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Growing sunflowers in south-western Australia

A progress report on sunflowers in Western Australia—and some basic information for farmers who wish to try this new crop

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Sunflowers were first cultivated by the North American Indians and were not introduced to Europe until the 16th Century. In the last 50 years, due mainly to the efforts of Russian plant breeders, they have become the third largest oilcrop in the world after soyabean and ground nuts (peanuts) and are especially important in Russia and Eastern Europe.

The oil produced from sunflowers falls into the "polyunsaturated" group and usually commands a premium price on world markets.

Some Western Australian farmers seeking to diversify their cropping programmes in the face of marketing difficulties for many agricultural products are trying sunflowers, although commercial production has not yet been achieved.

This article sets out some basic information for farmers wishing to try sunflowers.

Where to grow sunflowers
Most of the world's sunflowers are grown as summer crops in temperate regions on summer rainfall, soil-stored moisture or under irrigation.

Although sunflowers fall into the summer crops category they are much more adaptable than some other crops in this group such as maize, sorghum and soyabean.

They germinate reliably at much lower temperatures than these crops and are moderately frost and drought tolerant.
They do not have special day length requirements for flowering.

Farmers in south Western Australia are attempting to grow sunflowers in three fairly distinct situations:

**Winter-sown dryland crops**

Experimental and semi-commercial crops have been sown in the Geraldton region, at Lancelin, east of Albany and at Esperance over the past few years.

Crops are usually sown in late winter (late July and August) and mature in December-January. This later planting is preferred to the conventional May-June planting of cereals because early-sown sunflowers usually produce small heads and compete poorly with weeds under the cold, short day conditions of June and July.

For late winter plantings to succeed long growing seasons (south coast) or rapid maturity under adequate moisture conditions (Geraldton) are necessary.

**Summer-moist land**

On summer-moist land the crop is usually sown from September to November when the area is sufficiently dry for cultivation and weed control. The crop grows on soil-stored moisture.

A few successful crops have been harvested in the Albany region and some were grown around Busselton in 1975.

**Irrigation**

Encouraging results have been obtained with irrigated sunflowers on the sprinkler irrigated Tuart sands of the west coastal belt and preliminary trials suggest that yields up to 3 000 kg/ha are possible. Sunflowers grow to 2 m tall and this influences the type of sprinkler system used.

Sunflowers are also being tried under flood irrigation in the dairy areas this season.

**The sunflower plant**

The single-headed cultivated sunflower is very different from its many-headed wild cousin, which grows on wasteland around Fremantle and at Geraldton. The cultivated sunflower has been bred to produce a single strong stem bearing a large heavy head carrying a high proportion of fertile seeds.

At normal crop densities it is usually 1.5 to 2 m tall, has 20 to 25 leaves and carries a head 10 to 15 cm across.

Seed size of commercial sunflower ranges from 18 000 seeds per kilogram for the high-oil small-seeded Russian varieties to 9 000 per kg for the large seeded confectionery types.

The sunflower head is comprised of hundreds of small flowers. The outside row of flowers produces the typical “ray” petals around the head perimeter. Some ornamental sunflowers have all ray flowers. The inner whorls open at the rate of four to five rows per day, starting from the outside, and flowering time for the whole head is about 10 days.

Seed size varies considerably across the head and usually the centre of the head has a proportion of sterile seed.

**The seed**

The seed from the oilseed varieties consists of 40 to 45 per cent oil, 25 per cent hull, and 35 per cent high-protein meal.

The hulls are removed before crushing. They are very high in fibre and find various low grade end uses such as chicken litter and fuel.

The oil is extracted and refined and being high in linoleic acid can be described as “polyunsaturated”. For health reasons it is in demand for cooking and salad oils and margarine manufacture. It usually commands a premium price on world oilseed markets. The meal residue is high in protein and is a valuable protein source for stockfeeds.

**Plant development**

As a guide to when sunflowers will flower a “heat sum” can be used. This is measured in “degree-days” and is calculated by multiplying the mean monthly or daily temperature, \((\text{Max.} + \text{Min.})/2\) minus a certain base temperature (1°C is used for sunflowers), by the number of days involved.

The sunflower varieties being used at present require about 1 300 degree days to flower. Maturity is reached after a further two to three months.

The table below gives flowering times for a number of locations and times of planting using this formula. These are coastal locations with relatively warm nights. Inland from these towns flowering may be a few days later.

**Pollination**

Sunflowers are partially self-fertile but considerable self incompatibility exists in some lines. Yields are likely to be higher where there are populations of wild bees or beekeepers’ hives are present.

Sunflowers are very attractive to bees and care should be taken when applying insecticides at flowering to avoid killing bees.

**Varieties**

Sunflowers have three main outlets—for their high quality oil and protein, for birdseed and in the confectionery trade.

**Oilseed varieties**

Sunflowers for oil production have small black seeds. Open-pollinated varieties are mostly grown at present, but in the future there will be a shift towards hybrid sunflowers.

Most of the open-pollinated varieties are of Russian origin arising from the All Union Oilseed breeding station at Krasnodar, 800 km south of Moscow. The most famous of these varieties is Perevodik which by elite selection has been constantly improved in oil

<table>
<thead>
<tr>
<th>Location</th>
<th>May 1</th>
<th>July 1</th>
<th>Sept.</th>
<th>Nov.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth</td>
<td>Aug. 18 (110)</td>
<td>Oct. 16 (107)</td>
<td>Nov. 30 (91)</td>
<td>Jan. 10 (71)</td>
</tr>
<tr>
<td>Albany</td>
<td>Aug. 26 (118)</td>
<td>Oct. 25 (116)</td>
<td>Dec. 9 (100)</td>
<td>Jan. 22 (83)</td>
</tr>
</tbody>
</table>
content and yield over the past 20 years.

Other varieties are Armavirets, Chernianka and Krasnodarets and a range of "VNIIMK" varieties, usually bearing a code number such as VNIIMK 6450.

A reselected Russian type variety Sunfola 68.2 is sold in Australia by Pacific Seeds, Toowoomba, Queensland.

Hybrid sunflower seed has only become a commercial possibility over the past few years with the discovery of cytoplasmic male sterile lines and fertility-restorer genes. This genetic system ensures 100 per cent hybrid seed.

Hybrid vigour in sunflowers is high and the crop produced is much more even in plant type and maturity than open-pollinated types, a big advantage in commercial production.

The hybrids available at present in Australia are Hysun 10, Hysun 20 and Hysun 30. Hysun 10 is the earliest maturing of these and Hysun 30 the latest.

Release of a wide range of hybrids is likely over the next few years. These should incorporate improved yield, oil content, disease resistance, dwarf habit and most importantly for Western Australia, early maturity.

Birdseed
The most common birdseed variety is Polestar, which has medium size, grey and white striped seed. It is not suitable for oil production, having an oil content of about 35 per cent. Seed is available from Queensland.

Confectionery varieties
Confectionery varieties have large seed and are often sold dehulled. They are not grown in Australia at present.

They are usually very tall, late maturing and are grown widely spaced to produce large heads with big seed.

Price of seed
Polestar and Sunfola 68.2 sell at about 65 cents per kilogram ex Queensland. Hybrid seed costs $3.50 per kg ex Queensland. These varieties are available from Pacific Seeds, Box 337, Toowoomba, Queensland.

From time to time supplies of open-pollinated varieties are available through local stock agents and from Refinoil Pty Ltd of Jandakot.

Seeding rates and methods
Recommended seeding rates are 3 to 8 kg/ha, depending on seed size, germination and planting conditions.

Because sunflower heads produce seed of different sizes, various grades of seed are available and the supplier usually recommends a seeding rate for the particular grade.

Locally-grown seed sometimes has poor germination and seeding rates should be adjusted to allow for this.

The seeding rate should be calculated to produce about 60 000 plants per hectare. Assuming 75 per cent emergence this will require a seeding rate of about 80 000 seeds per hectare, which with medium grade seed will require a rate of 4.5 kg/ha.

Sunflowers are best sown with check plate row planters which deliver seeds very evenly along the row and have variable row width. Unfortunately few W.A. farmers have these machines; most will have to use narrow row cereal combines which normally sow rows 18 cm apart. At the low seeding rates used for sunflowers the plants are more evenly spaced if every second grain run is blocked off. Masking tape is satisfactory for this. Seeds sown in this way at rates of 80 000 seeds per hectare should give plants roughly on a 36 x 45 cm grid.

Some growers may have interrow cultivation or spraying equipment and the rows can be widened out further to accommodate this equipment by blocking off more rows.

Table 2.—Different planting grids with a plant population of 60 000 per hectare

<table>
<thead>
<tr>
<th>Space between rows (cm)</th>
<th>Plant spacing within rows (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>x</td>
</tr>
<tr>
<td>36</td>
<td>x</td>
</tr>
<tr>
<td>54</td>
<td>x</td>
</tr>
<tr>
<td>108</td>
<td>x</td>
</tr>
</tbody>
</table>

Yields should not suffer greatly if rows are widened out to as much as 108 cm and are likely to be increased if better weed control is possible. Table 2 shows plant densities and arrangements obtained with different seeding rates and row spacing.

Sunflower seed tends to "bridge" around the cups in the seed box.
A typical sunflower head nearing maturity. Hundreds of small flowers, each producing a seed, make up the head.

Dangling chains or wires suspended above the runs help to avoid this.

Seed bed preparation and weed control

Sunflower crops are very thin compared with the solid cereal stands to which most W.A. farmers are accustomed. A consequence of this is very poor competition against weeds until several weeks after planting.

Also, if sunflowers are sown in late winter they may take up to 10 days to emerge and then grow slowly whilst the well-adapted weed species grow quickly.

Good weed control before planting is essential, and in high production irrigated crops inter-row cultivation or spraying may be necessary.

A common practice in Europe is to plant deep—up to 10 cm—and cross-harrow with light spike harrows between planting and emergence.

Pre-emergence sprays are another possibility.

Fertilisers

Sunflowers are adapted to a wide range of soil types and have grown satisfactorily on the acid peaty sands of the south coast through to the highly calcareous soils around Dongara. Provided the normal trace element requirements for a particular soil type are met (see Department of Agriculture Bulletin 3614) they are unlikely to run into serious trace element problems.

The sunflower’s response to phosphate appears to be similar to that of cereals and until more information is available growers should use rates recommended for wheat crops.

Response to nitrogen is likely to be higher than that normally found in cereals and rates should be increased above cereal rates by up to 50 per cent. Second dressings may be necessary on irrigated crops. Severe yellowing of the lower leaves before flowering suggests nitrogen deficiency.

In many of the situations where they are likely to be grown, particularly summer moist land and irrigation, the sunflowers may experience potash deficiency and 50 kg/ha of muriate of potash (KCl) can be applied at or soon after planting. Second dressings may be necessary under irrigation.

Pests and diseases

Insect pests

Insect pests have not been a problem on the limited areas so far sown in W.A. However, a number of insects which attack most broad leaf crops from time to time are likely to appear and appropriate control measures should be taken. Cutworm (Heliothis) attack is likely at flowering and Rutherfordglen bug may infest the maturing heads.

Fortunately Western Australia does not have the sunflower head moth (Homeosoma ellectellum), which ravages sunflowers in other parts of the world. This insect has largely prevented production in California.

Diseases

Sunflower rust (Puccinia helianthi) is likely to be the most important disease. It has been recorded in W.A. and is often devastating in eastern Australia. However, resistant genes are available and are incorporated in hybrid sunflowers such as the Hysun range.

Sclerotinia, which invades the roots and stem of the plant and causes wilting and death may cause trouble in some areas.

Birds

Bird damage has not yet been a problem in W.A. but overseas experience indicates that damage must be expected in the future. Control measures are difficult and damage is often worst on small areas where the birds can concentrate. Farmers can only adopt a wait-and-see attitude on this problem.

Spray drift

Sunflowers are very susceptible to damage by 2,4-D type herbicides and care should be taken when using it near them.

Harvesting

Seeds are mature when the back of the sunflower head turns yellow and the seed has turned black. However, moisture content is still high at this stage and it is usually worth waiting until the heads dry out before harvesting.

Uneven maturity, shedding or bird damage may prevent this delay and early harvesting and artificial drying may be preferred in some circumstances. Moisture content should be less than 8 per cent for safe storage and shipping.

Sunflowers can be harvested with standard grain headers. The main adjustments required are:
1. The cylinder speed should be reduced to 300 to 500 rpm to avoid cracking seeds.
2. Heads thresh easily and drum clearance should be greater than for cereals to avoid cracking and air blast reduced to avoid blowing seed over the back.
3. The major modification is the fitting of sunflower trays or fingers to the header. Sunflowers are tall and the seed falls out of the head easily when the heads are dry. Without trays 20 to 30 per cent of the seed may fall in front of the comb. The trays stick out about 1.5 metres in front of the machine and catch the falling seed which then shakes back into the machine (see sketch).

Markets
Sunflowers are still in the experimental stage in W.A. and no formal receival and pool arrangements exist at present. Growers should contact oil crushers, birdseed packers etc. for prices and if possible arrange contracts before sowing. Some contractors provide seed and limited finance. Prices have been high over the past few years, ranging between $150 and $350 per tonne.

Experiments
The Department of Agriculture runs several sunflower agronomy trials each year. These involve variety testing, seeding rates, times of planting and fertilisers.

Much useful information has been obtained but there is still a lot to learn before reliable sunflower production is possible in Western Australia. Farmers trying sunflowers are adding to this knowledge by testing new techniques themselves and keeping in touch with research workers and district advisers.