Agriculture and pollution in Western Australia. Part 2. Pollution problems in W.A

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PART II—POLLUTION PROBLEMS IN W.A.

In Part I pollution was defined as a reduction in the usefulness of a resource and its significance in relation to resource fragility was discussed. Pollution problems in Western Australia are here considered in broad geographical regions with further subdivision into pollution types.

Kimberleys

Silt
On the 17,800 square mile Ord River catchment, 1,450 square miles are seriously eroded due primarily to past overstocking. About a million dollars has been spent on pasture regeneration to reduce the silt load flowing into the new Ord River dam. The Public Works Department has estimated the annual average suspended sediment load at 20 million tons, enough to one third fill the main Ord dam in 100 years.

Dust
While silt is the pollution product of overgrazing and development in the wet, dust is its counterpart in the dry season. Dust covered vegetation is unattractive to stock, and some plant species die as a result of dense covering with dust. Sand-blasting of young seedlings may be a major factor influencing survival on denuded areas. Introduced animals such as donkeys, goats and camels contribute to overgrazing and hence to dust. Grazing control and re-vegetation on the Turner River plain have greatly reduced the dust storms which were once a regular feature of the area. The indigenous wallaby has increased dramatically in the Fitzroy River area following the provision of more watering points.

Dust is a pollutant affecting comfort, health, machinery wear, road safety, and wool quality. Of itself accumulation of dust in wool is of no great importance. However, dust may cause abrasive damage to wool fibres and result in inferior and hence lower priced wool. Besides being a personal nuisance, dust may affect the functioning of water tanks and troughs, and in severe cases may cover fences and fill cattle pits.

Pesticides
Because insecticides may contaminate meat the use of chlorinated hydrocarbons for the control of external parasites on cattle, sheep and pigs has been banned throughout the State, Craig (1967). Chlorinated hydrocarbons may also lodge in meat if eaten on contaminated feed.

On the Ord River irrigation area where heavy dressings of insecticides, weedicides and defoliants are common, there is a real opportunity for pollution problems to arise. Regulations are in existence to closely control the use of hormone
herbicides and methods of application in this area. Similar regulations apply in vine and tomato growing areas in the Swan Valley and near Geraldton.

**Other pastoral areas**

Many of the comments already made apply equally well in the other pastoral areas. Dust problems are possibly more severe due to the drier climate, more fragile vegetation, and recent large scale mining.

Some areas such as the Hamersley Ranges have been relatively little affected because of their ruggedness and the absence of good grazing lands. Similar areas exist in the Kimberleys. However, areas suitable for grazing such as the Gascoyne and Murchison catchments, have been almost entirely utilised by the pastoral industry and some sections are regarded as irreversibly degraded.

**Vermin poisoning**

Aerial baiting has been used extensively as a means of wild dog control. Consideration of the effects of control methods on wildlife are part of a research programme within the Agriculture Protection Board.

**Salt and boron**

Analyses of water used for irrigation at Carnarvon show that salinity, boron and sodium problems could be expected. The use of poor quality waters is likely to "pollute" the soil unless the levels of hazardous material are low and special irrigation and soil management methods are used.

Near the mouth of the river many properties have been abandoned due to water quality deterioration during drought. Saline groundwaters are common near the irrigation areas and heavy pumping for irrigation may result in salt water intrusion.

Top: Wheatbelt saltland.

Middle: Deep gully erosion in the degenerated area of the Ord River catchment.

Bottom: Pesticide spraying is an essential part of cotton production on the Ord River.
into the aquifers. Monitoring of water quality of all bores in the irrigation area has been commenced and it is proposed to restrict the use of waters below certain quality standards.

**Wheat and sheep areas**

**Dust and silt**

As in the pastoral areas one of the most serious and widespread pollution problems in the wheat and sheep farming districts is wind and water erosion. Heavy stocking and multiple cropping, with its associated stubble burning, are recognised as detrimental to soil in many situations. These practices combined with seasonal conditions have resulted in widespread water erosion and some of the worst dust storms in the cereal growing districts since the days of fallow (Soil Conservation Service Annual Report, 1969). Clover harvesting has resulted in very severe wind erosion on sandy surfaced paddocks.

The consequences of wind and water erosion which come within the definition of pollution include those listed for the pastoral areas as well as buried fences, drifts on roadways, sandblasted vehicles, and earth tanks in which silt and sheep dung create regular cleaning problems.

**Salt**

Another major pollution problem which occurs throughout the agricultural areas of the South West of the State is salt encroachment. Reports as early as 1897 indicate that destruction of the native vegetation turned the creeks saline in the Northam-Toodyay district.

The salinity problem is now acute on many farms. A redistribution of salts in the landscape has occurred following replacement of the natural perennial vegetation with annual crops and pasture. As a result, wells, earth tanks, springs, and rivers have turned saline. Vegetation has been killed in areas of salt accumulation and a total of 305,000 acres of previously good land was estimated to have become salt affected and unproductive by 1962 (Lightfoot, Smith and Malcolm, 1964). Salt affected areas are estimated to be increasing by about 9,000 acres per year, with appreciable economic loss to individual farmers. Technical and economic problems of reclamation are considerable and present research efforts are being concentrated on obtaining grazing production from the affected land using salt tolerant plants (Malcolm, 1969).

As for many other pollutants the sources of salting are frequently distant from the site of the symptoms. A good example is the presence of salt in rivers such as the Avon, Murray and Blackwood which have their headwaters in the wheat and sheep areas. There is evidence that the Blackwood River was fresh before agricultural development. The long term effects of agricultural development of land in the catchments of these rivers extend to their present unsuitability for use for irrigated agriculture and human consumption.

**Flooding**

A closely related problem concerns the increased run-off following clearing. In a survey involving 43 farmers and 165,800 acres of cleared land in the Hyden-Kondinin area, over four per cent of land was found to be salt affected and a further six per cent was affected by occasional shallow flooding, (Soil Conservation Service Annual Report, 1968). Although water is not generally regarded as a pollutant in semi-arid areas, temporary flooding in valleys, a consequence of land clearing, restricts the usefulness of the land for crops and pastures.

**Pesticides**

Pest control in the wheat and sheep areas involves the use of insecticides on growing crops, pasture and grain. General recommendations for control of insects include quarantine, cultural methods, biological control, and insecticides. Before use, each of these methods of control is assessed in terms of effectiveness, the effects on the balance of nature and possible residues and toxicity to other life. As an example, cultural practices for webworm control may obviate the need for any further action. Where insecticides are used, preference is given to organo phosphate or other materials over chlorinated hydrocarbons. The

A healthy stand of kapok bush established on a once completely bare area of Turner Plain in the Ord River catchment.
former do not accumulate in animal tissues as do the latter but they are more dangerous to handle, Craig (1967). The use of chlorinated hydrocarbons on pastures has been phased out in recent years. Dieldrin is not recommended at all on crops and pastures.

Local trials have been conducted in which control of insect pests of stored grain has been obtained by forced aeration of the grain silo at appropriate times, Rimes (1970).

Malathion is commonly used for control of grain storage pests and has a life of 3 to 6 months. After milling most of the residual malathion is in the bran. Another possible source of pollution in grain is from fungicides such as the organo-mercurial, copper containing, and hexachlorobenzene (HCB) dusts. Grain pickled with these materials may cause unacceptably high tissue levels of the chemicals when fed to sheep and pigs. Poultry meat and eggs may similarly be affected and pickled grain must not be fed to any animals destined for human consumption. Use of HCB dusts has recently been discontinued and organo-mercurial compounds are likely to be banned shortly on the recommendation of the Australian Pesticides Committee.

Weedicides
Cultural and management methods of weed control avoid pollution problems, and are preferred in many cases for agronomic reasons. Pearce, (1972) reports that low rates of 2,4-D weedicide followed by grazing can control most broad leaved weeds in pasture. The low rates of weedicide required do not adversely affect clover growth and also reduce the likelihood of any pollution side effects.

Weedicides have improved the prospects for using cropping systems involving minimum tillage. Since the weedicides employed leave no residue, and the system is likely to result in reduced run-off and silt, the minimum tillage system has the potential to reduce pollution.

The dispersal of weed seeds by vehicles and animals, in run-off, wind blown material, and grain may be considered as pollution. The Agriculture Protection Board sprays noxious weeds on local authority and public lands and may do so on private land. Spraying may damage wildflowers. However, information reported by spray operators indicates that major damage has probably not occurred.

Vermin poisoning
Pollution-free methods of vermin control are preferred by the Agriculture Protection Board but are not always available. Good control of emu migration has been obtained by the use of fences. Where 1080 baiting for rabbits is not desirable fumigation or ripping of warrens is undertaken. The use of 1080 does not appear to have had a serious affect on wildlife numbers. Birds and at least the larger native mammals require relatively large dosages of 1080 to kill them. From reports by the Agriculture Protection Board field operators and farmers, numbers of wildlife deaths attributable to 1080 baits appear to be low except for the wood duck (Tomlinson and Gooding, 1971). Dogs, cats, foxes and a hawk are known to have been killed by eating poisoned animals, presumably rabbits.

Myxomatosis offers the ideal selective non-polluting control for rabbits and is the subject of continuing study.

South West
Pollution problems associated with the cereal and sheep industries in the south west are largely the same as those discussed in the preceding section.

Pesticides
Problems of pollution of dairy, pig, and poultry products with pesticide residues are similar to those encountered in other areas. Pesticides are used with special precautions when other methods will not succeed. Improved labelling and increased awareness amongst users of the hazards associated with pesticides are believed to have led to improved handling and decision making.

For some years, vegetable crops in Perth and Carnarvon have been sampled fortnightly at random for chlorinated hydrocarbons and organo phosphates to ensure that they are safe for human consumption. In general, controls in force aim to minimise the use of chlorinated hydrocarbons and mercurial dusts on vegetables. An alternative to insecticides is the use of biological controls. Many types of specific viruses and predators are currently being tested.

Pesticide residue problems in fruit are probably least important in citrus where the latest spraying is normally five months before harvest and in any case the fruit are peeled. Fruit fly spraying on citrus is not common. If peel is to be used, special precautions may be adopted. Apples and pears are normally sprayed 1 to 2 months before harvest.

Residues in fruit are most likely to occur from the spraying of stoned fruit for fruit fly. The materials used are organo phosphates and spraying is done close to harvest. Checks of pesticide levels on export fruit are made and must comply with Commonwealth standards. Samples of home consumption fruit are also checked.

Biological control is always preferred to spraying and the two may complement each other. For example it is sometimes recommended in spraying for red scale that some trees be left unsprayed to perpetuate natural predators. Other work in W.A. on biological control includes study of a virus of light brown apple moth.

Waste disposal
Intensive pig and poultry husbandry present particular waste disposal problems. Liquid piggery and dairy effluent may not be discharged into streams, and spray irrigation is used as a method of disposal. Droppings and deep litter from poultry sheds provide a source of organic manure for vegetable growing. However, a growth active principle in fowl manure causes hormone-like distortion in sensitive plants such as tomatoes. Efforts to trace the source of the material have so far been unsuccessful. Fly problems on poultry manure are normally controlled with non-residual insecticides.

Fertilisers
On the coastal plain where high yielding crops with large fertiliser requirements are grown ground-
water pollution may occur. Although a large quantity of nutrients could be removed in a crop, it is likely there is a considerable flow of nutrients into the groundwater.

Problems of groundwater pollution by irrigated agriculture have influenced discussions between the CSIRO and the Town Planning Department on coastal plain planning. Effects of industry on agriculture and vice versa form part of current environment-oriented studies by the CSIRO.

Salt
Water supplies for irrigation and industrial and domestic use are of prime importance. A considerable monetary sum has been spent in purchasing properties in the Mundaring catchment in order to prevent salinity. Further south, in the Wellington catchment, studies have been initiated by the CSIRO to find the source and trace the movement of salt in catchments before and after clearing. The results may indicate whether activities such as bauxite mining, forest removal for pine planting, and the wood chip industry will contribute to stream salting.

Saline irrigation water is an important pollution problem in fruit production. Crops such as stoned fruit and citrus are highly sensitive to water quality. Degrees of stream salting which are of little or no consequence to stock, forage production or even domestic use, may cause considerable damage if sprayed onto the leaves of some fruit trees. Many orchards have declined seriously after being watered from supplies such as the Blackwood River, despite the use of under-tree sprinklers or trickle irrigation.

Air pollution
Air pollution by sulphur dioxide arises from the use of fuel oils with a high sulphur content. Only minor damage to some annuals and possibly to vines has been reported from this pollutant in Western Australia. Sulphur dioxide emissions are greatly reduced when natural gas is substituted for high sulphur fuel oil.

Fluoride air pollution may result from baking of clay products. High levels of fluoride have been found in pastures, vines, native trees, and garden plants in the vicinity of
brickyards and fertiliser works. Some years ago the occurrence of fluorosis in cattle near the Byford brickworks was investigated. Emissions of fluoride will not be significantly affected by the change to natural gas. Local fluoride damage to plants has included mild to severe leaf scorch and leaf shedding on a wide range of species.

Radioactivity
The possibility of radioactive contamination of agricultural products in Australia due to fall-out of strontium 90 and caesium 137 has been investigated by the National Radiation Advisory Committee (1965). Radioactive materials in milk and sheep bones were examined from animals on various pastures in Australia. It was concluded that all but long lived isotopes had decayed to negligible levels. However in the proceedings of the International Atomic Energy Agency Seminar on Environmental Contamination by Radioactive Materials in 1969, the need for continued surveillance of global fall-out is recognised, in view of the resumption of tests by new nuclear powers.

Noise
A general hazard for agricultural workers is noise pollution. A number of farmers have been found to be suffering from noise induced loss of hearing which has almost certainly been caused by tractor noise. Cost and performance problems mitigate against the general adoption of quiet tractors and the less satisfactory approach is to use ear muffs.

What can be done about pollution?
Already many controls are exercised through various departments and instrumentalities to minimise pollution of foods, water, air and other resources. Co-ordination of these efforts should result from the activity of the recently formed Environmental Protection Council.

The present review indicates the scope of pollution problems in the field of agriculture in Western Australia. In Sweden a large-scale public education campaign aimed recently to establish awareness of problems of pollution and to encourage the public to identify and report examples. Members of the public are often well placed to give early warning of the development of pollution problems (Anon, 1969).

Agricultural developments should be undertaken in the light of broad environmental considerations which have sometimes been overlooked in the past. Better pollution control will result if environmental criteria are considered in research, extension and practice. For this to be done however, it may be necessary to provide justification through cost-benefit analyses.

Conclusion
Pollution problems related to agriculture in Western Australia are widespread and of many types. There is general awareness of problems of pesticide pollution. Where overseas markets are likely to be affected careful control via Commonwealth sampling procedures is exercised. Materials for local consumption have been the subject of numerous tests. Research and extension generally aim at non-pesticide control, and where this is not possible minimum effective rates and least dangerous materials are sought. Some effective means of management and biological control have been devised.

Problems of salinity, silt and dust have caused inconvenience, discomfort, and economic loss over a vast area of the State. In some cases large sums have been spent to correct the problem. However, economic pressures and failure to take all the effects of agricultural practices into account result in the perpetuation of these problems.

Disposal of agricultural wastes needs attention as part of a mounting waste disposal problem. Health hazards for agricultural workers exist in the handling of pesticides and in machinery noise.

References
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