AERIAL AGRICULTURE: OPERATIONS DURING 1961-62

Particulars	Unit	N.S.W.	Vic.	Q'land	S. Aust.	W. Aust.	Tas.	Total(a)
Top-dressing and seeding—								
Area treated with—								
Superphosphate alone	Acre	3,997,857	600,994	1,060	150,847	306,921	74,230	5,131,909
Seed alone	,,	167,180	925	107,419	8,645	1,029	100	285,298
Superphosphate and seed together	,,	850	74,300	..	1,230	41,792	..	118,172
Gypsum	,,	263,809	..	..	..	1,120	..	264,929
Other	,,	890	300	2,237	3,010	19,461	..	25,898
Total (a)	,,	*4,330,707*	*676,219*	*110,716*	*163,732*	*366,103*	*74,330*	*5,721,807*
Materials used—								
Superphosphate	Ton	201,659	43,860	53	8,226	19,221	4,734	277,753
Seed on—								
Pasture	lb.	303,920	5,135	187,106	119,910	36,665	300	653,036
Other	,,	20,000	..	..	..	247,840	..	267,840
Spraying and dusting—								
Area treated—								
Pasture	Acre	39,238	37,012	4,173	8,445	6,982	600	96,450
Crops	,,	306,574	192,151	106,302	106,594	537,772	9,070	1,258,463
Other	,,	5,963	1,935	10,029	770	500	..	19,197
Total (a)	,,	*31,775*	*231,098*	*120,504*	*115,809*	*545,254*	*9,670*	*1,374,110*
Total Area Treated (a)	,,	**4,687,232 (b)**	**972,269 (c)**	**231,220**	**279,541**	**908,508**	**84,000**	**7,162,770 (d)**

(*a*) Areas treated with more than one type of material in one operation are counted once only. (*b*) Includes 4,750 acres baited for rabbit destruction. (*c*) Includes 64,952 acres baited for rabbit destruction. (*d*) Includes 69,702 acres baited for rabbit destruction. *See* footnotes (*b*) and (*c*).

NOTE.—The information contained in this table was collected by the Department of Civil Aviation.

4. **Pasture Improvement.**—(i) *Indigenous Species.* The earliest Australian pastoralists encountered a diversity of indigenous vegetation which had developed according to the varying conditions of soil and climate. The value of these plants as fodder, together with the local water supply, determined the capacity of each region as a grazing district.

The incursion of herds and flocks following the opening-up of new grazing districts resulted in many changes in the composition of native pastures. Species which were especially attractive to domestic stock were grazed more heavily, and in consequence suffered more than those which were hardier and less palatable. Where forests and bush were cleared, species requiring a shady aspect were frequently replaced by others which were normally found in exposed and drier areas. However, such species were not always well suited to the higher rainfall of the newly cleared regions, and new species had to be introduced from other countries to replace them. This introduction marked the beginning of pasture improvement.

The indigenous vegetation which is suitable for grazing may be classified into three groups according to growth habit—perennial grasses, annual grasses and perennial shrubs and trees.

The perennial grasses generally have the capacity to resist dry periods. The upper portions of these plants die off, and the crowns, which are usually at soil level, remain dormant. In northern Australia, where the rain falls mainly in the summer months, these plants hibernate during the colder winter months. Of the many species occurring, the best known are Mitchell grass (*Astrebla spp.*) and Flinders grass (*Iseilema spp.*). Spinifex (*Triodia spp.*) is a widespread desert type. In areas of southern States where summers are hot and dry, common aestivating species are wallaby grass (*Danthonia spp.*), spear or corkscrew grass (*Stipa spp.*), and panic or millet grass (*Panicium spp.*). In wetter areas, tussock grass (*Poa australis*) flourishes.

Members of the annual group generally have a short life cycle which coincides with the rainy season, and are both numerous and varied in Australia. In many districts, they are a valuable addition to the more permanent perennials.

The third group consists of shrubs and small trees, many of which provide satisfactory grazing for stock. Prominent species include acacias such as mulga and myall (*A. pendula*), kurrajongs (*Brachychiton spp.*), wilga (*Geyera parviflora*) and numerous species of salt bush (*Atreplex, Bassia* and *Kochia spp.*).

(ii) *Plant Introduction.* Exotic pasture plants introduced into Australia were characteristic of pastures in the United Kingdom and Europe. These included the rye grasses (*Lolium spp.*), cocksfoot (*Dactylis glomerata*), clovers—white (*Trifolium repens*), red (*T. pratense*), subterranean (*T. subterraneum*), and strawberry (*T. fragiferum*)—and lucerne (*Medicago sativa*). From America, paspalum (*Paspalum dilatatum*), and from Africa, rhodes (*Chloris spp.*), veldt (*Erharta calycina*), buffel (*Cenchrus ciliaris*), birdwood (*Cenchrus setigera*) and kikuyu (*Pennisetum clandestinum*), grasses were introduced. A large number of other species arrived as impurities in seed or in stock fodder which occasionally entered Australia by ship. Two of these introduced species developed very effectively in their new environment, the medics and subterranean clover. The latter is recorded as being established in South Australia before 1900.

(iii) *Pasture Research.* Australian research into improved pasture commenced some time prior to 1926, when Professor (later Sir George) Stapleton visited Australia. His work and visit gave a fresh impetus to improved pasture research which continued on into the 1930's. All State Departments of Agriculture, the Commonwealth Scientific and Industrial Research Organization, and some universities have staffs permanently engaged on this research. Progress has resulted from following three main lines of research.

The first is based upon the belief that a pasture, though usually a complex of various species, behaves like a crop in that it requires a fertile soil as well as suitable climatic conditions for active growth. Under grazing, considerable quantities of the various chemical elements are removed, and, unless the soil is well supplied with these basic elements and they are readily available to the plants, deficiencies are likely to appear. If this limited supply is depleted, less favourable species which require smaller quantities of these elements may appear, and in time assume dominance. If these species are of lower grazing value, this leads to pasture deterioration. The simplest case is of phosphatic deficiency which is widespread in many Australian soils. The response of pastures to the application of superphosphate was first demonstrated soon after the 1914–18 War. Since then, the practice has become an integral part of improved pasture maintenance programmes. At present, many millions of acres of pastures are top-dressed with superphosphate each year. On the other hand, Australian research into trace element deficiencies in soils and the methods developed for rectifying these has resulted in improved pastures being established on millions of acres of virgin land previously considered infertile. In this way, research into fertilizers and their application has greatly assisted research into improved pastures and their management.

The second line of research is based upon the fact that most species of pasture plants comprise a variety of forms, each of which has its own peculiarities of growth and development. These characteristics are often extremely significant in determining the success or failure of the species under certain soil and climatic conditions. For this reason, State Departments of Agriculture have introduced seed certification schemes aimed at guaranteeing that farmers obtain pure seed of a variety suitable for their district. A major problem still unsolved, however, involves the development of varieties which will provide a high yield of top quality feed in the summer rainfall areas of northern Australia. Varieties are also being sought which will thrive in the southern areas of the continent where limitations are imposed on plant growth by highly variable rainfall conditions.

Finally, research has been directed into the effect of grazing animals upon standing pastures, for if a pasture is to be maintained over the years it is necessary that the animals grazing on it be managed with due regard to the characteristics of the plant in the pasture.

The general level of pasture quality has improved steadily as these three lines of research have been developed, and the results have been applied at the farm level.