Planning for horticultural expansion on the Swan Coastal Plain

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Horticulture is an intensive, high value form of agriculture highly dependent on the availability of good water supplies for the year-round production of fresh produce. Population increase in Western Australia and the encouragement and development of export markets has caused rapid expansion of the industry in recent years.

Expansion is expected to continue, placing severe pressure on available water supplies and suitable land close to markets. At present, 90 per cent of the State’s horticultural land is on the Swan Coastal Plain and minor selected hills areas around Perth.

On the coastal plain virtually all irrigated water pumped from the underground water supplies of the Perth Basin exploits mainly the superficial or shallow aquifers. The soil types overlying these aquifers are infertile, porous sandy soils needing heavy fertilization for optimum yields.

Existing horticultural irrigation practices, as well as urban and industrial activities, have the potential to pollute groundwater with nutrients such as nitrogen and phosphorus. Moreover, these underground water resources are not limitless and their use is already stretched under existing production.

Groundwater polluted with nutrients may not be suitable for future uses as a domestic water supply, or it may need expensive treatment. Such water also finds its way to lakes and wetlands.

To manage such problems careful planning is needed to cater for the land and water demands of horticulture and to avoid deleterious side-effects on the environment. Suitable land and water resources need to be identified for horticultural use and improved management practices developed for optimum production and reduced water and fertilizer inputs.

The Water Authority of Western Australia and the Department of Agriculture have been assessing the demand for and the availability of land and water for horticultural purposes. The initial study is on the Swan Coastal Plain between Moore River and Dunsborough. Once completed, the potential of the Swan Coastal Plain to the north of Moore River and inland parts of the south-west of the State will be assessed.

### Demand for horticultural produce

The term ‘horticulture’ covers vegetables, fruit, grapes, nuts, flowers and ornamental plants. Of these, vegetables and fruit account for about 75 per cent of the total land and water use by horticulture. The actual area of land irrigated differs significantly from the total area of vegetable crops because of multiple cropping.

Western Australia’s demand for horticultural products is a function of population and per capita consumption (Table 1).

The outlook for the State’s horticultural exports also appears favourable, particularly in the Asian region (Table 2).

If these projected increases in output are to be realized, more land will have to be brought into production and more water used.

### Land and water demand and availability

A reasonable figure upon which to base estimates of water demand for the vegetable industry is 11 ML (megalitres)/ha/year. This accounts for two crops each year, the cool season crop requiring 4 ML/ha and the warm season crop 7 ML/ha.

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**Planning for horticultural expansion on the Swan Coastal Plain**

By Peter Coghlan¹, Geoff Moore² and Jim Dixon³

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*Industry and housing are encroaching on to horticultural land.*
The projected horticultural demand for land and water, and the source of that water, in 1996 and 2011 are shown in Tables 3 and 4.

The Water Authority has a policy of not developing new public surface water storages to supply irrigated agriculture. However, the use of public water supplies is very small relative to that of private surface and groundwater and this policy will have minimal impact on the industry.

Table 1. Projected Western Australian consumption of horticultural produce

<table>
<thead>
<tr>
<th></th>
<th>1986</th>
<th>1996</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables (tonnes)</td>
<td>166,400</td>
<td>198,400</td>
<td>257,300</td>
</tr>
<tr>
<td>Fruit (tonnes)</td>
<td>65,830</td>
<td>76,100</td>
<td>98,700</td>
</tr>
<tr>
<td>Grapes (tonnes)</td>
<td>10,950</td>
<td>14,160</td>
<td>21,750</td>
</tr>
<tr>
<td>Nuts (tonnes)</td>
<td>4,680</td>
<td>7,105</td>
<td>13,510</td>
</tr>
<tr>
<td>Flowers and ornamentals ($M)</td>
<td>25</td>
<td>54</td>
<td>97</td>
</tr>
</tbody>
</table>

Source: J. Gallagher

Table 2. Projected export of Western Australian horticultural produce

<table>
<thead>
<tr>
<th></th>
<th>1986</th>
<th>1996</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables (tonnes)</td>
<td>34,800</td>
<td>90,260</td>
<td>187,720</td>
</tr>
<tr>
<td>Fruit (tonnes)</td>
<td>15,564</td>
<td>13,990</td>
<td>18,490</td>
</tr>
<tr>
<td>Grapes (tonnes)</td>
<td>520</td>
<td>585</td>
<td>640</td>
</tr>
<tr>
<td>Flowers and ornamentals ($M)</td>
<td>2</td>
<td>8</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: J. Gallagher

Most of the horticultural development on the Swan Coastal Plain will depend on private underground supplies. In broad terms groundwater beneath the coastal plain may be obtained from the superficial, Leederville or the Yarragadee formation. However, about 9,000 ha of additional land will be needed to meet horticultural demand in 2011. Of this, about 6,000 ha will be supplied from these coastal plain aquifers.

Table 3. Summary of land and water needed for horticulture

<table>
<thead>
<tr>
<th>Horticultural activity</th>
<th>1986 Land (ha)</th>
<th>1986 Water (ML)</th>
<th>1996 Land (ha)</th>
<th>1996 Water (ML)</th>
<th>2011 Land (ha)</th>
<th>2011 Water (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>3,050</td>
<td>33,550</td>
<td>3,960</td>
<td>43,560</td>
<td>5,260</td>
<td>57,850</td>
</tr>
<tr>
<td>Fruit</td>
<td>3,150</td>
<td>31,500</td>
<td>3,610</td>
<td>36,100</td>
<td>4,950</td>
<td>49,500</td>
</tr>
<tr>
<td>Grapes</td>
<td>630</td>
<td>6,300</td>
<td>860</td>
<td>8,600</td>
<td>1,215</td>
<td>12,150</td>
</tr>
<tr>
<td>Nuts</td>
<td>600</td>
<td>6,000</td>
<td>890</td>
<td>8,900</td>
<td>1,690</td>
<td>16,900</td>
</tr>
<tr>
<td>Flowers and ornamentals</td>
<td>862</td>
<td>10,845</td>
<td>1,980</td>
<td>24,950</td>
<td>4,100</td>
<td>51,600</td>
</tr>
<tr>
<td>Total</td>
<td>8,292</td>
<td>88,195</td>
<td>11,300</td>
<td>122,110</td>
<td>17,215</td>
<td>188,000</td>
</tr>
</tbody>
</table>

ML = megalitres Source: J. Gallagher

Of the 100,000 ML of irrigated water needed per year for the projected expansion, 70,000 ML or so will come from coastal plain aquifers. Perth's current annual water consumption by comparison is 200,000 ML.

Demand for water and land are not so easily matched. Although horticulture uses 11 to 15 ML of water per hectare, rain replenishes only one-tenth of this amount to the aquifer each year. In crude terms, for every hectare of horticultural land, up to 10 ha of recharge capacity needs to be reserved to replace the groundwater used. This implies a rather diffuse distribution of horticultural enterprises throughout the coastal plain which adds to the difficulty of managing environmental problems. It also emphasizes the over-riding need for more efficient irrigation practices.

The Water Authority is still determining whether or not there is sufficient water to meet the State's projected demand from the horticultural industry (Table 4).

Land capability study

Land capability is the ability of the land to

Table 4. Projected Western Australian horticultural demand (ML) for water by source

<table>
<thead>
<tr>
<th></th>
<th>1986</th>
<th>1996</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>41,600</td>
<td>64,700</td>
<td>111,000</td>
</tr>
<tr>
<td>Public surface water</td>
<td>3,500</td>
<td>4,900</td>
<td>7,500</td>
</tr>
<tr>
<td>Private surface water</td>
<td>43,100</td>
<td>52,500</td>
<td>69,500</td>
</tr>
<tr>
<td>Total</td>
<td>88,200</td>
<td>122,100</td>
<td>188,000</td>
</tr>
</tbody>
</table>

Source: J. Gallagher
Wetlands are valuable, but overpumping of groundwater could cause them to contract.

A land capability classification relies on specification of the crop type, crop management and conservation requirements. The land's attributes relevant to the growth of that crop type, to farm management and to conservation can then be listed, mapped and compared.

The land capability study so far has concentrated on the Swan Coastal Plain between Moore River and Dunsborough since a large proportion of the industry's expansion will probably occur here. The land resources of the Swan Coastal Plain have been assessed for their ability to sustain a specific use without on-site or off-site land degradation.

Land use = General Perennial Horticulture

- Class I Very high capability
- Class II High capability
- Class III Fair capability
- Class IV Low capability
- Class V Very low capability

Mandurah-Murray Land Capability Study Map from Martin Wells
support horticultural activities. This information will be combined with information on climate, water availability, eutrophication hazard and land tenure to identify areas to which horticulture may expand.

Several soil maps at scales of between 1:250,000 and 1:15,840 have been interpreted in terms of the ability of mapped soil types to support horticultural uses. The map units range from broad soil associations to soil phases, and they will always include other soil types. The assessment follows the methodology of FAO (FAO, 1983).

In this study, the following land attributes were assessed for each map unit.

**Crop requirements**
- Site drainage
- Moisture holding capacity
- Nutrient availability
- Rooting conditions
- Salinity hazard
- Flood hazard

**Management requirements**
- Suitability for machinery
- Soil workability

**Conservation requirements**
- Wind erosion hazard
- Water erosion hazard

How well the requirements of the crop, management and conservation correspond with the land attributes is expressed as a 'capability class'.

The generalized definition of land capability classes are:

- **Class I** - Land with a very high capability for the proposed use.
- **Class II** - Land with a high capability for the proposed use.
- **Class III** - Land with a fair capability for the proposed use.
- **Class IV** - Land with a low capability for the proposed use.
- **Class V** - Land with no capability for the proposed use.

The final capability classification for each land use or each map unit of the Spearwood Dune and Pinjarra Plain systems, for example, is shown in the map.

### Environmental issues and planning conflict

The location and development of a successful horticultural industry depends on more than the availability of land and water.

- **Wetlands** have a high public amenity value. Some of their wildlife is migratory and subject to international preservation agreements. The location of horticulture in relation to a wetland could have a major influence on that wetland by polluting it or lowering the watertable.

- **Nitrate nitrogen** from fertilizers, industrial and urban sources can pollute this groundwater. If the levels exceed 10 mg nitrate nitrogen per litre the water is considered unsafe for drinking.

- **Salinity problems** may develop from horticultural land use, the nature of the problem depending on the areas. Irrigation may cause aquifer drawdown and the movement of a salt water wedge in some areas. In other areas where there is a shallow, saline watertable, irrigation recharge to this watertable may lead to build-up of salinity through evaporative concentration of the salts at the surface.

- **Substantial areas** of the coastal plain are favoured by planning restrictions and as such, cannot be considered available for horticulture. These restrictions include local authority planning schemes and State Planning Commission schemes, areas overlying proclaimed groundwater supplies, Crown land and urban areas.

- **The Perth metropolitan area** is expanding rapidly, forcing horticulturalists further out. Land subject to urban encroachment becomes unavailable to horticulture as a result of its increasing value which prevents growers buying or expanding in an area. Other growers are encouraged to ‘cash in their superannuation’. Given the rapid spread of urban areas, the juxtaposition of remaining soil and water resources could well be limited.

- **Urban expansion** brings with it the issue of the ‘right to farm’. Urban dwelling and horticulture are not necessarily compatible land uses. Urban dwellers do not appreciate agricultural chemicals drifting into their back yards or even down the street, nor the odour of organic manures.

Growers are troubled by theft of produce, vandalism and litter. The time could arise when these conflicts erupt in court and the land user first in the area may need legal protection to be able to continue that land use.