing or simply moving to another wedge.

All fencing is electric, and these can be driven over at the right angle with four wheel motorbike and trailer.

Feed is tossed on the ground twice a day, in the form of fist size, pre-prepared cobs.

The entire unit is moved to a different site every year, which can take up to two weeks to complete.

Very few farmers breed their own replacements, but buy gilts from the Pig Improvement Company, an organization which specializes in breeding high performance hybrid pigs. Sows, bred for outdoor farming are hardier than others, and have slight skin pigmentation to cope with sun burning.

Sows still require up to 1.4 tonnes of feed per pig per year, as compared to an average figure of one tonne per pig per year, indoors.

2-10 Extensification

There is a very definite trend in the UK towards funds allocated for Research and Development to be directed to more towards work of "public good", than the traditional near market work. This has meant a swing towards work involving the environment, and conservation measures rather than continued increase in production levels. The word used to describe this trend is extensification, and the types of things being looked at currently are:

- (a) low cost drainage - ways of increasing mole channel life and reliability of mole drainage in marginal areas
- (b) organic farming - concentrating on sustainable production of beef and vegetables
- (c) reducing fungicide and herbicide inputs for cereals - minimizing fungicide resistance, reducing gross margin damage to cereals by using too much herbicide
- (d) non chemical weed control in organically grown cereals - weed thresholds rotations. Seeding rates, varieties and within crop cultivations.
- (e) improving pesticide applications - spray drift, localized herbicide application
- (f) fluid driven rotary atomizer for controlled drop application of herbicides
- (g) water management for agriculture and nature conservation
- (h) lower input farming and the environment - conservation tillage, no tillage and a variety of crop rotations
- (i) the effect of wheel compaction on soil management and cultivation practice
- (j) the establishment of crops in the presence of straw residue
- (k) the tillage efficiency of secondary cultivation mechanisms with particular reference to cost and energy savings

(l) farm scale aeration of pig slurry for odour control

(m) sludge or slurry application rate control and monitoring.

These projects form the basis of a world movement towards "green" policies.

3 Soils

Wind Erosion; This can be quite a problem in the light sandy soils and also the black peat soils in the fens of Lincolnshire and Norfolk. Straw and animal waste incorporation are practices which are widespread, but mainly to assist with soil health and the increased ability of soil to transfer nutrients through better levels of organic matter. Leaving cereal straw residues on top of the fallow is a practice receiving publicity in Nottinghamshire, where farmers are battling to establish Sugar Beet in sandy areas. This practice however, requires modified planting equipment to deal with the trash.

Gleadthorpe Research Center in Notts, have developed a system of mould board ploughing with fairly high soil moisture levels, towing a furrow press to compact the top inch or so. The surface of the fallow then "caps" or "crusts" with time and drying sugar beet is planted into this fallow at fourteen inch spacings, with emphasis on minimal soil disturbance. The undisturbed area between the rows of sugar beet remain hard and very effectively hold together in windy conditions.

In the fens, one family has developed, and now builds, a machine which will unroll round bales of cereal straw, and plant it between the rows of seedling onions or sugar beet. It is a relatively expensive operation, but also very effective.

A more common practice is inter-row planting of cereals, (mainly barley). This is done in onions crops and the cereal is planted two weeks before the onions, and then sprayed out at a later stage. The dying barley still offers protection for some time after spraying.

The spreading of poultry waste in wood shavings, thinly, after seeding is a cheap but not always effective measure taken.

A very expensive, but successful, method I saw in Norfolk was spraying Poly Vinyl acetate. Fifteen gallons per acre of glue with one hundred and fifty gallons per acre water was sprayed onto moist soil at cost of sixty pounds per acre. In this case a small susceptible area on the windward side of a field, which otherwise would not blow, had been treated. The thin skin of glue will be effective for up to six weeks, and does not inhibit crop emergence.

Soil mixing was the original practice to curb wind erosion. This meant carting in heavier soil to mix with light soils and is no longer an economic proposition.

3-1 Organic Matter

In the UK, no green manure crops are grown for incorporation into arable ground. The only introduction of organic matter to the soil is through spreading of animal waste either as slurry in a gathering medium, such as straw with animal bedding, or wood shavings with poultry. This is done on a large scale, and in sandy soils where very heavy applications take place, the nutrient holding ability of the soil has been increased markedly.

As economic pressure is increasing on UK farmers, the interest in soil "Feeding" is decreasing. In the peat fens, organic matter usage to grow crops continually, is causing three quarter subsidence per year. The farmers attitudes seem to be "farm it while we can". It is predicted that this may only be for another twenty years, in some areas. Some of the fens are down to clay already, which has meant more drainage and reverting to the basic crops of wheat and oilseed rape from high return brassica and root vegetable crops.

The levels of phosphorus and potassium in soils are generally held at much higher indices, than in Australia, and nearly all artificial fertilizers are spread prior to seeding. Some are even applied up to six months before the main requirement. Soil testing is done annually and whatever is required to keep the indices between three and four, is applied.

3-2 Drainage

In the UK and Wales, sixty percent of arable soils are clay based. A separate sixty percent require drainage for reliable arable production. Of the drained soils, thirty seven per cent require a secondary treatment involving either mole draining or sub solid cultivation.

Very little new drainage works are now carried out. Since joining the economic community, a seventy percent subsidy for drainage has been phased out. Many contractors have left the industry.

In heavy clay soils drains are up to two chains apart, with mole drains two yards apart. Recent studies of leg slot and shatter cracks, from mole draining have shown that three to five years is the effective life of a mole drain in good conditions.

The timing of a mole draining operation is critical to ensure longer life of the drain.

Subsoil cultivation is very popular, but little spade work is done to see how necessary it is. It is referred to by some as "recreational tillage". Sub soiling is more disruptive to backfill material than mole draining, thus reducing the overall effective life of the pipe drain.

Researchers are investigating moled main systems, in a search for low cost drainage. Moled main systems use cheap mole drains as collectors as opposed to the now commonly used, but expensive, clay or plastic pipe backfilled with gravel. A critical area in the success of this system is the hydraulic connection between the laterals and the collector.

3-3 Compaction and Structure

As compaction problems can be related to soils with a high moisture content, at the time of compacting and structural problems can be caused by working ground when it is either too moist, or too dry, these problems are not as relevant in the UK as they are in Australia.

Australia with its extremes of wet and dry seasons, is totally different to the all year round rainfall distribution of the UK.

This combined with the five below average rainfall years in the UK, has made UK farmers complacent with regard to soil damage from careless cultivation or harvesting operations.

Research however, is very keenly pursuing two traffic systems for cropping, which revolves around using a twelve metre wide gantry. Now commercially built, the unit is powered by 100 horse power diesel driving a hydraulic motor at each wheel. Capable of all operations except ploughing, the gantry will close up to normal tractor width for moving from field to field, simply by travelling at right angles to its normal working position.

Results have shown that the heavier the soil type the more profitable it is to reduce wheel compaction.

Even slightly reducing tyre/soil contact pressures has shown substantial benefits. This has led to fitting "terra" or wide tyres to the front of conventional tractor, as it is the front tyres that cause most compaction problems.

At harvest, most crops are removed from fields in six to eight tonne farm trailers, on wide low pressure tyres. Rarely do large articulated trucks drive on arable fields.

3-4 Straw Incorporation

From January 1992, stubble burning will be totally banned in the UK. The reason for this is air pollution prevention rather than soil

degradation. In fact, soil experts are adamant that stubble burning is not harmful to the soil.

The ban on straw burning has however, led to renewed interest in straw incorporation, if only in some cases as a means of dealing with the residue.

All grain harvesters in the UK are fitted with straw choppers, which cut and spread the straw. Straw is chopped to four inches or less, which makes the job of pulling tyned implements through straw mixed with soil, much easier when clearance can be a problem with long straw.

A problem inherent with straw incorporation and seeding before the straw has decomposed sufficiently, is seed straw contact allowing toxins produced by the straw to render the seed useless. This problem occurs more with grass seed than other seeds.

There is a notable interest in the use of stripper fronts for harvesters, which only remove the grain heads, and therefore leave a much longer stubble. (The main attraction to a stripper front is its ability to harvest grain at up to three times the speed of a conventional front.) Research has been carried out with regard to long stubbles, and the conclusions are :-

- (a) for mould board ploughing - roll the stubble in the direction of ploughing
- (b) roll at right angles, prior to discing
- (c) heavy tyred implements prior to discing help to bury straw
- (d) heavy rolling after cultivation help to speed up breakdown by improving soil/straw contact.

Twisted shank cultivators and square ploughs, have been tried but both have their limitations. Most interest in the UK and Europe revolves around disposal of straw. There is little benefit in their relatively moist and reliable climate, in keeping crop residues on the surface to assist with moisture conservation.

I found theories on the initial nitrogen requirement to break down incorporated straw, and then the release of nitrogen when the straw breaks down, most interesting.

3-5 Irrigation

Irrigation schedules are not popularly monitored in the UK. Farmers are inclined to "under-water" in the expectation of heavy rain falling soon afterwards. They are fearful of crops becoming too wet.

Neutron Probes and tensionmeters are no longer popular. The Advisory Service (A.D.A.S.),

provide a service called Irriguide, which gives all information necessary for those interested. Evapotranspiration figures are accurate to a square kilometre. With the co-operation of the meteorological bodies, the service is close to actually predicting evapotranspiration.

Virtually all broad acre irrigation is done with "hard hose" (reel) irrigators. Soft hose irrigators are no longer used. There are several center pivots and linear moves, but for their large initial cost and their main advantage being accuracy, they have not caught on.

Boom type irrigators with the advantages of low pressure and accuracy in wind, are now being connected to hard hose machines instead of rain guns, and although increasing the capital cost considerably, have obvious appeal.

4 Conclusion

Australian farmers rate very high by world standards in their level of efficiency. In terms of efficient use of capital and utilization of labour, there is a great deal Australian farmers could teach the farmers of Europe and the United Kingdom.

Europeans also have the enormous advantage of a large population base, on their doorstep, providing markets of unbelievable proportion.

The one thing Australia has to offer, and produces in leading quality and quantity is wool. The importance of wool to Australia, and its position in world markets, must be recognized by the public and governments alike.

The fragile nature of the environment in Australia, and the large scale of problems caused by agriculture, such as salinity and river pollution, will have to be addressed with increased input of public funding and technical assistance. The success of the Land Care initiative, Whole Farm Planning Groups and Greening Australia, shows that farmers in Australia are more aware of farming within environmental limitations than ever before.

Nowhere in the developed countries in the world, would a government allow such an important sector of the economy, in terms of export earnings and employment, suffer to the extent that Australian producers of major commodities of wheat and wool, are suffering right now.

When I saw the levels of support given to agriculture in Europe, North America, etc., I was shocked. But on returning to Australia to see and hear of the financial, and subsequent mental and family problems, caused by the wool crisis, the trade war between the Economic

Community and United States of America, the recession we had to have and the drought, all at the same time, I wonder whether there is not a happy medium to be found. Not production based subsidies and its inherent dangers, and not total neglect of an industry. There will not be a "level playing field" for world markets; at least not at our level. Australia must address the major issues of tariff protection, and further reductions in interest rates.

This report is a brief account of a most interesting and stimulating five month tour. It contains only a small portion of the information brought home. I hope it is of interest to readers.

Robert Henry

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