AUSTRALIAN NUFFIELD FARMING SCHOLARS ASSOCIATION

REPORT OF VISIT TO THE UNITED KINGDOM

By Christopher Hindaugh
(Victoria 1982 Award)

A study of Wheat growing in the United Kingdom and Crop Establishment using the technique of direct drilling. Field Sprayers and developments in suspensions for sprayer booms. A short description of the Common Agricultural Policy of the European Economic Community.

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Crop establishment using the technique of Direct Drilling. Field Sprayers and Developments in Suspensions for Sprayer Booms. A short description of the Common Agricultural Policy of the European Economic Community.

ACKNOWLEDGEMENTS

I would like to thank the Australian Nuffield Farming Scholars Association, and its Chairman Mr. George Wilson, for making it possible for me to study in the U.K. in 1982. Without them, this annual endeavour to promote a better understanding between farmers here and in the U.K. and to increase practical farming knowledge would not be possible.

Also, I am indebted to a number of sponsors, particularly Qantas Airways and the State Bank of Victoria for their generous support. The assistance of the Milk Marketing Board in supplying a car whilst in the U.K. and the support from the members of the National Farmers Union and the Agricultural Development and Advisory Service (particularly Mr. J.M. Ewing) was of the greatest value.

I very much appreciate the help and guidance of the Nuffield Farming Scholarship Trust in the U.K., its Chairman Mr. John Cyster, and its Director Captain John Stewart. I would also like to thank Capt. Stewart and Mrs. Stewart for their hospitality and kindness shown to me during my stay.

WHEAT GROWING IN THE UNITED KINGDOM

There has been a marked movement away from livestock production in the arable areas of the United Kingdom and because of better financial returns cereals are now grown wherever possible.

Those rotations of wheat, roots, barley and pasture which were yesterday thought sacrosanct have now given way to the continuous growing of wheat, or a wheat - oilseed rape, rotation. Previous systems of rotation were necessary to break disease and weed cycles and provide an input of nitrogen from legumes. But today control is provided by fungicides and herbicides and bagged nitrogen fertilisers provide the needed fertility.

Ten years ago twice as much area was sown in spring as in autumn. Today that is reversed. This is because greater yield is achieved by autumn sowing, but it leads to an excessive workload in late summer and early autumn. Harvesting is not generally finished until mid-August. Stubbles must then be burnt, and the new crop established by the end of October if possible.

Although winter cereals require higher inputs of chemicals and fertiliser, yield increases are of the order of one tonne per hectare, compared to a spring-sown crop. Average wheat yields in the U.K. have increased from 2.4 t/ha in 1947 to 5.6 t/ha today. Agronomists had calculated that the maximum theoretical yield of wheat from a hectare would be 11.5 tonnes, but yields of 13.5 t/ha have been achieved and the scientists have had to rethink their original estimates.

This increase in yield over the years has been a remarkable achievement of British agriculture, and plant breeders at the National Institute of Agricultural Botany maintain that new varieties of cereals available to farmers are responsible for average yield increases of 3½% per year. These new varieties achieve their higher yields by making greater use of higher inputs of nitrogen and fungicides. Even so, plant breeders place a lot of emphasis on disease resistance, and a new variety will not be passed unless its disease-resistance score is above an acceptable level. Breeders are looking for resistance that is not reliant on one

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gene alone but on a number of genes, thereby giving background or residual resistance to disease.

Plant variety rights form a very important part of the plant breeding industry, and plant breeding is carried out by both large and small commercial firms as well as institutes such as the Plant Breeding Institute, Cambridge.

U.K. cereal growing relies on high inputs to achieve its high outputs and the projected break-even yield for the 1982 harvest was 6.2 t/ha for a high input regime, and 5.3 t/ha if using a medium level of inputs. Recent Agricultural Development and Advisory Service trials and farmer trials have shown that high levels of fertiliser and crop protection inputs are economically justified at the high level of yield, but rising fixed costs are highlighted as being the major factor in reducing real incomes. Fixed costs such as rent, labour and machinery costs have risen faster than inflation, and assuming that E.E.C. cereal price increases will remain below the level of inflation, then farmers will be heavily relying on new higher yielding varieties from the plant breeders to maintain their profitability in the years ahead.

DIRECT DRILLING

The history of farming has shown a steady development in the methods of cultivation, and in the last few years the amount of horse-power and the range of cultivation equipment available to the farmer have become immense. Cultivation problems which were difficult to surmount can now be overcome because of the sophistication of the implements and the size of the tractors. It is perhaps ironical that the appearance of the high horse-power tractors has coincided with the movement towards simplified cultivation methods, even to direct drilling the crop with no soil disturbance before the seeding operation.

It used to be considered essential to plough the land as an initial step in controlling weeds, burying crop residues and preparing a seed bed that would give every opportunity to the successful germination and establishment of the crop. But experimental work of the 1930's showed that the most important function of ploughing was weed control. The discovery by I.C.I. in the 1950's of paraquat, a plant dessicant, meant that weed control was now possible by chemical means. Paraquat becomes inactive on contact with the soil and therefore the newly sown crop is not affected by any residue from the previous spraying operation. Experimental work with paraquat had progressed in the early 1960's to the stage where field trials were being conducted, but success was delayed until I.C.I. had developed a suitable drill with which to sow the crop. This drill, the triple-disc drill, is now established as the major, but by no means universal, implement for direct drilling.

"How much soil disturbance is really necessary?" is the question which is being examined by Letcombe Laboratory, Oxfordshire. It has been estimated that the annual cost of cultivating the 3.7 million hectares of land on which cereals are grown in England and Wales is about $187,000,000. Nearly half this area is composed of clay soils and these soils are suited to autumn-sown crops which will yield well if there is adequate drainage. Problems that arise in these areas are caused by particularly wet or particularly dry autumns which make seedbed preparation extremely difficult.

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Extra time and energy is required to overcome these problems and sowing dates are delayed, which lowers the yield potential. Therefore there is much interest in a system of crop establishment which does not require the inversion of the soil by ploughing. Experimental work carried out between 1969 and 1978 jointly by Letcombe Laboratory and the Weed Research Organisation showed that yields of winter wheat and spring barley were similar on well structured and easily managed soils, where the crops were either established after ploughing or were directed drilled. Soil types for these experiments were chosen to represent nationally important soil types for cereal growing where simplified cultivation systems would offer the major advantage of improved timeliness of sowing. These studies cover long term effects of ploughing and direct drilling on the properties of the soil and on the roots and shoots of the crop. During the course of the experiments the average yields from the different methods of cultivation have been similar, but differences have arisen in some years. More nitrogen is needed for a direct drilled crop during wet autumns to achieve the heaviest yields, but in dry years direct drilled crops have given the heaviest yields because more water was available at depth.

Because of difficulties in crop establishment by direct drilling on silty loams, the crops of the first two years were poorer than those established after ploughing. In subsequent years similar yields were achieved irrespective of the means of establishment because of the improved tilth brought about by the use of the triple-disc drill increasing the amount or organic matter near the surface of the soil. Over the years there has been a change in soil structure resulting from the use of a particular establishment method, especially on clay soils. After direct drilling, a compacted surface layer is formed, but despite this, the number of large pores remain adequate and because their continuity has not been broken down by the passage of the plough, drainage and root development have been improved. Impeded root growth has been observed in ploughed ground due to the development of a pan at plough depth caused by the passage of the plough and the furrow wheel.

In many cereal crop experiments, yields have been measured and soils classified into three categories in relation to their suitability for direct drilling.

CATEGORY 1: Chalk and limestone soils and well-drained loans. These soils will give yields of direct drilled autumn and spring sown cereal crops equal to or greater than yields of crops that are conventionally established.

CATEGORY 2: Calcareous clays and other clays which have been drained. With good management direct drilled autumn crops will yield as well as conventional autumn crops, but direct drilled spring crops will tend to be inferior.

CATEGORY 3: Non-self-structuring soils, sandy soils and silts, and wet alluvial soils and clays. These soils carry a substantial risk that direct drilled crops, especially spring sown, will yield less than conventionally established crops.

Land which has been direct drilled is often more resistant to compaction and so it is possible to travel over it with field sprayers and fertiliser spreaders sooner after wet weather than with ploughed land. Clay soils are easily deformed when wet and with many passes of heavy vehicles there is a possibility of cumulative damage. Combine harvesters and tractors pulling trailers loaded with grain may be the principal causes of this effect, but without cultivation there is no opportunity to counteract these effects. It therefore may be necessary to reintroduce the plough or subsoiler every so often if a compacted layer is formed.

Between 1973 and 1981 the Agricultural Development and Advisory Service (ADAS) conducted 106 comparison trials in the Eastern Region using many soil types and comparing ploughing, direct drilling and shallow cultivation. A limited summary appears below.

Number of sites where highest yield given by:

	Ploughing or Deep Cultivation	Shallow Cultivation	Direct Drilling
Winter Wheat	19 (6.0)	21 (6.0)	32 (6.2)
Winter Barley			
light soils	10 (5.6)	3 (5.4)	1 (5.3)
heavier soils	2 (6.2)	3 (6.1)	2 (6.0)
Spring cereals	7 (4.2)	5 (4.1)	1 (3.8)

(mean yield in brackets in tonnes/hectare).

It is obvious that direct drilling gave the highest yields for autumn sown wheat. With barley these results were poorer on both light and heavy soils. But it may be economically justifiable to accept a lower yield if by direct drilling the crop more is sown at the optimum time because of the higher speed of the operation.

Weed control can be by either cultivation, break crops or herbicides, but much closer attention must be given to weed control if the crop is to be direct drilled. Weed control in early sown continuous winter cereal crops is almost completely dependent on herbicides. More than one application of herbicides may be necessary because weeds may germinate from autumn to spring. With the earlier sowing dates of direct drilled crops, weeds can become well established in the autumn, and may require spraying the herbicides when soil conditions are too wet to avoid compaction with existing equipment. Low ground pressure vehicles and helicopters have been adapted to avoid these problems. Good control of broad-leafed weeds is now possible with available herbicides but grass weeds can present problems. Couch grass can be controlled with glyphosate, which has now been cleared for use a few days before harvest, and has given encouraging results. Control of sterile brome is still difficult in direct drilled crops whereas conventional ploughing buries the seed deeply and is therefore not such a problem.

The removal of straw is necessary if the crop is to be direct drilled and this is best done by burning. Excess straw left on the ground can block the drill coulters, and toxins released when the straw is broken down can inhibit seed germination. Burning the straw can also destroy weed seeds and volunteer cereal seeds and so help in controlling weed populations.

Straw burning has become a contentious issue in the U.K. and there is increasing pressure from the environmentalists and townspeople to have the practice banned. This is obviously not because summer fires may get away but because of pollution. England is so closely settled, with a village every few miles, and the straw windrows are so dense, that smut on newly washed clothes is a real problem. Dense smoke blowing across busy roads is a bad traffic hazard, and there is generally trouble from conservationists if hedge-rows are burnt. So many hedgerows have been pulled out already to allow for more efficient use of machinery that there is a strong movement to preserve the ones which remain.

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There have been some new technilogical developments in the machinery used for direct drilling. Most drills which have come on the market recently are designed for the popular 12 metre tramline system, and feature automatic tramline equipment as standard. Tramlining is the technique of marking out the crop, usually when sowing, so that all subsequent fertiliser and spraying operations are accurately matched by following the tramlines left as a guide in the crop. The system works by automatically shutting off seed and fertilizer to two sowing tubes every three, four or five bouts. Modern drills are usually offered with transport wheels at one end so that the drill can be towed end-on down the narrow lanes and through farm gateways. The choice of drill under-carriage is increasing, with a triple-disc drill still the most popular. But tyne drills are attracting increased attention.

A new development from the Scottish Institute of Agricultural Engineering is the A-Blade coulter using a much wider point on the tyne and blowing the seed to both sides of the point. Fertiliser is placed in the middle of the two rows of seed and a press roller is used to firm the soil after the points have passed and to give accurate depth control. Ahead of the A-Blade coulter runs a vertical disc to cut through trash and form a vertical slit in the soil. To enhance the freedom from blockages, four finger-tyne springs are mounted on the leading disc to intermittently wipe the coulter leg and keep it free from trash.

Because direct drilling involves seeding into unploughed ground the wear rate of the soil-engaging components is increased. The National Institute of Agricultural Engineering at Silsoe has examined alternative to hard facing. The relationship between the hardness of the soil particles and the hardness of the point is of prime importance. Steel is only 40% as hard as the quartz component of soil. Hard facing is about 60% as hard but some ceramics can be three times as hard as the soil component. A ceramic of aluminium-oxide was found to be the most cost effective and can be used on agricultural implements providing it is given support to compensate for its inherent brittleness.
The literature from the institute suggests that it takes half a day to a day to change 50 points, and this gives you some idea of how short the days are in England.

Experimental work on direct drilling is continuing in the U.K., and it is unlikely that any one system of cultivation will be universally appropriate. Ultimately, each farmer will find a cultivation system to suit the soil type of his own farm, his own cropping programme and the resources and machinery he has available.

FIELD SPRAYERS

From being a farming operation which only took up a few weeks of the farming calendar, crop spraying has moved in only a few years to become one of the major inputs of an arable enterprise. The chemical companies supplying the farmers have continued their research and development but fewer new chemicals are reaching the marketplace because of the high cost of research and the very high safety standards that must be met. Reformulations and mixtures of existing chemicals have made up a part of the new products released in recent times.

But on the machinery side, there has been much research and development work and many new concepts and models have been recently introduced. Field sprayers used to be small and simple pieces of farm equipment, and relative to the farm tractor, cheap to buy. Today, field sprayers have increased in sophistication and complexity, and the more elaborate are now more expensive than the farm tractor. Instead of applying less than Forty Pounds worth of chemicals per hectare each year, farm sprayers are now applying chemicals costing in excess of One Hundred Pounds per hectare each year. Not only has the cost of the chemicals increased but now much greater use is made of chemicals in the search for ever higher yields.

In 1974 Hinel said: "crop spraying is the most inefficient industrial process ever practised". But today developments are taking place in almost every possible aspect of sprayer design and construction.

For many years the traditional hydraulic boom sprayer was the universal method of applying chemicals to target weeds, insects and fungi, and applying growth regulators. But the hydraulic boom sprayer has a number of limitations. Firstly, large quantities of water have to be on hand, and carted across sometimes boggy fields to carry the chemicals. Applications rates of up to 200 litres are used and much time wasted in refilling the boom spray tank. Another limitation is that the hydraulic nozzles put out spray droplets of varying size, in fact covering a very large spectrum. 90% of the fluid is contained in only 8% of the droplets. These are obviously the largest and in fact are so large that they tend to roll off the target leaf and are lost on the ground. Conversely the smallest droplets are too small and will drift away or evaporate before they reach the target. Each pest problem will require droplets of a particular size and the hydraulic sprayer has been successful because within its spectrum of droplet sizes the correct one will be found, and satisfactory results are obtained due to vast overdoses of chemicals.

Today there is much greater pressure to ensure that the minimum of chemical is applied to ensure a satisfactory result, and only to the target, with no chemical drifting away to contaminate non-target areas.

Therefore the search is on for reliable devices that produce droplets of a controlled and even size that are the optimum for the job in hand. Recent research into nozzle design has improved the performance of the hydraulic sprayer and made it more possible to achieve a desired droplet size matched with a given volume of fluid per hectare.

A totally different approach to applying chemicals is the spinning disc types known as controlled droplet applicators or rotary atomisers. These use the centrifical force of a spinning cup to form the droplets when the fluid is forced up a series of grooves cut in the inner wall of the cup. When the fluid reaches the top it is flung out in a circular pattern. Droplet size is varied in two ways. Spinning the disc faster decreases the droplet size as does reducing the flow of fluid to the spinning cup. A variation of this concept is the Micronair rotary atomiser which forms droplets of an even size from a rotating gauze and uses a fan to create a air blast to disperse the spray droplets, and drive them into the crop to provide underleaf coverage. Thc fan overcomes the limitations of the rotary disc atomisers which have difficulty in directing chemical to target weeds at the base of a crop.

Much research work has been carried out on electrostatic spraying as this is seen to be an important and very worthwhile step on the road to greater efficiency and protection for the environment. The principle of using electrostatic charges to improve the spraying of substances on to surfaces is not new and has been widely used in industry for paint-spraying, in printing processes and for air filtration.

Agriculture tends to place difficult stresses on components and only recently have reliable and cheap power packs become available that will produce the very high voltages that are necessary for electrostatic spraying. Electrostatic spraying involves charging the spray droplets with, say, a negative charge. This will result in a mutual repulsion of the droplets and the cloud of droplets will increase in size. This mutual repulsion will prevent the aggregation of droplets that tends to happen to some extend in controlled droplet applicators and so will ensure that the droplets remain at the optimum size. As the cloud of spray droplets approaches the crop the negatively charged droplets induce free positive charges to the plant surfaces, and free negative charges are repelled to earth. The droplets are then attracted to all surfaces of the plant by the induced positive charges. An electrical field is set up between the plant and the charged spray cloud which is continuously replenished by the electrostatic generator built into the spray nozzle. The field is strong enough to overcome the forces of air resistance and gravity normally acting on a droplet and they are drawn around and upwards to cover all surfaces of the plant. Charges spray droplets are attracted straight to the crop and there is not the tendency for them to drift downwind. The following drift characteristics are relative to droplet size in a 4.8kph wind when settling from 300mm:

3 micron droplet drifts 1.2km
10 micron droplet drifts 160 m
15 micron droplet drifts 60 m
100 micron droplet drifts 1.5 m
500 micron droplet drifts .3 m

So it is important to eliminate this drift by charging the spray droplets.

Experimental work is continuing at various research establishments in the U.K. to perfect electrostatic sprayers, and different approaches are being taken to the method of producing and charging the spray droplets.

At the Agricultural Research Council experimental station at Rothamstead, the APE 80, a charged rotary atomiser is undergoing trials. A commercially available spinning disc atomiser has been adapted and an ionizing electrode is fitted to charge the droplets as they leave the spinning disc. Field trials have shown that the apparatus gave a greater spray deposition on both upper and lower leaves than uncharged rotary and hydraulic atomisers and that systemic materials can be applied electrostatically in open canopy crops at considerably decreased dosages without significant loss of biological effect.

At the Weed Research Organisation at Begbroke Hill, researchers are working on a device which combines a pulsed microjet with induction charging to give a generator of dispersed, charged, uniform droplets suitable for spraying pesticides. Uniform droplets are formed when a pressure wave formed magnetically is applied to the fluid before it passes through holes in a spinnerette and a charge is induced on the droplets by a pair of charge plates.

The most radical approach to the production and charging of droplets is being developed at I.C.I. The I.C.I. Electrodyne sprayer is unique in that it avoids the complexity and maintenance requirements of spinning discs by having no moving parts. An electric field is used to atomise the liquid, to charge each droplet and then to propel the spray. Liquid emerging from the gap between concentric electrodes is subject to an intensely divergent electrical field. The field both forms the droplets with a polarity the same as that of the nozzle electrode, and repulsion propells the droplets away from the nozzle at high velocity. The droplet size can be varied between 40 microns and 200 microns by adjustment of the applied voltage, and typical rates are from .5 to 2.5 litres per hectare.
One of the attractions of having no moving parts is that the Electrodyne can be offered as a ready-to-use spray pack for hand spraying. The chemicals supplied to the user in an integral assembly of disposable plastic nozzle and container. When plugged into a suitable Electrodyne spray tool, this sealed package will immediately operate as an electrodynamic sprayer. No nozzle maintenance or adjustment is necessary, and the integral pack is immediately ready for use without filling or mixing of chemicals. Thus there is no toxic hazard due to spillage during mixing or filling. One limitation of the Electrodyne is that it is only suitable for oil-based pesticides and to be commercially acceptable an adequate range of herbicides, insecticides and fungicides will need to be reformulated using an oil base. Thus I.C.I. must reach agreement with the holders of the patents of the popular farm chemicals and induce those companies to reformulate them in oil. If that problem is successfully overcome the Electrodyne has great potential to change the present techniques of pecticide application.

SPRAYER BOOM SUSPENSIONS

Research by H.J. Nation, N.I.A.E., Silsoe, starting in 1963 showed that commercial sprayers under ideal conditions with new nozzles, smooth surfaces and skilled operators, gave a variation of spray deposit from $\frac{1}{4}$ to $2\frac{1}{2}$ times the target rate. Under field conditions, farm sprayers were found to give a much larger range of deposit, in the order of 1/10 to 5 times the intended rate. It was found that errant movements of the sprayer boom were the major cause of this variation. The research showed that variations in height of the ends of the boom will result in uneven pesticide deposit because of incorrect overlap of adjacent nozzles, and a boom whipping back and forth causes the nozzles to move at varying speeds over the ground.

A computer program was designed to interpret these movements and determine the effect that those movements would have on spray distribution. It was shown that although the contruction of the boom was important, the major factor in errant boom movement was the method of attaching the boom to the sprayer, and that it was essential to isolate the boom from the rolling and yawing motion of the sprayer if variations in spray rate were to be minimised.

Engineers at N.I.A.E. have developed a mounting using a horizontal pivot to isolate the boom from the rolling motion of the sprayer and a vertical pivot to isolate the yawing motion. Pairs of springs restrain the boom in each plane, and viscous dampers suppress the oscillation of the boom. This arrangement, in effect a gimbal mounting, reduces the movement of the boom tips by 50% in the vertical plance and by 60% in the horizontal plane compared to a fixed boom.

Most commercial developments in the U.K. have not embraced this concept and although many attemps to isolare the boom from rolling motion of the sprayer, the effects of sprayer yaw are mainly ignored. The methods used to isolate the boom are generally one of three types:- first, some form of vertical springing; second, simple pendulum suspension; and thirdly, those where the boom is suspended on links.

The vertical spring support gives good control of shock loads but no control over the yawing or rolling motion of the sprayer. Damping by frictional or viscous means is necessary to control random oscillations.

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Tip movements of a boom supported by a simple pendulum will not differ greatly from one that is rigidly mounted unless the boom is long. This is because the rotational inertia of the boom about its centre pivot is high in relation to its weight. A fundamental disadvantage of a pendulum boom suspension is that it will tend to remain horizontal when the sprayer is crossing a slope, allowing one boom tip to travel closer to the ground than the other (Fig. 1). This can be controlled by using an hydrolic ram to displace the pendulum suspension point to either side or by controlling the boom with weights moved by cables and pulleys so that the centre of gravity of the boom can be moved to one side or the other.

Twin linkage boom mountings with either the links converging toward the ground or the reverse do not isolate the boom from the yawing motions of the sprayer, but if the links converge towards the ground, ie. in a V-formation (Fig. 2), the boom will tend to lie parallel with the ground, even when the sprayer is traversing a slope.

A further development of the twin link system (for which a patent has been applied) is the N.I.A.E. twin link suspension using ball joints at each end of the links to allow felxibility of the boom in the rolling mode, and isolation of the yawing motion. Two further links also with universal joints at each end restrain the centre of the boom approximately in its correct position (Fig. 3). The advantage of this sustem is its simplicity, with the links providing isolation in both planes without recourse to springs or dampers, gravity supplying the only restoring force.

As mentioned previously, the contruction of the boom is also important to minimise random movement of the boom tipe. It was found that a boom of cantilever contruction and stiff in both planes gave the best results. Further, if the boom is parallel along its length in both vertical and horizontal cross sections it will have a high polar moment of inertia which aids stability without being exceptionally heavy.

To summarise, a boom sprayer should have:-

(i) a boom which is of rigid construction with stiff joints and with a positive break back mechanism;

(ii) a boom which is not supported or suspended by chains, ropes or cables;

(iii) a boom which is mounted in a manner to isolate it from the rapid rolling and yawing motion of the sprayer.

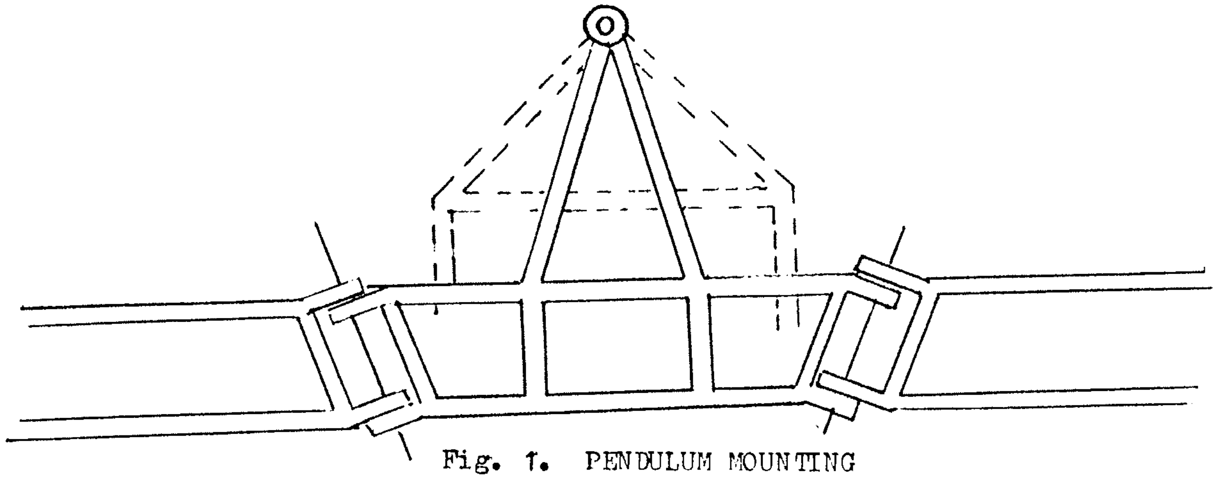

Fig. 1. PENDULUM MOUNTING

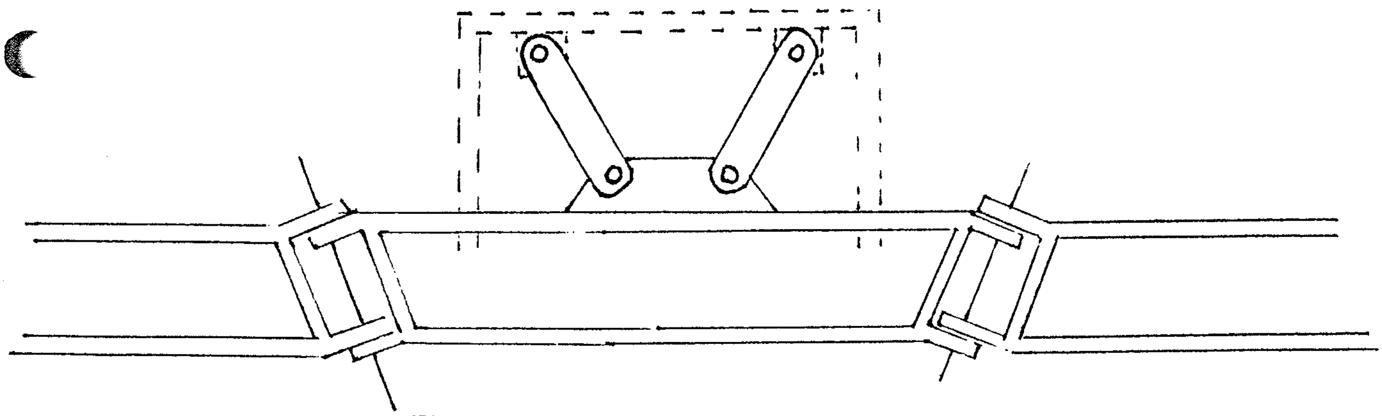

Fig. 2. TWIN LINKS IN V-FORMATION

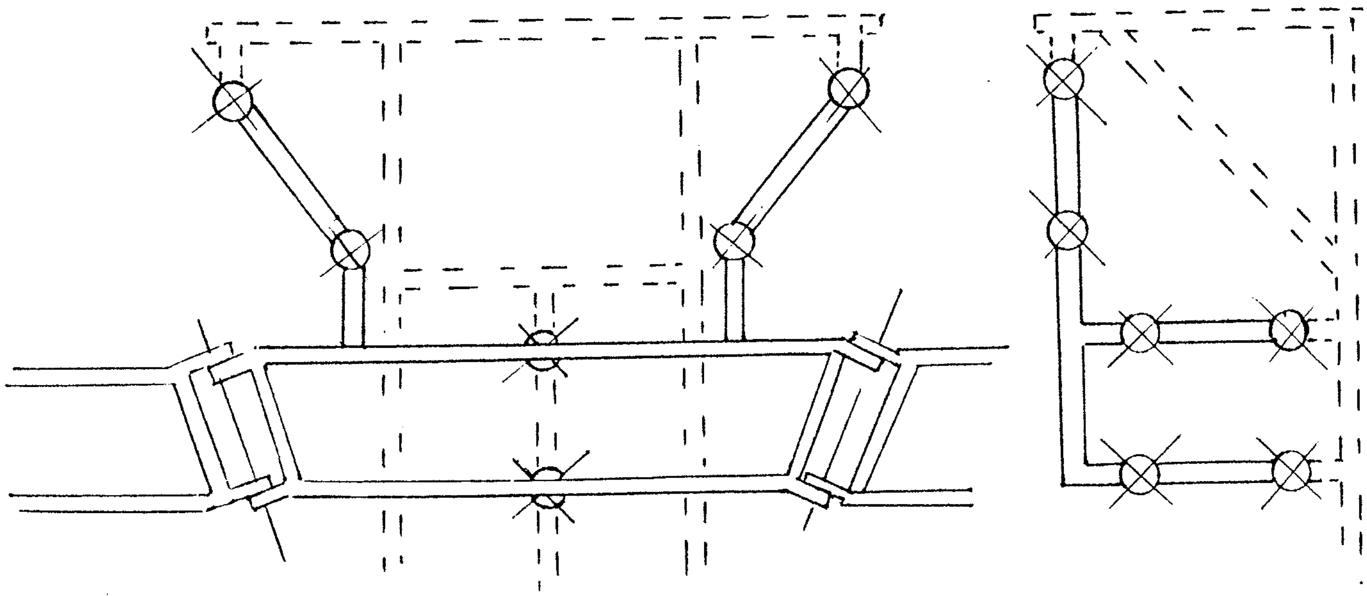

Fig. 3. N.I.A.E. UNIVERSAL TWIN LINK MOUNTING END VIEW

The advantages of a stable boom are that it can be carried closer to the ground without fear of the tips hitting the ground and the forward speed can be increased.

It has been shown that spray drift is lessened the lower the boom is carried and penetration of the spray into the corp is improved. Of course, with the boom carried closer to the target, the nozzle spacing will have to be altered or nozzles with a wider angle chosen, to maintain the necessary overlap of spray pattern.

SWATH MATCHING

Swath matching is more difficult with wider booms and various devices are available to improve the accuracy of the operator. Foam or dye markers are readily available, which leave blobs of foam or deposits of dye at the edge of the swath. A mirror system has been developed at N.I.A.E. to enable the operator to more closely follow the line of foam blobs. This uses a mirror attached to each end of the boom and two mirrors mounted on the tractor bonnet, and by using the mirrors in the manner of a periscope the driver can see down the line of foam blobs. The future may see closed circuit television used with cameras at each end of the boom and the monitor screen in front of the driver.

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THE COMMON AGRICULTURAL POLICY

of the

EUROPEAN ECONOMIC COMMUNITY

Since its formation in 1958, the E.E.C. has grown from a grouping of six member states to one encompassing ten states, with Spain and Portugal in the process of applying for membership.

Agriculture has always been seen to have a major role to play in the development of a common policy aimed at increasing the living standards of not only those who work in that industry, but all who live in the community. These basic aspirations have been enshrined in Article 39 of the Treaty of Rome:

1. "The objectives of the common agricultural policy shall be: a) to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour;
   b) thus to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture;
   c) to stabilise markets;
   d) to ensure the availability of supplies
   e) to ensure that supplies reach consumers at reasonable prices.

2. In working out the common agricultural policy and the special methods for its application, account shall be taken of:

a) the particular nature of agricultural activity, which results from the social structure of agriculture and from structural and natural disparities between the various agricultural regions;

b) the need to effect the appropriate adjustments be degrees;

c) the fact that in member states agriculture constitutes a sector closely linked with the economy as a whole".

These are obviously admirable objectives but they contain basic conflicts and weaknesses which are not resolved when the methods are put into practice. The main methods used in the C.A.P. are:

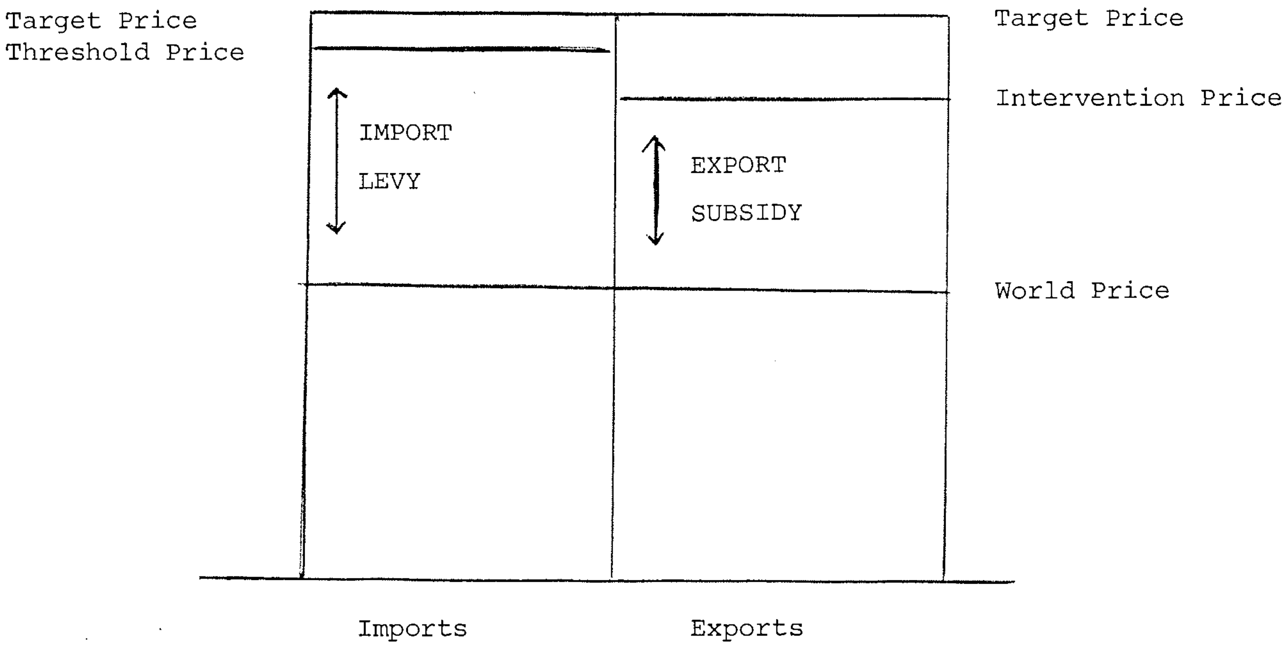
1. The common customs tariff which protects E.E.C. farmers from imports from third countries.

2. Intervention buying, whereby produce is bought by government agencies in times of surplus.

3. Provision of grants to assist changes in farm size and to provide for farm improvements, agricultural education, farmer pensions and improved marketing.

The tariff or levy price and the intervention price are set at a level to ensure that the smaller farmer will achieve a profitable return. Very little account is taken of supply and demand, and of course those farmers with larger areas, notably in the U.K. and France, can ise their economy of scale to become highly profitable and further increase their output. The C.A.P. can be seen to be a social services policy ensuring a certain standard of living for the farming community and ensuring that deprived areas, such as hill regions, are not depopulated.

T. Heidhues of the Trade Policy Research Centre, London, describes prices under the C.A.P. in this way:-



The above describes the essential features of a typical CAP support system for a product (as applies, for example, to cereals) in a member state. The community sets a target price for the commodity in question which is the price which the policy-maker intended as a guide to producers and as a reference point for the operation of the policy. It has usually been set at a level which is above the price at which supplies are available from world markets. One mechanism for supporting internal market prices at, or near, the target level is a levy on imports, which varies so as to ensure that imported produce cannot undermine the domestic market. This levy is calculated by setting a threshold price, a little below the target price to reflect the cost of transport from port to internal market centres, and charging importers the difference between this threshold price and the world market price.

The import levy will on its own, keep internal market prices near the target level as long as the country is less than self-sufficient in the commodity. If, however, domestic supply is more than adequate to meet internal demand, it is necessary to prevent some of these supplies from being sold on the domestic market. For this reason an intervention price is set, somewhat below the target price. If the internal market price should now fall to the intervention level, official intervention agencies will buy all produce offered to them at the intervention price and sell it to traders who export it to the markets with the aid of a subsidy (or restitution), approximately equal to the difference between the intervention price and the world price.

Similar subsidies are paid to private traders who directly export the product. Analytically, there is little difference between direct exports and the disposal of intervention surpluses, since each will attract approximately the same subsidy and sell abroad at the world price.

Although the C.A.P. has channelled large resources into agriculture in the last 20 years, the number of people engaged in the industry has been halved, with 8 - 10 million people leaving farming in the E.E.C. During that time, from being major importers of wheat, meat, feed grains and cheese, the E.E.C. is now self sufficient in those commodities except feed grains, and is now a large exporter of wheat, beef, cheese, butter, non-fat dry milk, poultry meat and sugar.

All this has not been without great cost, and today there is much debate about the growing surpluses and the price of storing those surpluses and disposing of them on to world markets. Of the countries which make up the E.E.C. only Denmark and the U.K. had a tradition of cheap food, but today food prices right across the community are remarkably high and generating increasing consumer anger and resistance. The consumer is becoming aware that he is paying twice for the C.A.P. - first with high food prices, and again with taxes to support intervention buying and the disposal of surpluses on to world markets. One can question the ethics of charging one's citizens 10% more than world prices for home-grown food; 30% above world prices must be deplorable, and to charge them 50% is surely outrageous.

The reform of the CAP is a problem taxing the minds of E.E.C. commissioners and commentators and the Economic and Social Committee of the E.E.C. recently released an Opinion on this subject. It drew attention to the declaration of the 1958 Stresa conference that emphasised the importance of the balance between supply and demand and the importance of a prices policy that avoided overproduction. But reform of the C.A.P. will be a lengthy and difficult process, and those member states with large numbers of the poorer farmers will be unwilling to alter any of the procedures in a way that will disadvantage those farmers.

The C.A.P. has had a major effect on the trading patterns of other world agricultural exporters. Those that traditionally exported to the E.E.C. have found themselves locked out of that market, and during that time the E.E.C. has come to be a major competitor when disposing of her surpluses. The C.A.P. has therefore become a major irritant in the E.E.C's trade relations with traditional and efficient agricultural exporters.

Some figures will illustrate the loss of trade from Australia to the E.E.C:

E.E.C. share of Total Value of Australian Exports

	1958-59	1965-66	1979-80
Beef and Veal	57%	31%	2%
Dairy Products & Eggs	69%	58%	Neg.
Sugar	43%	47%	Nil
Wheat	70%	12%	Nil

But it is the disposal of surpluses at heavily subsidised prices on to markets which have been developed by Australia that is of the greatest concern. Because there is no adequate mechanism to divert resources away from sectors of European agriculture that are producing surpluses, these surpluses can be expected to increase. In the next five years cost efficient exporting countries can expect to face a crisis situation as Europe tries to establish long-term supply arrangements to dispose of its surpluses. This is what the Community chooses to call "a more active export policy" which can only further depress agricultural prices and further displace efficient agricultural exports from world trade. Is it any wonder that the U.S.A. has threatened a trade war using the disposal of a limited range of agricultural products to try to force the E.E.C. to liberalise its trading policy in a way that is not at variance with the trade-creating objectives of the Treaty of Rome, and not contrary to the open trading system embodied in the General Agreement on Tariffs and Trade.

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