Intensive animal industries in the Peel-Harvey catchment

R W. Payne

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The Swan Coastal Plain to the north and south of Perth is attractive for the intensive production of pigs and poultry for several reasons. It is close to markets, feed manufacturers and labour; has a less extreme climate than inland areas; and is underlain by a large reserve of high quality groundwater.

These industries have also been joined in recent years by sheep assembly yards which have sprung up in the near-metropolitan area as staging points to allow the assembly, acclimation and inspection of sheep destined for the live sheep export trade; and their efficient loading onto ships at Fremantle.

Because these are all intensive operations, large quantities of nutrient-rich waste are produced over a very small area. They can severely damage ground and surface waters unless steps are taken to control the wastes which they produce.

This article outlines both the nature of intensive animal industries in the area and steps which are being taken to limit their impact on the environment.

The environmental problems of the Peel Inlet-Harvey estuarine system stem principally from an excessive input of phosphorus into the system, therefore this article concentrates on phosphorus. However, intensive animal production also results in the production of large amounts of nitrogen, and in areas such as the Gnangara and Jandakot water mounds, where shallow ground waters are earmarked for domestic water supplies, nitrogen can become a more significant pollutant.

Whilst the Peel-Harvey estuarine system is the most severely damaged water system in Western Australia, most of our southern rivers and estuaries show similar but less advanced signs of damage. Unless care is taken, strict control measures will be needed in these areas as well.

The origin of phosphorus in animal wastes

Phosphorus is an essential component of all animals' diets. As with other dietary components, the supply must exceed the animal's net requirement to compensate for digestive inefficiencies and the natural turnover of phosphorus from within the body. Wastes resulting from animal production, therefore, will contain phosphorus. In the case of pigs, only 20 per cent of phosphorus contained in the diet actually remains within the pig, the remainder is lost in the waste.

Phosphorus management practices

Unlike nitrogen, which can be converted to ammonia or nitrogen gas and thus lost to the air, phosphorus will always be retained within the soil or water system. This means that the only options available in environmentally sensitive areas are either to remove the phosphorus-rich waste to a less sensitive area, or to spread it on land at a rate which can be used by the receiving vegetation or retained in the soil.

Where adequate land is available, it is reasonable to spread raw wastes - assuming health and odour considerations are not compromised - in place of inorganic fertilizers. However, as shown in Table 1, large areas of land are needed if phosphorus application rates are not to exceed the 9 kg/ha/year rate presently recommended for pasture on deep grey sands in the catchment. It is therefore often necessary to cart phosphorus-rich wastes further afield. To reduce cartage costs, the volume of the waste needs to be reduced, either by precipitating the phosphorus out of liquid wastes or by composting solid wastes.

Greg Fitzpatrick, of Wellard, alongside nine-month-old Tasmanian blugums and acacias irrigated with piggery waste on his property.
Poultry

Poultry waste is basically dry and is produced under cover, and so long as it remains under cover, does not represent an environmental threat. However, this material is often disposed of as organic fertilizer on market gardens. Phosphorus application rates resulting from this practice can be extremely high, and it is possible that limits will be placed on its use within the catchment.

The industry therefore needs to consider means of making it more attractive to cart their waste longer distances (i.e., out of the catchment). Composting the waste is one method. This will not decrease the amount of phosphorus, but will reduce the bulk of the waste to be handled.

Broiler sheds typically hold about 80,000 birds in ground-level pens spread with about 50 mm of sawdust. As birds reach market weight the shed is destocked and the sawdust and accumulated droppings removed before fresh sawdust is laid. This process is repeated about six times a year.

In the Eastern States a slightly different practice is used. Sawdust is only changed once a year. This practice poses health considerations for both poultry and humans, but these can be overcome by piling the wastes between successive generations of birds to allow sterilization by composting.

The Western Australian layer industry is based on caged birds, with droppings collecting on the floor beneath. Standard West Australian practice is to remove this material annually, whereas if sufficient room is provided below the cages (as in 'highrise' sheds), the wastes compost in-situ and do not need regular removal.

In both cases, the end result is a less bulky, more valuable waste and, in the case of the broiler sheds, a lower demand for sawdust.

Sheep assembly yards

A series of sheep assembly yards now ring the Perth metropolitan area to service the live sheep export trade. Only two sizeable operations are now operating within the catchment area—about 1.5 million sheep pass through them annually.

One of these assembly yards now holds about 80 per cent of its stock under cover; wastes are collected and removed by contractors in a similar manner to poultry wastes.

The second operator is presently negotiating with the Environmental Protection Authority (EPA) to develop a management programme which will control both nutrient losses and the dust which is often associated with livestock assembly yards.

Piggeries

Piggeries are the most environmentally significant of the intensive animal industries in the catchment, therefore the Department of Agriculture concentrates its work for intensive animal industries on piggeries. Some 23 operations between them hold 38,000 pigs.

Piggeries produce large volumes of waste because of the water used for shed washing and waste transportation. Phosphorus can be effectively separated from this liquor by passing the waste through ponds in which a combination of physical, chemical and micro-
biological events result in some 80 per cent of phosphorus settling into a sludge layer.

An alternative is to accelerate this settling process by adding chemicals such as lime or alum to the waste. What takes days in the ponds can be achieved in a matter of hours. However, the cost and technical complexity of chemical settling has prevented its widespread use. A new chemical settling method developed by the Department overcomes some of these limitations but chemical settling still produces a greater sludge volume than does ponding. The cost of handling this sludge is still a major hurdle to widespread use of chemical settling.

A programme has been developed between the Department of Agriculture and the West Australian Pig Producers Association encompassing all intensive piggeries in the area. This programme, which is presently before the EPA, seeks to reduce phosphorus losses from piggeries by more than half by upgrading treatment practices. These improvements are based on ponding followed by irrigation over pasture or trees to be planted under the Tree Trust Scheme recently established by the Department of Conservation and Land Management. Tasmanian bluegums (Eucalyptus globulus) for woodchips and will be planted. Several piggeries have already undertaken tree planting programmes, and results to date suggest that very high growth rates are attainable under these conditions.

The effect of trees is two-fold. Being a deep-rooted perennial crop, they scavenge phosphorus from the soil more efficiently than annuals, and a high evapotranspiration rate enables them to prevent the flow of waste waters either to ground waters or off the property in surface flow.

At this stage it seems likely a phosphorus application rate to trees of about 30 kg/ha/year may be acceptable on deep grey sands.

Possibilities of reduced phosphorus levels in pig feeds

Recent studies by the New South Wales Department of Agriculture show that pigs can attain optimal growth rates when fed lower dietary phosphorus levels than are presently recommended. Dietary phosphorus levels to grower/finisher pigs could be reduced from 5.0 g/kg of diet to about 3.5 g/kg.

The reason for this may be that Australian standards for pig feeds are based on total phosphorus levels recommended from British and American trials. These trials used diets based on maize and soya bean, from which only 12 to 20 per cent of the phosphorus content is digestible, compared with 33 to 50 per cent digestibility in barley and wheat commonly used in Western Australian rations.

There is, however, a further complicating factor in that the pig's phosphorus reserves are placed under particular stress during pregnancy and lactation. As future breeding animals are selected from the herd at the end of the grower/finisher period, any reduction in dietary phosphorus levels in the growing pig may jeopardize the herd's reproductive potential.

A study has started at the Department's Medina piggery to determine the effect of decreased dietary phosphorus levels on reproductive performance. Young pigs are being raised on a range of dietary phosphorus levels to maturity (90 kg live weight) and selected gilts will then be monitored through two pregnancies.

If this trial demonstrates that lower phosphorus levels can be used without detriment, then it is estimated that the total phosphorus output by the pig industry in the catchment area could be reduced by a further 28 per cent.