Chapter 3

1940 to 1970: war and the major post-war expansion

World War II, its effects and demands, and the post-war recovery dominated the first decade of this period. Advising on and managing the shortages of labour, fertilisers, machinery, materials and staff in order to produce the food needed for the armed forces and the community was the challenge of the war years. A new wave of development using trace elements to develop millions of hectares of previously uncleared light land dominated the second decade. Dealing with the demands related to the rapid expansion based on the use of trace elements, new machinery and high prices, was then the challenge of the 1950s and 1960s. Major increases in departmental professional staff and capacity, the development of the South Perth headquarters, expansion of the research and extension capacity and improvement in country office space were the main features of the later years. The Ord River development had started and the dam was virtually completed by late 1970.

The war years

War was declared between Germany and Britain on 3 September 1939. It continued until April 1945—more than 5½ years later. Australia joined England and declared war on Germany. On 7 December 1941 Japan attacked Pearl Harbour and brought the United States into the war on the Allied side and Australia was automatically at war with Japan until August 1945.

By September 1941 Germany had control of all of continental Europe and Scandinavia except for Sweden, Spain and European Russia. The loss of Western Europe meant that supplies of primary products to the United Kingdom were totally severed.

Australia’s major agricultural industries depended on exporting much of their production, so the whole export segment was threatened by the loss of shipping space because of enemy activity and the need to transport munitions.

The Australian Government moved rapidly to market the main exports of primary products. By June 1940 it had introduced legislation to establish boards with extensive powers to acquire and dispose of products such as meat, wheat, barley, apples, pears, and eggs and/or made arrangements for the disposal of the export products.

The British Government:

- Contracted to take 240 000 tons of meat at 1938 prices, which were above those immediately before the war. The government was confident the remainder would find a ready market.

- Contracted to buy the whole of the wool clip for the period of the war at a price of 13.4 pence (11.2c) per pound. In addition, the Australian Government would receive 50 per cent of any profits from sale of wool outside the UK.

- Agreed to buy 200 000 tons of the previous season’s wheat held in store in WA. The government established the Australian Wheat Board to acquire all wheat delivered to sidings for the remainder of the war. At 30 June 1940 the Wheat Board paid $15.75 per tonne and more payments were expected.

- Contracted to buy almost 95 000 tons of butter annually, starting with 75 000 between September 1939 and 30 June 1940. They agreed to pay 90 per cent on shipment and 10 per cent within 28 days of arrival at an English port.
• Contracted for 13,000 tons of cheese on the same payment basis.

In addition, the Australian Government:
• Appointed a Barley Board with the same powers as the Wheat Board to acquire the barley crop.
• Acquired the apple and pear harvest at a price of 2 shillings per bushel for apples and 3 shillings per bushel for pears. A further shilling per bushel was to be paid on delivery of a specified quality.

The entry of Japan into the war in December 1941, and its capture of Indochina, Singapore, Indonesia and Burma resulted in Australia becoming a major base for the eventual fight-back across the Pacific. As a result, a large number of American troops were based in Australia. Australian troops, who had traditionally fought overseas, were called home.

By June 1940 the shipping shortage was impinging on WA's export industries, particularly those which needed refrigerated space. The Australian Government's purchase of all unshipped wheat and fruit allowed those industries to stay in business. The UK contracts were renewed for 1940/41 at much the same price. The Australian Government also bought some grades of lamb, which allowed the market to continue to function.

By early 1942 Japan occupied much of South-East Asia and by mid-1942 the whole outlook for Australia's primary industries changed again.

Australia became a military base, with a great deal of food required by the armed forces. Conscription was imposed in 1942 and farm labour became very short. The position was so acute that 150 prisoners of war were used in April 1942 to dig the potato crop. A survey showed that between 25 and 50 per cent of permanent labour remained in the major industries but casual labour was virtually unavailable. The Commonwealth Government recognised this and manpowered all remaining permanent farm workers.

The casual labour situation was partly resolved by forming a women's land army and using Italian prisoners of war who were willing to work on farms. Women had a particular role in labour-intensive areas such as fruit picking and packing, vegetable production and tobacco picking. Examples of women virtually running broadacre farms on their own are also well documented.

A major concern was the availability of fertilisers. The Germans attacked Nauru in December 1940 and sank British Phosphate Commission ships. In 1942 the Japanese occupied the Nauru, Ocean and Christmas Islands. In 1940/41 the only phosphate rock available had come from Christmas Island. This met only 70 per cent of the State's needs. As a result the area sown to cereals in WA was reduced by 33 per cent. Farmers were advised in mid-1942 that phosphate supplies for 1942/43 would be only half of those available in 1939/40.

The Department of Agriculture was required to administer this rationing and the two fertiliser manufacturers were fully cooperative. Petroleum and rubber supplies were also interrupted with the occupation of South-East Asia by Japan.

In 1942 only about 25 per cent of the normal sulphate of ammonia was available and that was reserved for commercial market gardeners. Wyndham abattoir had ceased operation after the winter of 1941 so the amount of blood and bone was reduced to about half of normal requirements. Again these supplies were only available to commercial market gardeners. The supply of meat meal was also reduced.

By 1942 the war was affecting the capacity of the Department of Agriculture to operate efficiently. Nine professional officers had joined the forces during 1941/42. In the farming areas there was a shortage of manpower, farm equipment, chemicals for pest control, stock foods and fertiliser. While a policy was introduced to declare agriculture a protected industry and to 'manpower' participants, shortages already existed. Wheat production had been
curtailed through acreage restriction, labour and fertiliser shortages. Only 1.5 million acres were sown for grain in 1942/43 compared with 3.4 million in 1938/39. The area cut for hay had been reduced along with other forms of fodder conservation. The area under orchards was also falling. Beef supplies from the north had been interrupted largely due to Japanese activity. Sheep numbers and wool production had increased. Pig production suffered in 1942 through an outbreak of swine fever in metropolitan piggeries, necessitating the slaughter of some 12,000 pigs. A major change in policy was to declare certain agricultural products on the same footing as munitions for access to scarce materials. The shortage of manpower created increased demand for farm machinery but manufacturers had been largely redirected to the war effort. The distribution of the limited supply was controlled.

The war in Europe ended in April 1945 and there was now an urgent need to plan for the future. The Under Secretary for Agriculture was concerned that the UK, which was Western Australia’s biggest export market, and the USA, which was a potential export competitor, had both developed high technology agriculture during the war. If Australia was to compete it needed to go down the same path. The capacity of the UK to buy would also be affected by its changed financial situation.

The war ended in August 1945, the wholesale unwinding of wartime arrangements had to begin. In the short-term there was a demand from Europe for some products but it was recognised that markets would progressively become more competitive.

By the end of 1948 Australia was adjusting to peacetime. The damage to European agriculture which helped the demand for agricultural products was continuing and prices were high.

**Some post-war issues**

During 1946/47 the UK extended the price guarantees for agricultural products including wheat. On this basis it was considered that a policy of land development and increased production could be followed in WA.

A Royal Commission was appointed to recommend on the best method of marketing wheat in the event of the Australian Wheat Board collapsing. The commission recommended a State-controlled compulsory pool system. In the case of pears, apples and tobacco the government agreed to continue the acquisition schemes to the end of 1947. In WA it was decided to empower a State board to control the acreage planted to potatoes and to acquire and market the crop. It was expected that there would be a need to downsize the industry but the development of the Singapore market overcame this problem.

Two years after the war ended the supply of machinery had not improved. There was a particular problem with large tractors; few were produced in Australia and supplies had to come from the UK or the USA.

**Seasonal conditions**

The year 1940 was very dry throughout the agricultural areas. Early April rains in 1941 helped feed supplies and it was a good year. In the pastoral areas the long drought in the Gascoyne finally broke; 1942 was again a favourable year except for part of the Murchison. In cereal growing areas the
season was reasonably favourable early but a dry September and October affected late-sown crops. The 1943 season opened well but spring turned dry, which affected crop yields and pasture growth in the dairy districts. Some crops were affected by an outbreak of stem rust. Autumn rains in 1944 were light and feed was short but sufficient rain was received for grain yields to be reasonable and hay yields near normal level. The 1945 season started slowly but very heavy June rains interrupted cropping and caused damage to sown areas. The spring cut short despite the heavy winter rains, reducing grain yields and the quantity of hay conserved in the high rainfall districts. Autumn rains in 1946 were satisfactory and widespread. They were followed by heavy and widespread rains in June, giving an excellent outlook for both crops and pasture. In the agricultural areas the very wet winter of 1946 was followed by a dry spring and a dry summer. In 1947 autumn rains were adequate for cropping in the cereal areas and it was generally a favourable year. These satisfactory climate conditions continued through 1948.

The 1949 season completed a run of five very good years, with eastern districts being a little dry, but crops were helped by October rain. However, farm water supplies were difficult due to the light winter rains.

**Staff policy and administration**

The department had to adapt to the war. Initially there were a number of staff losses due to enlistment. In his report of 1939/40 the Under Secretary had commented on the work of the officers in the following terms: “The technical officers of the department continually contact the rural community by personal visits, correspondence, lectures, demonstrations and by articles in the Press and the Journal”. Capacity for this was greatly reduced during wartime.

By mid-1941 the continued enlistment of young officers created difficulties in providing a full suite of services to industry. In addition officers worked in areas seen as being of greatest importance which resulted in the cessation of some activities. The department had always been short of laboratory space and either could not carry out some work or had to use space made available by the University of WA.

In his June 1942 report the Under Secretary wrote: “The greater control of production during wartime has required the department to carry out many functions—particularly on behalf of the Commonwealth Government—other than the normal duties … officers have adapted themselves to their new and varied duties … a tribute is paid not only to the technical staff but to the administrative and clerical staff for the manner in which the increased work has been carried out under difficult circumstances”. By June 1942 Australia was firmly established as the major platform for the fight-back against Japan. Agriculture was recognised as an important 'munition' of war. This focus increased the demands on the department at a time when it was undermanned. Advice was sought on varied war-related issues including the suitability of soils for airfields, control of pests in army camps, and the dehydration and canning of fruit and vegetables. The department was also asked to undertake the inspection and supervision of all food manufacturers (other than meat and fish) providing food to the defence forces.
An officer chaired the State Nutrition Committee which monitored civilian nutrition problems occasioned by the war. Another officer was responsible for the organisation of District War Agricultural Committees and field officers acted as the chairmen of these committees. The approval to purchase certain equipment and materials including fertilisers was controlled by the department. The department was also represented on the Shipping Priorities Committee and provided advice to the Commonwealth and State Governments on a wide range of industry policy and technical issues.

To achieve an informed approach to the control and distribution of scarce equipment and materials the District War Agricultural Committees throughout Australia dealt at the local level. Their broad remit was to assist in the maintenance of agricultural production. They were all chaired by departmental officers and included the local manpower officer, a paid executive and four others, at least two of whom were farmers. Thirteen of these committees were formed throughout WA. Each committee covered selected statistical districts, which made information collection easier. They were required to focus on the areas of production needed for the war effort, which could mean restricting some industries and stimulating others. Their task was not to list the difficulties but to plan and solve the problems at a local level. Labour intensive operations such as fodder conservation, shearing, potato digging and fruit picking were special areas needing attention. Where machines were not installed milking was a challenge in dairying areas.

Labour needs were eventually met by a range of actions. In some cases the army agreed to release soldiers for short periods for specific purposes; in others Italian prisoners of war were willing to work on farms, and the Women’s Land Army made a big contribution. As a result the casual labour needs were largely managed successfully.

Fuel was a special problem. Apart from war needs, oil and rubber supplies, which were largely cut off by the Japanese advance, were not available. In some cases fuel shortages were overcome by the use of charcoal gas producers. These devices produced carbon monoxide by burning charcoal in an oxygen-deficient environment. They were made to fit onto tractors, trucks or cars. The carbon monoxide could be used in petrol or kerosene motors and made a major contribution to overcoming the fuel shortage.

The loss of rubber supplies was more difficult because of the lack of a cheap alternative. Later in the war artificial rubber became available in limited quantities. One of the committees’ tasks was to identify the most strategically important use of the very limited numbers of motor tyres. The allocation of special fuel supplies was another important role.

The change in attitude to agricultural production clearly spelt out its importance while the war lasted and for a number of years after. The Under Secretary made the point that while there was an immediate short-term need, the longer term must also be kept in focus. This statement carried with it a need for the department to increase capacity in its traditional roles of applied research and extension to deal with both current issues and long-term opportunities and needs. Looking forward, the WA Government appointed a Post War Works Committee early in 1942; the Under Secretary was a member.

The department formed an agricultural sub-committee to review suggestions from its various industry committees before they were fed into the major policy committee. This committee comprised the Under Secretary, Plant Nutrition officer, Chief Veterinarian and the Superintendents of Dairying and Horticulture. Departmental officers also gave extensive evidence to the Post War Reconstruction Commission when it visited WA in April 1943. In their evidence they pointed to areas which were available for development.

There was little change over the following year. It was a case of dealing with the
routine issues associated with the war. By June 1944 the focus was clearly on the post-war period and the challenges that would bring. Materials and equipment continued to be in short supply and had to be managed. Grain and other surpluses had been cleared, partly due to drought.

Additional fertiliser supplies were expected and plans were being made for significantly increased plantings of crop in 1945. The District War Agricultural Committees dealt with their important responsibilities in an efficient and professional manner. They were required to determine allocations of farm labour, allocate scarce materials such as motor tyres and galvanised iron among farmers, and allocate special fuel supplies. Advice was also important in allocation of machinery. The committees also promoted and organised the use of machinery pools where appropriate.

While the second half of 1944 had been very busy for the District War Agricultural Committees the end of the European war saw a slowing of their activities from early 1945. Nevertheless the shortage of materials continued and the local committees continued to carry out their responsibilities efficiently. Machinery allocation, which was managed by the committees, could be released for purchase or lease, or for groups (on a pool basis) or contractors depending on the committees’ assessment. Pools were established, and operated on smaller properties; 43 such pools were established between September 1944 and June 1945, largely in the South West. The Department of Agriculture also acted as an agent in any transactions where the Commonwealth retained ownership.

Concluding his 1944/45 report, the Under Secretary commented that while the demand for educational and advisory work continued at a high level, the department’s capacity to provide it was limited by trained staff and the pressure of wartime commitments, particularly among staff who were involved with the War Agricultural Committees.

The committees were disbanded in March 1946. It was considered that with some informal advice the situation could be managed by normal administrative means. After they were disbanded the central executive was retained for a time in head office. In the northern agricultural areas two executives were maintained to assist in the distribution of tractors, which were still in very short supply.

There was an increasing demand for extension services but manpower limited the extent to which these could be offered. Some services were offered through the production of educational films, which began with the end of the war, and the continued use of radio broadcasts and the Journal of Agriculture.

During 1946/47 the Under Secretary, GK Baron Hay, was seconded to the War Service Land Settlement Department as Chairman of the Land Settlement Board, and Alistair McKenzie Clarke became Acting Under Secretary. In the annual report McKenzie Clarke commented on the loss of senior staff due to lack of opportunity for advancement and the difficulty he anticipated in recruiting young staff due to the salary differences in later years between the Commonwealth and the State.

Other problems included difficulty in obtaining motor vehicles, and country housing. He commented that the department was less than holding its own in providing extension services desperately needed by new settlers and the agricultural industry, which was starting to develop again after almost two decades of stagnation.

In 1947 there were four country offices and three professional advisory officers stationed there. Gerry Throssell, who had returned in 1944 after serving with the AIF, was at Geraldton; Jim Marshall who would later lecture at Muresk and Fremantle Technical College, was at Beverley; and Eric Watson, who would later join CSIRO and manage Glen Lossie Research Station at Kojonup, managed offices at both Kellerberrin and Merredin.
During 1948/49 the title of the head of the Department of Agriculture was formally changed to Director of Agriculture. In his annual report the Director commented again on the problem of a lack of experienced technical staff to meet the needs for advisory and research work. He was taking an interest in the enrolments in Agriculture at the University of WA, but commented that these young graduates would take time to become experienced. He was also critical of the accommodation arrangements for the department.

In 1949/50 there was still a shortage of technical staff, and accommodation remained an issue at head office. Two new research stations were established, one at Bramley near Margaret River, and the other at Wokalup, south of Harvey.

The department proposed formation of a branch to provide research and advisory services to the pastoral industry. It was recognised that officers with experience in the pastoral areas were not available in Australia and young graduates would have to be trained.

While there was evidence of development starting to pick up, there was still a shortage of superphosphate, requiring rationing in 1949/50. Supplies of sulphur from the USA were uncertain. Iron pyrites from the Goldfields would be used to overcome this problem in due course but in the interim, experimental work to investigate alternatives to normal superphosphate was needed.

The focus was on improved quality through the decade.

The Commonwealth Dairy Products Marketing Board, which was established in 1939 to administer the arrangements with the UK, required the department to test all butter produced after October 1939 and potentially available for export. After that date, twice the amount of butter was tested as was tested under the State testing arrangements. It also involved testing butter produced in the summer; this had not been tested previously. The tests revealed problems with the quality of butter produced in the warmer months.

The first licence for margarine manufacture was issued during 1939/40.

In order to increase the amount available for export, butter rationing was introduced by the Federal Government in early June 1942. Previously, to increase butter production, the government had put an embargo on the sale of table cream, which absorbed an estimated 100 000 pounds of butterfat.

In order to improve returns to farmers the Federal Government decided to provide a subsidy to producers and allocated some $4 million for the purpose in 1942. In April 1943 this was increased to $11 million.

In 1943 there was a fall in the quality of butter. This reflected a drop in the quality requirements of the UK Government and reduced intensity of inspection and associated advisory work due to staff shortages. In 1943 the US army requested permission to be associated with the inspection of the whole-milk processing depots. Following these inspections they suggested changes in cleaning procedures, which improved the quality of the milk. In 1944 the US asked for cows in the Harvey area producing milk for their forces to be tested for TB.

In 1945/46 the quality of WA butter had fallen further. Despite staff problems 2500 visits were made to dairy farms in that year. The department began a bacteriological and chemical survey of all butter coming forward.
This was welcomed by manufacturers as it gave them guidance on how to clean and manage their factories. The increase in inspection and the laboratory input was rewarded and in 1946/47 the quality of the butter produced improved, with 20.2 per cent graded ‘choice’ compared to 5.3 per cent in the previous year.

The 1948/49 dairy production was marginally down on the record production of 1947/48 but 40 per cent more butter was graded choice than in the previous year.

During 1947/48 the Commonwealth Government announced that it would make £250 000 available for dairy industry improvement over five years. The allocation to WA was £16 125. Funds were used for initiatives in extension and research.

With more manpower available, inspections were increased and in 1949/50 field officers made 2252 inspections of farm premises. In 517 cases the premises were considered unsatisfactory, either structurally or through poor hygiene.

By the end of the decade the drift out of dairying had begun. By 1947/48 the number of dairy cows had fallen by 6400 since 1944, due to a move to beef or fat lambs in areas such as Kendenup and Mt Barker.

The pig industry

The decade proved challenging for the pig industry. There was an outbreak of swine fever in 1942, eradicated on a slaughter-out basis involving the loss of 12 000 pigs. The losses to individuals resulted in a Pig Industry Compensation Act being passed in late 1942. A levy was charged on all sales of pigs and paid into a fund. However, the big challenge came from the marketing arrangement due to changes in the British requirements. Supply of animals fluctuated, depending on the price of wheat, the availability of meat meal and the changes in British requirements.

Egg production fell initially but with the government seeking increased production after 1943, there was considerable expansion, notably in the wheatbelt. Surpluses were pulped after the Commonwealth installed an egg drying facility in WA. This facility was operated by the Department of Agriculture. In the year following the war the production of eggs was so much above home consumption that the government decided to introduce legislation to control marketing. A board with power to acquire all eggs and sell to available markets was created. In 1947/48 the industry bounced back, exporting to the UK. Significant amounts of poultry meat were also sent.

With assistance from the department, poultry farmers tested a new infra-red system of brooding for rearing chickens. During 1946/47 the department obtained land near Herdsman Lake for development of the Poultry Research Station. A Poultry Industry Trust Fund was also established.

Livestock

At Avondale Research Station the experimental feeding of grain supplements to ewes in the last four to six weeks of pregnancy continued to show improved survival of ewe and lamb.

The veterinarians were now involved in widespread testing in association with plant scientists to estimate the extent of mineral deficiencies. Surveys of copper status of farm animals showed that mild deficiency was widespread and that ‘stringy wool’ was a reliable indicator of copper deficiency in sheep. Samples from properties suspected of cobalt deficiency were also collected. Copper and cobalt deficient areas were mapped as they were identified.

An investigation began into dystokia among lambing ewes. Subsequent work showed that the subterranean clover strain in pastures contained an oestrogen precursor. By the end of the decade the infertility
problem in sheep appeared to have been managed in the field by increased cropping and a focus on balanced pastures.

A problem of malnutrition and sterility in cows at Manjimup was investigated, together with a serious infertility problem in cattle in the Margaret River area. This work showed a serious phosphorus deficiency late in the summer, leaving little time to recover before the demands of milk production commenced. It was found that milking cows need direct phosphorus supplementation to raise their blood phosphorus to ‘normal’ levels. The research station at Bramley was purchased as the focal point for future investigations of this problem.

It was shown that only ‘greenish’ coloured cereal hay had sufficient carotene to be a source of vitamin A. Based on the knowledge that animals at birth have no vitamin A in their livers there was an interest in the vitamin A content of the colostrum of ewes following a dry summer. It was found that the level was only one-quarter of the ‘normal’ level produced on green feed. The effect on lamb health was studied as it was known that in calves low levels can increase the degree of infections, but no effects of treatment were seen.

Despite improved methods of treatment, mastitis continued to cause serious losses to the dairy industry. Mastitis caused by Streptococcal bacteria had been successfully treated with penicillin but results with Staphylococcal-caused mastitis were not promising.

The testing of dairy cattle under the Cattle Compensation Act for tuberculosis identified 191 reactors. This was similar to previous years. In 1941/42 farmers were given help to free their herds from both TB and contagious abortion.

In 1946 the amended Milk Act replaced the Dairy Cattle Compensation Act and provided for the compulsory tuberculin testing for all cows owned by licensed dairymen. In 1947/48 tuberculin testing of all cattle providing whole milk began.

In 1947/48 a serious outbreak of laryngotracheitis occurred in poultry. As eradication was not possible, vaccination was adopted for affected areas.

**The wool industry**

The price of wool was very low at the beginning of the war and fixed at a low rate for the acquisition scheme which applied until June 1946. In 1946/47 wool was auctioned against a reserve price scheme and acquired by the Australian Wool Acquisition Committee if it did not reach the reserve price.

From June 1947 it was auctioned on the open market and realised prices well beyond those ruling in the first part of the decade. In 1946/47 the prices were double the prices received previously. In 1947/48 the price averaged about 10 shillings a pound (220c per kilogram) and in 1948/49 about 4 shillings and 6 pence a pound (99c per kilogram). It was again firm in 1949/50.

In the pastoral areas there were serious problems with blowflies in favourable years, causing considerable losses. Sheep were still being run extensively in the Kimberley.

In 1943/44 the number of fat lambs slaughtered was up on the previous two years, at 314 000. The figure for 1939 was 330 000. In 1948, 228 000 lambs were processed and in 1949, 142 000. These figures show the variability driven by season and wool price.

**The cropping industries**

The wheat industry through the decade was a product of the effects of seasonal variability and of the restrictions created by the war and post-war shortages.

The 1939 season proved to be favourable for the wheat industry, with good rains throughout. By contrast, 1940 was poor. It was only saved from almost total disaster by belated finishing rains that raised the average yield.
The area sown to wheat in 1942/43 was restricted to two-thirds of the four base years ending in 1940/41. In 1945, yields were reduced in the south by the wet winter. As controls were lifted and supplies improved the area of wheat sown in 1946 was 30 per cent greater than in the previous year. A wheat price stabilisation scheme operated across the industry during the decade, based on Commonwealth and State legislation.

There was a small increase in the area sown to wheat and oats in 1948/49. The total harvest and the average yield in 1949/50 saw out the decade much the same as 1948/49.

Through the decade the plant breeding, field trials, pedigreed seed production and species testing activities of the research stations continued. Maintenance of strength in export flour was an issue as the quantity of wheat delivered was only enough to provide for orders, with little opportunity to blend wheat of varying quality.

The annual cropping competitions continued, most of them judged by departmental officers. Numerous trials were conducted on farmers’ properties.

There was an interest in growing flax. Britain had obtained its flax from Belgium before the war, but this supply was no longer available. The price had risen from about 75 pounds to 400 pounds a ton ($150 to $800 per tonne) as a result. This resulted in the establishment of a flax industry in the Boyup Brook district later in the decade.

During 1944/45 the Commonwealth Seeds Committee decided it would be desirable to have enough vegetable seed in reserve for a full year. This work was handled by the department and involved making contracts, inspecting growing crops, arranging cleaning and purity and germination tests on the final seed to be obtained.

Soils and plant nutrition
During the war soil surveys were carried out on potential runways of seven airfields for the US Air Force. Assistance was also given to the Commonwealth Works Department on a proposal to use soil cement for runway construction on airfields.

Long-term experiments at Merredin were used as the basis for recommending farmers use only 40 pounds per acre of super for their cereal crops in the period of phosphate shortage, which extended through most of the decade.

Experiments were carried out to determine the most efficient use of scarce fertiliser resources on vegetables. They demonstrated that chemical fertilisers were as efficient as blood and bone. This work showed split applications were more efficient for maintaining the nitrogen and potassium fractions, particularly on sandy soils. The level of these nutrients was shown to have a big effect on both yield and quality. The value of bulky organic matter dressings on sandy soil was not questioned.

In the dry season of 1943 a soil survey was carried out on the potential for irrigation of the Ord River basin. It showed that there were extensive soil types suitable.

Soil surveys were carried out at Margaret River, Many Peaks (30 000 acres) and Rocky Gully (40 000 acres) by CSIR. Trace element experiments carried out for most of the period demonstrated widespread responses, especially to copper and zinc across a large number of soils, particularly the sandy and gravelly soils of the extensive sandplain. This information laid the foundations for the major land development of the post-war period. This is dealt with in Chapter 7.

At Carnarvon there was concern about the deterioration of structure on some of the research station soils. The effect of sulphur and gypsum on the problem was investigated.

A soil reconnaissance east of Pingrup, extending to Lake Magenta, showed the heavy soils had quite high salt content and it was concluded that more detailed examination was needed before settlement.
could be recommended. The department was now concentrating on ‘land capability surveys’ instead of detailed soil surveys. These were based on general land classification, including limited soil sampling, and judgment on the basis of past experience. This survey covered 1200 square miles (303 000 hectares). Following these surveys some reconstruction of farm size was necessary; 150 farms covering 250 000 acres (100 000 hectares) were involved.

Concern was increasing among farmers about salinity in agricultural areas. Examination of seepage water in lighter rainfall areas showed the salt content to be between 3000 (42 900 ppm) and 4000 grains per gallon (57 200 ppm). Salinity investigations were continuing, with testing of salt-tolerant plants at Avondale and studies of the effect of shallow versus deep cultivation at Hines Hill. These experiments with different implements and depths of ploughing on a private property and at Merredin Research Station showed no advantage of deep ripping on either ordinary or saline soils.

The Soil Conservation Act was passed through Parliament and LJH Teakle was appointed the first Commissioner of Soil Conservation. In its early stage the service addressed gully erosion with banks and structures, wind erosion with plantings of cereal rye, and control of clearing. Clearing control was implemented in the eastern and north-eastern wheatbelt shires in October 1950, through the gazettal of two soil conservation districts covering these shires.

Horticultural industries
The Under Secretary stated that due to the war and related arrangements there was a considerable increase in the demand for advice, inspection and investigation for the vegetable industry. In particular, experimental work to determine fertiliser requirements was needed. There was also a major requirement for assessment of fruit crops under the Commonwealth acquisition arrangements.

In 1941/42 The Commonwealth Government requested increased vegetable production for troops. This was a major challenge to the industry during labour and fertiliser shortages. Shortages of seed and nitrogenous fertiliser were particular issues. In 1939/40 summer fruit production was substantially reduced by the severe conditions. Only a million bushels of apples were produced of an expected crop of 1.5 million bushels. Despite the difficulty with shipping it was possible to export some 601 000 bushels to the UK, the Near East and Europe. In addition 23 000 cases of pears and 52 000 cases of grapes were exported. It was 1945 before exports of apples to the UK were resumed.

The Commonwealth Government introduced an acquisition scheme to keep the apple and pear industry operating during the war. The Fruit Branch was required to inspect orchards to estimate the quantity that the grower could have delivered in a normal market situation and it was necessary to employ extra staff for this task.

In 1940/41 only 10 to 15 per cent of the apples available for export could be shipped. None went to the UK. Export of grapes was not affected until late in the year and 45 000 cases were shipped to the Near East, which was generally comparable with previous years.

The government acquisition scheme was extended to mid-1948. While the home market increased with the build-up of armed forces and limited amounts were exported, much went to waste.

After the war the neglect of apple and pear orchards caused concern. This was partly due to marketing problems, partly labour and partly shortage of chemicals and fertilisers. The citrus industry was much smaller and less affected.

Even when the war finished in 1945, recovery was slow, partly through an initial shortage of planting stock. By 1948/49 the
Commonwealth Acquisition Scheme had concluded but an Act was passed to continue the arrangement under State control.

During the decade fruit fly was a periodic problem. This was clearly due to seasonal conditions and failure of householders and orchardists to exercise proven control measures. Where these measures were implemented control was achieved. In 1944/45 a Fruit Fly Eradication Fund was established. In 1946/47 the Plant Diseases Act was amended to allow compulsory eradication schemes, with departmental inspectors heavily involved. Despite such schemes the general situation was not satisfactory.

The department’s studies of apple and pear storage had shown the importance of time of picking in both species, the importance of wrapping for long-term storage of apples and the need to get pears to storage as soon as possible after picking.

The Potato Industry Licensing Act (1941) provided for growers to be licensed. It was also expected to be ‘valuable in connection with industry control’.

When hostilities ceased in 1945 there was concern that there could be a problem with over-production of vegetables. This did not eventuate, due partly to the export of 14 500 crates to Singapore. An export trade in vegetables emerged, with Singapore an important destination.

During the decade canning of vegetables and dehydration of potatoes were carried out for the first time in WA. The department had been responsible for inspection of the product and provision of technical advice to the processors. Officers of the US Army provided valuable advice in this development stage. Three plants were engaged in apple canning and four in dehydration. The supervision of fruit and vegetable drying, and canning for the armed forces continued until hostilities ceased. Manufacturers then moved to packs more suited to the civilian population. New techniques were necessary, and these produced their own problems.

In 1946/47 trials were started to test the best locations and the management needed for the production and canning of peas. The longer growing and processing period made Albany a suitable location for a future industry.

Throughout the decade, inspection of packing sheds, orchards and points of entry continued under the Plant Diseases Act. Despite shortages of staff, inspection of imported fruit trees and nursery material. In 1945/46 and subsequent years inspection work resumed at about normal levels and some 62 000 fruit trees and seedlings and 134 000 bulbs and roots were inspected at the point of import.

Viticultural production continued to be high and wine production increased. Some poorer quality wine was directed to distillers, as was some dried fruit. No wine or fresh grapes were exported during the war.

**Entomology**

In the five dry years before 1939 the small plague grasshopper caused serious problems and periodic problems continued through the following decade, depending on the season and the effectiveness of preventative measures. The combination of abandoned farms and the limitations on cropping meant potentially large areas of uncultivated egg beds. To address this problem the government subsidised ploughing-up of the egg beds and the provision of baiting materials to the Roads Boards. Plagues were experienced in 1940, the dry year of 1944 and in 1948. With the move to more wheat in marginal areas the problem largely disappeared.

In dry years the redlegged earth mite and lucerne flea continued to damage pastures, crops and gardens. Shortage of insecticide contributed to the problem.

The pea weevil continued to be a problem. An attempt at biological control was not successful in 1939/40 and it was repeated in 1941/42.
Work started early in the war to address the problem of grain insects which were expected to cause serious damage if substantial grain storage was required. Successful control of the insects in departmental experiments by dusting with diatomaceous earth led to CBH acquiring large deposits of this substance. Dry seasons and the control of cropping removed the stored grain and the problem.

The Argentine ant was first discovered at Albany but soon spread to the Perth Metropolitan Area. By 1941/42 affected areas in the Metropolitan Area had been mapped and a baiting program started.

In 1942/43 both codlin moth and apple scab appeared to have been eradicated. However, infestation of codlin moth was reported from Collie in 1946/47. Further work was continuing on this outbreak in 1948/49.

A serious pest, the apple jassid, had been identified in the Bridgetown area.

Blowfly strike was a particular problem in the pastoral areas during 1942 and it is estimated that up to 300,000 sheep could have been lost.

The cabbage white butterfly, which was first reported in Bassendean in early 1943, spread rapidly through Western Australia.

In the post-war period experiments were conducted with DDT to determine its effect on a range of insects. These continued to the end of the decade. Unfortunately the predators of bryobia mite and lucerne flea were both affected by DDT and pest numbers exploded.

**Plant pathology**

Through the decade the demand for legume Rhizobium root nodule cultures remained strong. The numbers supplied, largely to farmers, in successive years from 1939/40 were: 3020, 1200, 1744, 2000, 6000, 7690 and 10,000 in 1948/49. Two strains of Rhizobium isolated from barrel medic proved better sources of inoculum than the old stock strains.

Demand continued at a high level for certified seed of potatoes but there was some difficulty finding areas isolated enough to ensure that there was no disease transfer.

Flax rust was identified in a heavily infected crop of linseed at Northam; it was present on all linseed crops in the area and was identified in some flax crops in the South West. It had not been reported previously in WA.

In 1949/50 five new diseases of flax were reported, together with eight new diseases of vegetables. The resulting problems were overcome through finding resistant material or, in the case of seed-borne viruses, developing virus-free seed.

**Botany and weed control**

The Government Botanist, CA Gardner, made major advances in classification of species and preparation of the Flora of WA during the decade. In 1941/42 a list of plants with medicinal qualities, or the possible capacity to produce rubber, was prepared. A list of possible fibre plants was also prepared. In 1943/44 investigations of the drug potential of a range of plants were carried out. The collection of plants containing drugs or essential oils continued in 1946/47. One plant Eucalyptus oleosa var. robusta was shown to be outstanding for oil content. Two of the four identified varieties were shown to have very high levels of oil. Pituri was found to contain more nicotine than the then-current commercial sources of the drug.

Weed control efforts were limited by lack of staff but work on endemic weeds continued through the decade. The main focus appears to have been on St John’s wort, rapistrum weed, Bathurst burr and cape tulip. In 1947/48 a Chrysomelid beetle was introduced as a parasite of St John’s wort. Attempts to eradicate Bathurst burr and star thistle continued in Kalgoorlie.

Certification of clovers on the basis of strain and separately on a purity basis was carried out through the decade. More than 100 tons...
of subterranean clover seed was tested in 1940/41. This increased to 733 tons in 1948/49.

**Tropical agriculture**

The decade was one of mixed fortunes for Carnarvon growers. The long drought from the mid-1930s finally broke in 1941. The years that followed featured variable climatic conditions, difficulties with transport during the war and some serious effects from disease and insect pests. The department had started to develop a research station in the area late in the previous decade, but, after getting it to operational level had to put it on ‘care and maintenance’ until after the war.

While bananas continued as the main crop in Carnarvon, the production of suitable vegetables was expanding. Vegetables provided a cash crop which could quickly provide income during or after drought or a cyclonic event.

In 1944/45 Carnarvon citrus proved successful but vegetable crops suffered damage from disease. In 1945/46 water supplies were satisfactory and production reached normal levels. Produce was largely transported to Perth by road. In 1946/47 the Gascoyne flooded three times, ensuring adequate water for the plantations. Some 310 acres of bananas were planted, of which 120 were full bearing. There was also a major planting of runner beans.

Research planning on the Gascoyne Research Station had been resumed and a new program was developed. However, it was 1948/49 before the station was fully functional with experimental work yet to get seriously underway.

The Abydos and Woodstock pastoral properties were taken over for experimental purposes. They had been abandoned and much of the fencing had been burnt and none of the mills worked. It was hoped to demonstrate how to make the country productive again.

In 1941/42 the Department of Agriculture and the Public Works Department established an experimental site at Carlton Reach on the Ord River. An engine and irrigation equipment was installed and an officer appointed. Mitchell, buffel, birdwood grass, paspalum, Phalaris tuberosa and lucerne were planted. By 1942/43 the experimental areas were successfully established and providing useful information.

In 1945/46 the Western Australian and Commonwealth Governments agreed to examine the possibilities of developing an irrigation system based on the Ord River. In 1948/49, 450 acres of the Kimberley Research Station had been cleared and some graded ready for planting. It was planned that a wide range of crops would be tested. In 1949/50 there was serious erosion on the research station during heavy summer rains, causing concern about the erodability of the black soils of the plain.

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**Irrigation**

During the decade the three main irrigation districts were consolidated. Outcomes depended largely on the amount of water stored and available for use during the irrigation season. The area irrigated varied between 12 000 and 14 000 acres. Most was in pastures and fodder, with potatoes, orchards and vegetables on the rest.
Vermin

Vermin continued to be a problem. Rabbit numbers rose and fell with the seasons and the extent of poisoning and other control measures exercised by farmers and vermin boards. In the eastern districts dry conditions periodically caused heavy reductions of all vermin, particularly rabbits, from shortage of water and feed and interruption of the breeding season.

Rabbits continued to be a danger whenever sufficient rain fell. Wild dogs and foxes continued to be important predators. Legislation was being prepared to establish the Agriculture Protection Board to deal with vermin in general, but rabbits in particular.

Making the future infrastructure: 1951 to 1970

The war had been over for five years. Machinery shortages had largely disappeared, together with most of the special wartime marketing arrangements for agricultural products. Possibly the only exception was the supply of superphosphate, which had to be rationed during the early part of 1951 as supplies did not meet demand. Subsequently, special transport arrangements were made so that the struggling transport system could get supplies to the country.

Large areas of scrubland and forested country were being cleared. New equipment such as bulldozers had been introduced in the post-war period and some innovative farmers had converted army tanks for this purpose. Land was cleared by ‘chaining’, a method of pulling down vegetation by dragging a very heavy chain, pulled between two large tractors or bulldozers, through the light forest or scrub. In forest areas, where larger trees were being cleared, the chain was weighed down in the middle with a large steel ball. The area ‘pulled down’ was left to dry and then burned. In forest country the remaining logs were pushed together with a bulldozer and burnt. In scrub country a heavy chain alone was often enough to pull down the scrub, which could then be ploughed ‘on the burn’ with a heavy disc plough.

The availability of larger reliable rubber-tyred wheel tractors, sometimes fitted with lights, started to revolutionise cropping in the wheatbelt. In the higher rainfall dairying and fruit growing areas the Ferguson tractor with its range of attachable and detachable implements took a lot of the hard work out of farming. However, the major change was the development of the light land areas which had been classified as third class and regarded as largely unusable up to the mid-1940s. Now with the demonstration that when fertilised with superphosphate and the trace elements copper and zinc, they could be farmed profitably, a large area of formerly useless land could be farmed. These light soils were suitable for subterranean clover in the medium rainfall areas and after a period of legume pasture could be cropped very profitably.

The Department of Agriculture was heavily involved in research, development and extension to support this ‘light land revolution’.

The availability of the physical technology, large areas of uncleared land, good prices for agricultural products and the accumulated knowledge were the driving forces for the biggest land development in Western Australia’s history.

Modern machinery made possible the clearing of extensive areas of forest country.
At its peak, land was being cleared at a rate of a million acres a year. This provided both the infrastructure for the development of today’s agriculture and opportunity to restructure pre-war agriculture. In the areas developed before the war the nature of the technology, particularly the lack of tractor power, had resulted in farms being quite small and cropped areas also relatively small. Many of these smaller farms were sold to neighbours, allowing their previous owners to move to the new areas to develop much bigger and more viable properties, and their neighbours also to expand. In effect the cleared area doubled without any material increase in farmer numbers so that the average farm size increased substantially.

The main wave of development occurred from 1950 to 1968. The new technology which created today’s modern farming has been overlain on this framework since 1968. The major development phase halted with the collapse of wool prices in 1968/69, the introduction of restrictions (quotas) on wheat production in 1968 and the drought of 1969. By 1951 the gross value of agricultural production had reached record levels on the expansion which began soon after the war. Between 1946/47 and 1950/51 sheep numbers increased 17 per cent, and the area sown to wheat by 14 per cent over the previous five years. In the 1950/51 wool selling season, the price of wool reached 3 pounds a pound ($6.40/kg) because of the demand for woollen uniforms in the Korean war; the average was a little over 2 pounds a pound ($4.40/kg). While these prices dropped sharply the next year, reasonably profitable prices continued until 1968/69.

By mid-1953 there was increasing evidence that, with more competition on world markets and increasing costs, market conditions were returning to those which prevailed before World War II. Nevertheless, the gross returns for the major industries of wheat and wool in 1951/52 were double those of the growing manufacturing industry.

In 1955 the Director of Agriculture commented on the general reduction in prices received by farmers during the year. This trend pointed to tighter conditions compared with most of the post-war period until that time.

Development had continued and in 1955 the cleared area in the agricultural areas was 22 million acres as opposed to 14.7 million in 1945. However the area sown to wheat was only 2.9 million acres as opposed to the five-year average of 3.0 million acres. By 1956 the move to longer rotations, the use of subterranean clover and medic pastures and the practice of ley farming were well established. In 1958 the area sown to crop was virtually unchanged, as were all the other measures of agricultural production.

During the 1960s the push for development gained full pace. Most of the forest clearing had been completed and the focus was on the sandy-surfaced scrub lands of the medium and lower rainfall areas. Some clearing was done by the War Service Land Settlement Board in the early years but most was driven by private farmers. Land was cleared at a very high rate and pastures were established at much the same rate. Some pasture establishment was on recently cleared land and the rest on land which had been cleared for many years. In 1960/61, 750 000 acres of land was cleared and some 500 000 acres were sown to pasture. In 1961/62, 893 000 acres were cleared.

The imposition of quotas on the amount of wheat for which the Australian Government would pay a guaranteed price, coupled with a fall in wool prices at the 1968/69 sales, stopped this development at the end of 1968.
The area sown to wheat in 1961 was 4.0 million acres (1.6 million hectares) which was the highest cropped area since 3.9 million acres had been sown in 1930/31. The total area cropped to cereals was 5.8 million acres. Production on all sectors continued to expand during the decade.

All of this was the beginning of the expansion of agriculture to progressively become the modern high-tech industry it is today.

While quotas were introduced based on previous production history to give individual farmers access to the wheat covered by the guaranteed price, there was no limit of production of non-quota wheat. While the allocation of wheat quotas was reviewed in 1969 they eventually had little effect on production, as the world wheat price rose in the early 1970s. Wool prices, which had dropped dramatically in 1969, did not recover until 1972/73. This situation in WA was exacerbated by a major drought in the medium and lower rainfall districts in 1969.

In view of the general financial problems of the sector, particularly the wheat and sheep industries, the State and Federal Governments decided in late 1970 to introduce a Rural Reconstruction Scheme.

The dairy industry, which was not involved in the major expansion of the late 1950s and 1960s, started to adjust to poor market conditions in the mid-1960s. It was faced with higher costs, a reduction in the subsidy on butterfat and the need to continue to contribute to equalisation of export and domestic returns, despite WA not being an exporting State. During the 1960s this industry was subject to substantial reconstruction.

**Seasonal conditions**

The period from 1950 to 1968 was one of the most favourable for agriculture in the history of Western Australia. The year 1954 was dry and 1969 was the worst drought since 1914, but the remaining years were within the normal variation experienced in the agricultural areas. In the pastoral areas the Kimberley experienced record drought in 1951/52. In the Gascoyne and Goldfields a serious drought began in 1968 and continued to 1972. Otherwise, seasonal conditions were within the normal parameters for these areas.

**Department of Agriculture staff**

In 1950 the Department of Agriculture had a total staff of 235, of whom 97 were professional staff, including 16 veterinarians. They were supported by 91 general division and 45 clerical division officers. The departmental report shows that in 1951 the professional staff had increased to 108, of whom 17 were veterinarians. They were supported by some 106 general division and 51 clerical division officers. The intake of 11 agricultural graduates in one year was exceptional. By 1952 there had been further small increases. There were now 114 graduates, 130 general personnel and 53 clerical officers. In 1953 there was a net increase of seven further graduates, increasing the number of professional officers to 121, supported by 130 general division staff and 54 clerical staff. While further graduates joined the department in 1954, some staff losses resulted in the overall staff position remaining stable.

In his 1953/54 report the Director of Agriculture commented on the failure to recruit additional graduate staff due to resignations virtually equalling recruitment. This had meant that the department had been unable to use the full amount of the Commonwealth Extension Services Grant (CESG) made available to stimulate extension services to farmers. A similar grant for the dairy industry was proving very valuable. Proposals for the use of the CESG had been revamped and these funds were spent later.

A decision had been made to move away from having offices staffed by one officer in each centre. It was decided that country officers should where possible be located together in a smaller number of larger
offices. A senior officer would be placed in charge and a library and other facilities would be provided.

In his 1954 report the Director pointed to the disadvantages for country agricultural officers in that they could expect to spend most of their professional life in the country. Unlike for teachers or police, there was no major area of employment in the city. Also the longer the officer stayed in the country the more valuable he became, but the government system did not necessarily reward him for his increased professional capacity. For all of these reasons the Director argued that good housing at low rentals should be available to district staff. In 1954/55 the professional staff increased by nine and the general division staff by 29, significantly increasing the capacity of the department.

The 1958 report records that there were 115 officers engaged full-time in extension activities and a further 98 engaged partly in extension and partly in administration. In the wheat and sheep areas there were now seven district offices—Geraldton, Northam, Narrogin, Katanning, Moora, Mt Barker and Esperance—with another planned for Merredin in 1959. In the higher rainfall areas offices were at Harvey, Bunbury, Busselton, Bridgetown, Manjimup, Denmark and Albany.

**Departmental organisation**

The only notable change to the department in 1950/51 was the creation of the North West Branch and the recruitment of three new graduates to it. During the year a cattle adviser and three graduates were appointed to the new branch. The three advisers were stationed at Port Hedland, Broome and Kimberley Research Station. The Tropical Adviser and the Gascoyne Research Station came under the branch on 1 July 1951. With the addition of Kimberley, Esperance, Wokalup, Bramley, and the vegetable and poultry research stations at Herdsman Lake, the department now had 12 research stations.

In early 1952 the department entered into an agreement with the then Farmers’ Union for the extension staff to cooperate closely with their branches in order to increase the efficiency of the extension effort. In 1951/52 the Agriculture Protection Board (APB) was established under legislation agreed in the WA Parliament and it went through a period of establishment. This resulted in the control of vermin and noxious weeds becoming its role which was at arm’s length from the remainder of the department.

In July 1952 the Tobacco Research Station was shifted again, this time to the Tobacco Training Centre and 4.5 acres of experiments were planted.

In 1955 the Director of Agriculture stated that the department had made some progress in improving its extension services, with seven district offices. These were at Northam, Moora, Narrogin, Geraldton, Bunbury, Bridgetown and Manjimup. There was difficulty in getting staff to live at the Kimberley Research Station and in Wiluna and Carnarvon, which were not at full strength. The Swan Viticultural Research Station had been established, together with the Stoneville Horticultural Research Station and the Wembley Vegetable Research Station. Experimental work continued on the recently established research stations at Kimberley and at Abydos Woodstock as well as the Gascoyne station.

A major advance in accommodation for the department was made with the laying of the foundation stone for the first buildings for the new headquarters at South Perth by the Minister for Agriculture, Mr EK Hoare in April 1956.

The development of regional centres was proceeding and with added staff the extension effort was increasing. With this came an opportunity to expand experimentation on farms through cooperative effort of the new cadre of research officers and the extension staff. There had also been an increase in pasture groups and farmer field days. It was estimated that 3000 to 4000 farmers attended such days during 1956. In addition, officers broadcast 250 radio talks.
Chapter 3 – 1940 to 1970: war and post-war expansion

The format and presentation of the *Journal of Agriculture* had been extensively modified in 1951. This led to increased circulation, which had doubled in the previous six years and continued to rise during 1957. Advertising revenue had also risen by a factor of 10 in the period.

The new offices at South Perth were being completed progressively and most of the head office staff had transferred by the end of 1959. A new research station had been selected and was being developed at Badgingarra.

**Extension activities**

In 1959 it was claimed that there were 138 full-time extension staff across the whole department and 99 who combined advisory work with other duties. In a more focused way the 1966 report refers to 18 advisers at nine district offices in the wheat and sheep areas. The Horticulture Division refers to 11 officers in country areas and the Dairy Division refers to nine advisers at eight centres in the higher rainfall zones.

In the fruit industry there was a continued demand for advice on the use of new hormone sprays, pest control, disease, and packing and storage. The subject matter varied from year to year depending on seasonal conditions, size of the crop and disease and pest incidence. The development of a new piece of technology, a new disease or pest or new control or management information increased the demands on officers. This was complex and demanding extension work dealing with the growing, harvesting and marketing of a large number of crops on different soil types in a range of climates and varied seasonal conditions.

In the vegetable industry, while there was always a short-term focus on the inspection of areas for suitability and on certification for potato seed production, advice was needed on issues dealing with the range of crops and climates where the crops were grown. Processors needed help with selecting areas for growing crops for processing, plus advice on transport and marketing of the produce. In the early 1950s identifying areas suitable for producing peas for snap freezing was an issue. The department also held schools on a range of horticultural issues.

While advice had been given on all aspects of tobacco production and preparation of the leaf for market in the 1940s and 1950s, this ceased when the sales and the industry collapsed in 1961. This followed a buyer boycott on WA leaf, which the buyers claimed had too high a chlorine content, causing a slow burn time.

The cropping and livestock industries of the medium and lower rainfall areas were serviced by offices at Geraldton, Moora, Northam, Merredin, Narrogin, Katanning, Albany and Esperance. An office was opened at Lake Grace in 1965. The area covered included 12 000 holdings and 22 million cleared acres. Officers were advising farmers on all aspects of crop production and pasture and stock management. They were involved in conducting 329 field trials and judging 43 crop pasture and fodder conservation competitions in 1961/62. Visits to the offices and farmers’ properties, ABC radio talks, film evenings, field days, field walks on farmers’ properties, telephone discussions in and out of hours were all part of the contact with farmers. Officers were also involved in stock inspection, animal health and vermin and noxious weed control. This was the pattern for the decade.
This was the period of great expansion of the agricultural areas, particularly in the medium and lower rainfall areas. The Esperance plain, the western sandplain, the areas east and west of Mt Barker and Albany, including Jerramungup and the area south and east of Hyden were all part of this major development, together with a multitude of smaller on-farm expansions. Many farmers new to WA, or from other districts, who were not familiar with the sandy soils, created a huge demand on the department’s extension staff.

The work of the general advisers in the high rainfall areas broadly mirrored the wheatbelt in relation to all aspects of pasture production and stock management. They also dealt with issues involved in the dairy industry. Special issues included advice on solids-not-fat, antibiotic residues in milk, management of milk or cream production and storage and collection from farms.

During the decade a new type of field day was organised combining the farm and factory with a focus on milking machine performance, sanitation, antibiotics, marker dyes, factory quality tests, calf rearing etc.

The pig industry was in part associated with the dairy industry, in part with the cereal production and in developing intensive housing. Numbers fluctuated, being particularly affected by the price of grains. When wheat prices were high pig numbers in the wheatbelt were low and vice versa. During 1960/61 the numbers increased dramatically by 45 000. Visits to farms and attendance at field days and sales were all part of the pig industry specialist’s work.

Veterinarians were located at the larger offices and attended to animal health problems on farmers’ properties. There was more demand about health issues from the larger animal industries but the vets also advised sheep owners on general issues and attended to any unusual deaths.

Soil conservation specialists were at most larger offices. Their role was almost entirely involved in advising on, demonstrating and implementing soil conservation works and management. They also gave advice and carried out demonstrations on saltland management. In the early 1960s they were required to begin the special, long-term role of stabilising a major eroded and degraded part of the Ord River catchment.

Officers of the North West Branch serviced the pastoral community. Specialists provided advice to horticulturalists in the Gascoyne irrigation area.

Separate from the field staff, most head office staff had a partial advisory role. Specialists also had a large demand on their services from farmers and householders who came direct to head office. Plant pathologists gave advice on all aspects of disease control, management and avoidance. Entomologists gave advice on issues related to a wide range of insects. The Weeds and Seeds Branch gave advice on weed control, seed production and identification. They also arranged the certification of species or strains of commercially valuable plants and the use of new and improved chemicals.

The State Herbarium provided a plant identification service, particularly poison plants. They also gave advice on tree planting and to apiarists on location of potential sources of honey. Officers of the Plant Research and Soils Divisions spent significant time in the field, inspecting experiments and investigating special problems on farmers’ properties. All specialists attended and participated in farmer and research station field days.

Part of the funding of the extension services came from the Commonwealth Extension Services Grant and the Dairy Industry Efficiency Grant. These made a valuable contribution to the development and equipping of the district offices.

Services

The department also provided a large range of services. Many of these began before and continued through the decade and beyond. Officers providing these services were also partly involved with extension work. Some
statistics from 1960/61 and 1961/62 are given below to indicate the nature and uptake of these services.

**Artificial breeding for the dairy industry:** 10,766 first inseminations were carried out from eight centres with 619 farmer members of the scheme in 1960/61. In 1961/62 virtually the same number cows were involved. There was a progressive increase in the use of this service over the decade. In early 1967 it was transferred to a board independent of the department.

**The Dairy Laboratory:** 24,020 samples were tested or analysed involving 48,800 estimations in 1960/61. This service was used substantially by the Milk Board for monitoring whole milk supplies. The service had probably started in the 1930s and continued until it was taken over by the Dairy Industry Authority.

**Milking machine testing:** This service was only introduced late in the 1950s and was clearly very valuable; 561 machines were tested up to 1961/62 with a high percentage found to need adjustment. While many of these adjustments could be done by farmers some needed expert advice. Involvement of country officers in this testing resulted in 218 machines being tested in 1961/62.

**Herd recording:** During the year 13,900 cows in grade herds and 906 cows in 40 studs were tested. The average length of lactation was 7.8 months. There was an increase in grade herd participation in 1961/62, with 14,866 cows involved; 951 pure bred cows participated in the scheme in 1961/62. The service continued until it was replaced by farmer sampling with analytical work done by the Dairy Industry Authority.

**Land grading and irrigation:** This service was provided on a continuing basis to irrigation farmers. In the sample year 1763 acres were graded under the supervision of officers and 29 miles of drains excavated.

**Contour surveys:** This service was provided by Soils Division country staff. In 1960/61 surveys were carried out on 29,275 acres for farmers. In 1961/62 a similar amount of 26,845 acres were surveyed for 169 farmers.

**Botany:** additions to the Herbarium through collections made by staff brought the number of specimens held to 64,000; 5500 identifications were made for the public and government officers.

**Grain and flour inspections:** In 1960/61 shipments under certificate were 368,647 tons. These shipments went to China, North Korea, Spain, Albania and Syria. In 1961/62 almost 820,000 tons of wheat and 20,000 tons of oats were exported virtually to the same markets. Flour was also exported under certificate.

**Stock, produce and seed inspections:** Import inspection was an ongoing task. It was an important part of the protection of Western Australia from plant disease, pest and weeds. Inspections were made at Kalgoorlie and Fremantle. This service started after the creation of the Bureau of Agriculture, when the 'trans' railway line was completed in 1917. It has continued since. Special problems were encountered with rugs from India, chocolate coated Noogoora burr in chocolate peanuts and burrs in tractor seats. Birdseed, cattle and sheep or seed from the eastern states all had some individuals or bags contaminated with weed seeds. In one year inspection of 45,000 fruit trees, 10,000 seedlings and 32,500 bulbs which were introduced was required. Inspections were carried out for the Commonwealth on exported produce, and for packing and grading under the Agricultural Products Act. In 1958 there was tightening of overseas quarantine requirements and special attention had to be given to San Jose scale in fruit preparation.

**Orchard inspections** continued across all industries to control pests and diseases and to prevent the establishment of new pests and diseases in orchards. There was particular interest in insects such as San Jose scale, white wax scale, codlin moth and argentine ants. A major outbreak of codlin moth was found at Mullalyup in 1954 and a smaller outbreak at Nannup. Both outbreaks were controlled over the next two years. Oriental peach moth had also been identified.
and a major effort was being made to eradicate it; by 1953/54 it appeared to have been eradicated. Compulsory fruit fly baiting coupled with the employment of six additional fruit fly inspectors had allowed better control of that pest.

Detailed inspections under the Commonwealth Quarantine Act were also significant. These included examination of the luggage of immigrants at Northam holding camp. Also in 1952 there was a large import of prefabricated houses which had to be treated for sirex wasp. New regulations were introduced under the Quarantine Act to help prevent the introduction of diseases and insect pests.

Seed testing: 4600 seed tests were carried out during the year. This service continued in 1961/62 and beyond.

Seed certification: 800 properties were inspected and registered for certified seed production; 1464 tons of seed were produced from these areas. In 1961/62, 800 properties were inspected and 2220 tons of seed certified. Small parcels of rust resistant Westralia beans and Sorghum almum were also certified.

Pedigreed grain production: 3705 bags of wheat (eight varieties) 3889 bags of oats (five varieties), and 229 bags of barley (one variety) were distributed to farmers. This service began in 1911 and continued through to the 1980s.

Potatoes: 45 acres were certified for the production of seed potatoes at Albany. At maturity six acres were rejected and 306 tons were produced off the remaining 39 acres. In 1961/62, 17 growers submitted 52.5 acres for certification for a seed production of 514 tons.

Veterinary: Tuberculosis testing of herds producing milk for the Metropolitan Area showed an incidence of 4.5 per cent among 19 000 cows tested. In other herds sampling indicated an incidence of 1.5 per cent. In 1960/61, 31 674 cattle were vaccinated for brucellosis with Strain 19. In 1961/62, 37 600 were inoculated. This vaccination program substantially controlled the disease in Western Australia.

A number of other diseases were dealt with and programs carried out. These included:

- Vibriosis and leptospirosis causing infertility in cattle. These were a problem in 1961/62 and beyond, proving to be major causes of infertility in the State.
- Footrot eradication in sheep was reported to be progressing, with 20 properties cleared and 16 left in quarantine. The program was still continuing in 2008.
- Pig diseases, including swine erysipelas, sarcoptic mange and pig lice. In 1961/62 the focus had shifted to viral pneumonia and a scheme for eradication was being prepared. In that year pig imports from NSW were banned due to swine fever.
- Poultry: More than 2100 birds were post-mortemted. Poultry continued to be included in the diagnostic service.
- Parasitology: Parasites of cattle and sheep were investigated and drenching trials, including testing of new anthelmintics were carried out. Later, worms resistant to anthelmintics became a management issue.
- Lupinosis and white muscle disease research – Investigations were carried out without success. In 1961/62 some 17 200 specimens were examined.
- Poultry: Two new diseases were discovered. One was avian encephalomyelitis and the other was vibronic hepatitis.
- Pig diseases accounted for 6 per cent of the specimens received. Sheep problems were also a major issue because of testing related to evidence of white muscle disease.
- Examination of samples of mastitis from dairy cows showed a high resistance to penicillin had developed. Mastitis continued to be a significant disease affecting milk and also contributing to shortened production lives of cows.
Chapter 3 – 1940 to 1970: war and post-war expansion

Research stations

Wheatbelt stations
This was a period of great activity at the wheatbelt research stations and on farmers’ properties. Research began on cropping systems and fertiliser need, particularly the use of nitrogen in early and later crops in a multi-crop system. Cereal variety trials were carried out with wheat, oats and barley and were repeated annually during the period. Work was also conducted on pasture species and on sheep management issues such as time of lambing, feeding of weaners, rate of stocking, ‘flushing’ trials and testing stocking rates, set stocking and the response of pasture to stocking.

An oat crop on Esperance sandplain planted after six years of subterranean clover fertilised with superphosphate, copper and zinc.

During these two decades major work was done at Esperance Downs Research Station. The results of this work provided the basis for the development of Esperance Plain.

Plant breeding and introduction continued to be a major function of these stations, as well as pure line rows for the development of pedigree seed supplies. Wheat breeding was carried out at Avondale and Wongan Hills (for clover ley areas) and at Merredin, which was the principal wheat breeding centre.

Rust resistance, yield and flag smut resistance were the main areas of focus. Oat breeding was at Merredin (early maturity) and Wongan Hills (later maturity); 2-row barley was at Wongan Hills and Avondale, with the aim to replace the variety Prior. The 6-row work was at Merredin with some small yield trials at Esperance and Kojonup. Introductions were made from USA and Victoria.

Linseed breeding was aiming to get rust resistance and higher yield. Flax breeding was continuing at Boyup Brook and aimed at rust resistance. Both these programs had been terminated by the end of the period because the industry had collapsed.

North West and Kimberley stations
At Carnarvon experiments were in progress with passionfruit, bananas, pawpaw, beans, tropical apples, custard apples, dates, onions, strawberries, grapes, avocados and mangoes. This work was continued in 1961/62 as part of an ongoing program.

At Abydos research showed the importance of a totally changed management in regenerating the degraded native pastures. Industry practice was to burn the spinifex in winter and graze the young grass shoots as soon as they appeared after summer rain. Early summer burning and deferred grazing until the grasses were established after summer rain allowed the swales to revert to a grass dominant condition. It was shown that it was essential that lambing be timed with the rainy season from January to March. Studies of fertility of rams and ewes and feeding of lambs were continuing but showed that locally bred rams maintained their libido better than imported animals.

Development of the Ground Water Research Station at Wiluna was progressing well. A water problem was overcome and experimental work initiated. Later this work was terminated and the station was taken over by a private operator, but access to markets proved a problem. It was finally taken over by the Department of Native Affairs.

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Kimberley Research Station continued its work for the developing irrigation industry on the Ord River. By the end of the period a demonstration of stock management on regenerated pastures on the Fitzroy River frontage had started.

**South West stations**

Denmark Research Station's role as a source of stud stock and a demonstration farm continued. An experiment on viral pneumonia eradication from the pig herd was also started. This program continued in 1961/62. Pasture work was also in progress.

At Wokalup Research Station artificial breeding was being used to develop two herds (one Jersey and one Friesian). The breeds were compared on the basis of milk production and composition, influence of time of calving and weight at birth on weight at sale of sale stock. Plant introduction was being continued. These programs continued through most of the 1960s. At the end of the period a major breed by stocking rate trial was being planned.

At Bramley Research Station the phosphate feeding trial with dairy cattle was the major work. The residual availability of copper was also being investigated. Cobalt availability was also being studied and a stocking rate trial was in progress. These experiments continued for some years.

**Horticultural stations**

At Stoneville, development was continuing with preparation for trials of rootstocks and pruning techniques. Small scale trials on hormones and herbicides and jarrah sawdust as a mulching agent and hillng material were carried out. During the period the infrastructure was consolidated and experimental work started.

At Swan Viticultural Research Station 11.5 acres were planted to experiments dealing with rootstocks, long-term fertiliser use, and replanting.

Development continued in the early 1960s at the new Vegetable Research Station but the facility was also used by other divisions to work on diseases and other issues.

At the Manjimup Tobacco Research Station an area was planted to hops following the collapse of the tobacco industry. Fertiliser, irrigation, variety, red spider control and nematode control trials were carried out. The latter trial was done in cooperation with a private farmer. In 1961/62 a tomato trial was planted to determine varieties suitable for processing. This station was largely unused for the early part of the 1960s and it was then closed and a new area more suited to work on fruit, vines and other crops was purchased.

**Research**

**Soils**

Soil structure issues were being studied at Merredin Research Station and other sites. Soil amendments were compared, along with continuous subclover pasture. Soil moisture penetration and moisture utilisation under different vegetation types were studied, with some of the trials carried out on farmers' properties. At the same time examination of a soil for irrigation potential was being studied.
Saltland vegetation studies were being carried out and yield and grazing trials conducted with bluebush and saltbush. Seed viability was investigated. Bluebush and Wimmera ryegrass seeds were found to be able to survive for an extended period under water with a 3 per cent salt content. However the growing plants did not do well in areas where they were waterlogged in winter. Puccinellia grew under these conditions as it could survive in extremely salty water. This work was continued.

Glasshouse trials showed that using citrus (Washington Naval) grafted on trifoliata rootstock the salt uptake from saline sprays increased with the level of salt in the water and with the length of time of the application. Intermittent spraying gave increased uptake. Citrus grafted on citronelle rootstock did not take up salt from variable salt levels or lengths of spraying. Citrus on trifoliata rootstock reached a level of 1.5 per cent while that on citronelle rootstock only reached 0.25 per cent.

A study of water run-off from a 60-acre catchment was initiated. After a number of years the site was contoured and the run-off compared with the previous experience. Nitrogenous fertilisers were tested to determine their effect on the growth and density of grass on a grassed waterway in a contoured paddock.

The 1963/64 report commented that ‘many of the soils of the Fitzroy flood plain are high in gypsum and sodium’, raising questions about their suitability for irrigation. It also noted that under furrow irrigation techniques there could be a slow build-up of salinity under irrigation.

Thorough land preparation to obtain weed control was shown to be vital on land which had not been fallowed. Ploughing proved better than scarifying. Ploughing as soon as possible after the opening rains was best. In 1961/62 further experiments compared cultivation, trash removal and seeding techniques. Trash removal and disc ploughing gave the best results.

**Plant nutrition**

The demonstration that copper, zinc, molybdenum and occasionally manganese in addition to superphosphate were essential to the development of millions of acres of new land for agriculture, placed plant nutrition specialists under a lot of pressure to provide specialist advice and new information for both farmers and extension officers. Later in the period as the position stabilised, other important work became possible.

Research showing that superphosphate levels could be reduced where super had been applied for a number of years before cropping was confirmed. It was also shown that there was scope for the use of nitrogen in later crops in a multi-crop system. While nitrogen fertiliser use became more common it was concluded in the early years that the use on new land was the most economic. In 1961/62 some 30 trials were carried out from Binnu to Esperance to determine the responses to nitrogen fertiliser, largely on sandy and gravelly surfaced soils.

Phosphate and nitrogen fertilisers were tested under a range of conditions. Rates of application to new land in the medium rainfall districts, time of topdressing phosphate onto pasture, phosphate leaching on sandy-surfaced soils, and residual value of dressings of 1 ton or more were all investigated. In 1961/62 glasshouse trials comparing different copper ores were commenced.

Nitrogen could increase feed available in autumn on dairy farms.
In the early 1960s trials investigating continuous cropping were established from Binnu to Avondale. Three nitrogen sources (urea, sulphate of ammonia and calcium ammonium nitrate) were being tested at five rates. Rates of seeding and rates of nitrogen were being tested at two sites. This was long-term work which made a vital contribution to the new agriculture which developed later.

Nitrogen fertiliser was also tested in the higher rainfall areas on pastures and crops sown for early feed. Substantial early growth was achieved. While the value for some purposes needed to be assessed in grazing experiments the conversion of feed to product was easier to determine in the dairy industry. The effect of nitrogen on production and hay yields in the higher rainfall areas was also tested.

It was noted that lucerne seemed to have a higher phosphate requirement than subterranean clovers.

In 1962 a trial to determine the residual value of potash was established, with the aim of determining the minimum rate which would avoid deficiency. Soil type and management were found to be fundamental to such work. Leaching soils or hay cutting were both dominant issues.

In 1962 it was suggested that a zinc contaminant in super had been important in maintaining the zinc level of previously deficient pastures. Residual values of copper and zinc and availability of sources for pasture and wheat were investigated.

Pasture species trials were carried out with a range of legumes over a wide range of environments.

Molybdenum deficiency was shown to be important in a confined area of the dissected hills associated with the Blackwood River and its tributaries in the Donnybrook, Bridgetown, Nannup and Boyanup districts. It was later found to occur extensively in subclover on some soil types in the Great Southern. Molybdenum had been shown to be required at higher levels for growth of crucifers than for nitrogen fixation in legumes. Grasses were known to have the lowest requirement. It was therefore surprising that it was also found to be deficient on cereals across large areas of the eastern wheatbelt.

Legume species were being compared to test their suitability for use on deeper sands. Different legume species were also being tested for suitability for the drier part of the wheatbelt. *Rhizobium* strains for various legumes and for lucerne were being examined.

In the early 1960s rates of super on clover on new land, maintenance dressings on older clover pastures, and the value of rock phosphate were assessed. It was concluded from this work that the use of fertiliser on pasture used for wool or meat production needed to be assessed under grazing with varied stocking rates. Different fertiliser rates could alter pasture composition and result in quite different results to those obtained under simple plot trials.

As a result an experiment comparing the interaction between stocking rate and phosphate fertiliser was commenced west of Mt Barker in the early 1960s. This experiment continued for a number of years and is reported elsewhere. A similar experiment was established on a different soil type on a property north of Kojonup. This work confirmed that it was essential to test fertiliser rates under grazing.
During the early 1960s CSIRO demonstrated in an experiment that higher stocking rates were possible on developed pasture than was industry practice. This led to widespread testing of stocking rates across the agricultural areas, with a general confirmation of the CSIRO results.

While superphosphate gave a response when applied in the planting hole with young apples there was no response to nitrogen application. Also there had been no response to surface phosphate and nitrogen dressings to grape vines in the Swan Valley.

Soil acidity was a problem causing poor production from cover crops on sandy soils at Caversham and potash deficiency was a problem for lupins, serradella and subterranean clover on a deep banksia sand at Caversham.

Possible toxicity of sprays on vegetables was investigated but no evidence of damage was found.

Experiments were carried out on broadcasting superphosphate as a method of speeding up the seeding process. It was shown that phosphate drilled near the seed was more available to cereals than when it was broadcast. Later work would show that broadcasting was the totally wrong approach to getting value from fertiliser.

**Wheat grain quality**

In collaboration with the Plant Research Division, the Cereal Laboratory studied the effects of variety, climate and soils on grain quality, the effect of nitrogen status of plants on grain quality, and the effect of nitrogenous fertiliser on grain quality and yield. In general the survey confirmed previous findings that the nitrogen level depended on rainfall, soil type and ripening conditions. On average the ‘heavy’ soils provided 1.3 per cent more protein than the ‘light’ soils.

**Horticulture**

The Apple and Pear Export Marketing Plan and subsequent statutory marketing arrangements had lapsed by the end of 1950 and marketing was freed up for the first time in a decade. The apple crops over the decade fluctuated but were generally in the range of 1.0 to 1.5 million bushels of apples, with exports at around 750 000 bushels. Pear exports were in the range of 100 000 to 130 000 bushels.

The industry was concerned about the decline of orchards during the war. The 1953/54 report noted that “the condition of the orchards continues to decline, with more orchards going out of production”. Expansion was limited by the cost of establishment and the time taken to get a return. Citrus also continued to decline. Stone fruit had shown a small increase. Shortage of nursery stock was an issue.

Research on storage issues with apples and stone fruit was carried out through this period. A particular problem was surface scald of Granny Smith apples in storage and the work developed a method of packing and storing to eliminate this problem. In 1953/54 experiments were also carried out to test chemical treatment of Jonathon apples to accelerate maturity.

Control of budburst and foliation on Granny Smith apples with oil sprays in areas with insufficient cold periods was investigated. Increased yield of fruit and increases in fruit size were achieved. Premature fruit drop in citrus was shown to be reduced by 2,4-D application.

In 1955 investigations continued on the use of oil sprays to overcome delayed foliation, plastic packing liners to improve storage, growth promoting agents and the introduction of superior strains of citrus from Victoria and South Australia. In 1957, items under investigation included zinc deficiency of apples at Albany, eelworm levels in replant areas of apple orchards, fruit thinning, use of mulches on orchards, storage of pears and apples and grapes using plastic liners, and superficial scald of Granny Smith apples.

There had been an increase in the planting of young trees, particularly apples, leading to...
an increased demand for advice on orchard layout, establishment techniques, pruning and after-care.

Potato production continued as normal, with increased interest in irrigation in the areas outside the major schemes. Some diseases not previously recorded were seen in the crops. Certification of crops for the production of seed potatoes and of seed of the ‘Westralia’ bean took considerable staff time. Officers were also heavily committed to lectures and show judging.

In the 1960s further work was carried out on superficial scald of Granny Smith apples and bitter pit of Cleopatra apples. Sprays of calcium nitrate applied from early November until early February reduced bitter pit from 25 to 11.5 per cent. Calcium chloride also cured the problem. Tray pack and cell packs were compared; both were examined in London, where it was found that the tray pack produced more bruising than the cell pack.

Citrus rootstocks were tested over a period and in 1963 the citronelle and sweet orange rootstocks had produced the largest trees. Troyer citrange were somewhat smaller, with trifoliata generally giving the smallest trees. Extensive apple thinning experiments were carried out during the year. Later citrus rootstock work showed that on soils better suited for citrus, troyer citrange produced good growth, cropping and fruit quality, citronelle had good growth in all areas but produced the poorest quality fruit. Sweet orange showed good growth and moderate cropping. Trifoliata gave the poorest growth but the best fruit quality.

Studies of chloride uptake from saline water are reported elsewhere.

Sodium fluoro-silicate plus malathion was used extensively for fruit fly control.

In 1961/62, trials were carried out to determine ways of controlling superficial scald and other storage problems of fruit marketed in bulk as opposed to being wrapped before packing. Calcium sprays were tested for control of bitter pit.

Breakdown of Yates apples stored in sealed polythene was shown to be due to a low oxygen environment. A range of rootstocks were under test. Chemical thinning of apples was investigated. Herbicides were tested for weed and cover crop control in orchards.

Viticulture

The viticulture industry continued through the 1950s, with some expansion into the Bindoon area, which required considerable help for new farmers. Later the War Service Land Settlement vineyards at Bindoon were restructured.

The main influence on outcomes was the conditions around ripening, and for the dried fruit sector, during drying. Little progress was made in dealing with the problem of unthrifty vines. The use of parachlorophenoxyacetic acid (PCPA) was effective in removing the need for cincturing of dried fruit vines. This work was confirmed and recommended to the industry in 1953/54. Subsequently it became clear that cincturing had reduced the vigour of the vines and sprayed vines gave better growth and yield.

New dipping materials developed by CSIRO for drying sultanas were tested and the chemical PCPA was used for setting Early Madeleine table grapes and preventing shattering in Santa Paula grapes.

Special attention was given to grapes in order to raise the standard of export packs. Estimates of crop sizes and maturity dates were made for all crops as a service to marketers and exporters. Advice on storage resulted in 10 000 cases being packed in polythene to achieve improved outcomes.

In 1957 the research program in the viticultural area included studies of the value of different cover crops in different soil and drainage situations, setting Ohanez grapes with pollen sprays, a study of currant grape buds, methods of dipping sultanas, the use of hormones in setting currants, and the propagation of desirable material.
In the 1960s currant pruning techniques, the use of alternative packing material and techniques for packing export grapes, use of gibberellic acid on grapes, and the possibility of using river or tributary water were all being investigated.

Vegetables
Potato variety trials pointed to Kennebec being the best for WA conditions. The hybrid Lakelend x Smoothskin looked the best in tomato variety trials. Harvesting trials were carried out with brown onions to test the production of dry onion sets; this was abandoned because it was decided that the process could not be used commercially.

In 1961/62 boron fertiliser was tested in an area where a deficiency was suspected but there was no response. A survey showed that WA potatoes had low solids. Work was being carried out to test the potatoes' suitability for frozen chips. Tests with ‘topping and tailing’ onions showed improved storage.

Studies of the establishment of peas and of available varieties, cauliflower variety trials, cabbage variety trials, broccoli and Brussels sprouts for snap freezing, and tomato variety trials were carried out.

The pastoral areas
The Ord Regeneration Project was started in the early 1960s. Rice trials were carried out at Camballin and buffel grass was being tested on the Pindan. In 1961/62 the department began a regeneration demonstration of denuded country in the Fitzroy Valley.

Lambing and mating trials were being carried out at Abydos, together with pasture management work. Animal studies showed local rams were more fertile and maintained a higher libido than imported rams.

Animal health and production
Experiments were carried out on time of lambing and on flushing ewes before mating. Experiments on poultry meat birds showed that riboflavin was not deficient in the normal diet. Different fattening rations were tested. Of the items tested fish meal appeared to increase growth rate more than other protein sources. This was confirmed in feeding trials during the following year. Rations with an energy to protein ratio of 45 to 1 were favoured. In laying trials there was no comparable response to fish meal. In contrast with the result from meat birds, experiments with layers showed riboflavin was deficient in the ration. Also there was an advantage of including green feed in the ration. Following this early work a full range of feeding trials was started.

Experiments examining time of mating of ewes were established at Esperance and Walebing. Mown and unmown pastures were compared as summer feed for weaners.

Resistance to penicillin was reported in mastitis examinations and vibriosis was identified as the main source of infertility in the dairy herd.

Poisoning of horses by *Crotalaria crispata* rather than *C. retusa* was identified in the Kimberley.

An examination was undertaken of the effects of subterranean clover in a mixed pasture on the fertility of ewes where the clover did not produce gross effects on the ewe. During the period a large experiment was set up at Esperance to compare the effect of different strains of subterranean clover on sheep production and fertility. Also the effect of weaning lambs several weeks before slaughter on carcase weight and quality was examined.

In 1961/62 an examination of a general ‘ill-thrift’ of sheep was attributed to marginal copper and cobalt levels. A detailed study was continuing. A survey showed critically low selenium levels in pasture throughout the South West. Lupinosis studies continued without any success.

Vibrionic abortion of sheep was reported near Ballidu.
**Plant diseases**

Root rots of cereals were a serious problem in clover ley cropping. No treatment apart from a cleaning crop had been successful in overcoming it. Depth of seeding was important in achieving good germination. The new rust strain 21-2 had taken Gabo out of the varieties to be sown. This work was continuing. In 1961/62 it was reported that the yellow dwarf virus had been discovered in WA for the first time.

The Pomme de Neige rootstock and plants free of the mosaic virus of Granny Smith and Jonathon apples were developed. In 1961/62 studies of the impact of the virus on tree growth were started. Virus indexing of plums for the line pattern disease had also started.

Studies of fungi involved in apple dieback continued. Tests of fumigation of apple orchards for long-term benefit and as a demonstration of the impact of nematodes were started.

Virus indexing of grape varieties was started in the mid-1950s. Studies of the resistance of grape rootstocks to nematodes began in 1964 and by 1966 had shown two available rootstocks to be resistant. Increased yields following fumigation had reached 28 per cent on sandy soils.

Vegetable disease control measures using old and new fungicides were outlined. The need to produce pedigree seed of the rust-resistant Westralia bean was noted.

Clover stunt virus at Esperance was the only pasture problem referred to. Lime pelleting of inoculated seed was favoured over inoculated-only seed.

In the 1964/65 report reference was made to a joint study of Jarrah dieback by the Forest Research Institute, the Forestry and Timber Bureau, Department of National Development, and the Department of Agriculture. The outcome was the identification of *Phytophthora cinnamomi* as the causative agent of Jarrah dieback.

**Entomology**

In a changing world in which new chemicals were becoming available but community concerns were increasing about chemical residues in food, the task of the entomologists became more complex. Some recommendations were made despite these constraints.

San Jose scale control measures were recommended. It was found that spider mites could be controlled with organo-phosphate sprays. A recommendation for citrus red scale control was made. It had been shown that fruit fly could be controlled in citrus with organo-phosphates in association with summer oil.

Detailed studies of the life cycle of the webworm in crops were being made. Control of black beetle in potatoes was also being examined. Further work on grasshoppers was started and an entomologist had been located in the Kimberley. In 1961/62 this program continued.

Insect control on the Ord River had started and the webworm complex was being worked out. Before the end of the decade insect control in the cotton crops on the Ord was becoming a serious issue.

**Weeds and seeds**

Saffron thistle was difficult to control as only about 30 per cent of the seed germinates. Early spraying was necessary. Cape tulip control was difficult because of reproduction from corms; burning reduces the number of corms and it was thought that a hot summer might also have a detrimental effect on their viability. Studies of soursob had started but it transpired that this never became a major problem. Evaluation of new herbicides was being carried out for control of weeds in vegetable gardens. It was found that control of eucalypt suckers was helped by adding white oil to 2,4,5-T. A study of hard-seededness of legumes was started.
Botany

The retired Curator of the Herbarium was continuing to work on the *Flora of Western Australia*, concentrating on the eucalypts.

In 1964 it was reported that fluoro-acetic acid had been found in the *Gastrolobium* and *Oxylobium* poison plants. This was confirmed in 1965.

Administration of Acts

The Department of Agriculture had 50 Acts of Parliament under its control. The relevant ones for this period were:

**The Agricultural Products Act**

Products exported to overseas or eastern states markets were inspected for soundness, quality packing and presentation. Products arriving at Kalgoorlie or Fremantle were similarly inspected.

This work continued year by year. Air freight of fresh vegetables to Singapore was an important part of the export trade.

**The Agriculture Protection Board Act**

The Agriculture Protection Board continued its activities in cooperation with shire councils and farmers. It had reduced vermin to low levels compared to a few years earlier.

Grasshoppers had not been an issue and ploughing of egg beds and on some occasions flooding had reduced the potential threat for the following season. Emus, kangaroos and wallabies had also been dealt with. This program had continued to keep the levels of rabbits, dogs and foxes to low numbers. Kangaroos, emus, wallabies, galahs, wild donkeys, wild horses and camels had all caused problems in local areas. The barrier fences had proved to be valuable barriers to vermin access.

**Argentine Ants Act**

The program continued through the period and involved cleaning up re-infestations and dealing with ‘new’ areas. This program continued until 1984.

**Bees Act**

The *Bees Act* provides power to control exotic diseases found in apiaries. American foul brood disease was found in 10 hives, which were destroyed. No significant activity was reported later in the period.

**Dairy Cattle Industry Compensation Fund**

This fund was based on a tax of 2 cents per pound of butter to compensate farmers for cows destroyed after reacting to the TB test. The farmer contribution is matched dollar for dollar by the State. All dairy cows had to be tested after 1 July 1961. During 1961/62 a total of 78 163 cattle in 1634 herds were tested, with an incidence of 0.86 per cent. The first test covering 85 000 cattle was expected to be complete by December 1962; 20 000 cattle from whole milk suppliers showed a reactor rate of 0.56 per cent.

**Dairy Industry Act**

The *Dairy Industry Act* provides power to maintain hygiene and quality standards in factories and on farms in the dairy industry. While there had been a general improvement in hygiene and facilities, cream grading had not reached the desired standard. Farm inspections showed 31 per cent of farms were not meeting current standards.
Fertiliser and Feedstuffs Act
The general standards of fertilisers and feeds were found to be satisfactory, with samples analysed meeting the requirements of the Act. This work continued annually and maintained a satisfactory level of control over the industry.

Noxious Weeds Act
The APB organised comprehensive schemes to deal with caltrop, cape tulip, blackberry, mesquite, carnation weed and saffron thistle. Large areas of blackberry were sprayed, which reduced the infestation dramatically. All the large mesquite trees in the Pilbara were killed and some other progress was made. Small areas of cape tulip and saffron thistle had been controlled and action taken on the larger areas.

Plant Diseases Act
The Plant Diseases Act provided power to control the import of plant material into Western Australia, to inspect orchards and packing houses or to require packing materials to be disease free. It could also require compulsory action to be taken against insects such as the fruit fly. This work continued during the period. Planting material produced in WA was fumigated as required, together with used fruit cases, used bins and fruit despatched to the South West.

Plant Quarantine Act
Imported plant material (fruit or plants) and timber were fumigated as required and in some cases grown on under quarantine. Prohibited material was destroyed. Post offices were also monitored.

Pig Industry Compensation Act
Under the Pig Industry Compensation Act 325 pigs were condemned and the owners compensated.

Soil Conservation Act
The only legal action taken under the Soil Conservation Act related to clearing control in 14 shires in the north-eastern wheatbelt. Since the introduction of controls in 1950, 2219 applications to clear 1,265,697 acres had been dealt with.

Veterinary Medicines Act
During 1960/61, 133 new registrations and 453 re-registrations were approved under the Veterinary Medicines Act; 21 were deferred and two rejected. Similar numbers of stock medicines were registered and re-registered each year.