

# Farming Systems & Agronomy

The incorporation of sunflowers into zero tillage farming systems, when combined with timely crop management has resulted in a significant increase in average sunflower yields.

The improvement in the performance of a rotation which incorporates sunflowers has occurred for one or more of the following reasons:

- Suitability to no till farming systems
- Greater stored soil moisture
- More options for effective grass weed control
- Disease break for winter cereals, including crown rot.
- Improvement of soil structure, the deep taproot loosens soil at depth.
- Provides an opportunity for double cropping
- Wide sowing window which minimises planting risk and allows easier transition from a winter to a summer crop.
- Incorporation of an oilseed which diversifies the marketing risk

## ROTATIONS

The development of a rotation is based on several factors critical to the success of any farming system:

- Providing an opportunity to inexpensively control weeds
- Ensuring a disease break so inoculum levels of important crop diseases do not build up.
- Spreading labour and machinery requirements
- Maximising yields and lifting the overall yield averages.
- Ensure soil health and stubble cover is maintained.
- Provide a positive return for each cropping phase.

## ROTATION SCENARIOS

In a **dryland** system, sunflowers are included following cereals, either wheat or sorghum.

*Grain Sorghum → Spring Sunflowers → Winter Cereal*  
OR

*Grain Sorghum → Summer Sunflowers*  
→ *Grain Sorghum*

OR

*Wheat → Sunflowers → Sorghum*

Positioning sunflowers between winter cereal crops ensures that adequate stubble cover is maintained to guard against erosion. Northern NSW and Southern QLD are particularly susceptible due to their high intensity summer storms.

It is well recognised that sunflowers leave little crop residue behind. However sorghum and wheat both provide a high level of stubble cover to compensate. Another popular way to incorporate sunflowers is in response to soil moisture levels, when there is 1m of wet soil, growers may choose to plant. This is referred to as **opportunity cropping**, and provided there is sufficient moisture and nutrients available, sunflowers fit this niche quite well.

The wide planting window of sunflowers begins in late August on the Darling Downs and NSW, and remains open in these regions until mid to late January. Planting in Central Queensland can occur as late as early March. This wide planting window, provides plenty of opportunity to take advantage of planting rains.

Furthermore, the short duration of the crop and the opportunity to control grass weeds is a welcome addition.

*Opportunity cropping with sunflowers provides favourable results when used with adequate moisture, effective broadleaf weed control and during the recommended planting window.*

Alternatively in an **irrigated** system sunflowers fit well in a rotation such as:

*Sunflower → Cotton → Winter Cereal*

There is some anecdotal evidence that sunflowers accumulate potassium which is released in stubble breakdown. Potassium is a critical nutrient for cotton as deficiencies are associated with low vigour and predisposition to diseases such as Alternaria leaf blight.

Although sunflowers have a high requirement for potassium during the growing phase, the majority of this is retained in the stubble and hence returned to the soil.

To enable the potassium to become available and to allow adequate preparation of fields for cotton, spring planted sunflowers are preferred.



Under irrigation, growers can expect yields to be as high as 3.5 - 4.0t/ha .

Contrary to popular belief, sunflowers do not require excessive moisture and in fact use amounts similar to or less than other summer crops.

A full profile of moisture at planting followed by a top up at budding and/or grain fill can produce average yields. Additional moisture during the vegetative stages can produce high yields.

### Rough Estimates of Crop Water Requirements for Queensland

Crop	Total Water Requirement (mm)	Estimated Irrigation Requirement (ML/ha) <sup>1</sup>
Cotton	550-950	4-10
Maize	500-650	3.5-6
Mungbean	300-450	1-3
Peanut	500-700	3.5-6.5
Sorghum	500-650	3.5-6
Soybeans	500-800	3.5-8
Sunflower	450-750	3-7

<sup>1</sup> The estimated irrigation requirement specified assumes effective in-crop rainfall of 250mm for summer crops and 125mm for winter crops (375mm for lucerne), and an irrigation application efficiency of 70%. Greater effective rainfall and improved application efficiency will reduce these irrigation requirements.

For more information, contact Graham Harris, Senior Development Extension Officer, Toowoomba Phone: 07 4688 1559.

The common irrigation practice has been to pre-water the fields prior to sowing, then apply an irrigation at budding and a second irrigation at the end of flowering. In hot, dry years a third watering may be required.

It is important that growers budget for the area they plant to ensure they can water all of their summer crop when it is required.

**Conservation Farming** - utilising minimum or no tillage systems with sunflowers has been shown to provide similar yield benefits as with other summer crops such as sorghum.

The use of precision planter's has improved establishment percentages and an even plant stand due to more accurate seed placement. This minimises intra and inter row

### PLANTING INTO WHEAT STUBBLE



Photos: Kevin McCosker, QDPI&F, Emerald

competition between plants for moisture and nutrients. Using a short fallow rotation and planting into either wheat or sorghum stubble is a good agronomic solution to the risks of soil erosion. Both zero and reduced till plantings into wheat and sorghum stubble produce better yields than conventional plantings.

### NUTRITION

As with all crops, prior to making a fertiliser recommendation, the grower and their agronomist should consider all of the information available to them.

### Levels of Nutrient Removal

YIELD /HA	1 TONNE			2.5 TONNE			4 TONNE		
	Seed	Stover	Total	Seed	Stover	Total	Seed	Stover	Total
N kg/ha	26	14	42	60	35	95	100	50	150
P kg/ha	4	1	5	9	3	12	14	4	18
K kg/ha	8	22	30	18	55	73	25	85	110

- Figures are an average of various data sources.
- The figures presented are not critical, but give an indication of levels. 1 tonne = low rainfall situation 2.5 tonne = good dryland crop 4 tonne = irrigation target



This includes paddock history, soils tests, stored moisture in the soil and likely yield expectations.

A simple nutrient budget can be of great assistance.

Use of a starter fertiliser is recommended on soils with medium to low phosphorus levels or in a long fallow situation when levels of VAM (vesicular arbuscular mycorrhiza ) are likely to have declined.

### SUNFLOWER NUTRIENT REQUIREMENTS WHEN COMPARED WITH SORGHUM

As most people are more familiar with the nutrient requirements of sorghum, it is often helpful to give sunflower recommendations as a percentage of sorghum.

As with all crops it is important to consider the maximum amount of nutrients which can be safely sown with the seed.

It is preferable to place fertiliser in a band beside and below the seed.

However if fertiliser is to be sown with the seed, the following table serves as a guide:

Element	Sunflower 2.5t/ha	Grain Sorghum 6.5t/ha
N	95	165
P	12	29
K	73	118

- Figures are an average of various data sources.
- The figures presented are not critical, but give an indication of levels.

Nitrogen and Potassium are the highest required nutrients in sunflowers. Potassium gives strength to stalks and other tissues, so this requirement should be considered when selecting a fertiliser. Although many growers ask about the importance of sulphur (S), it is much less important in sunflower than in other oilseed crops.

Nitrogen has been shown in local and international research to increase protein content in the seed, with a corresponding decline in oil content. This small decrease in oil content is far outweighed by the increase in seed yield.

**Other Nutrients** such as Zinc, are vital for sunflowers for the utilisation of available nitrogen.

Sunflowers are also quite sensitive to Boron and occasional deficiencies have been observed in Queensland. The deficiency normally shows up in small patches and affected plants will display hardened, malformed, necrotic and often bronze coloured upper leaves and often small deformed heads. See section on Disease Management for symptoms.

### Suggested maximum rates of fertiliser sown with sunflower seed.

Row Spacing	N Kg/Ha	P Kg/Ha	Fertilizer Product Kg/Ha		
			UREA	DAP	MAP
45	8	22	22	52	80
60	6	17	16	39	60
75	5	13	13	30	50
100	4	10	10	23	45

### PLANTING AND EQUIPMENT

The preferred planting times for each region and the currently available varieties are listed in the "Planting Recommendations" section of The Pack

As mentioned previously, precision planters provide the most even stands when correctly setup. It is important to remember that the establishment of a crop is often indicative of its likely seasonal performance.

Poorly established crops, or extremely gappy situations, provide additional concerns with evenness of crop maturity and weed control.

When precision planters are not being used, air seeders are often utilised with press wheels attached to improve seed soil contact.

Use a press wheel pressure of 2-4kg/cm width with the heavier pressure in situations where moisture is marginal or soil insects are likely to be a problem.

### MANAGING COMPACTION WITH CONTROLLED TRAFFIC

Soil compaction restricts water penetration and space for root development leading to poor establishment and subsequent plant growth.



"Right-angle root syndrome " caused by soil compaction  
(Photo: Kevin McCosker, QDPI&F, Emerald)





Compaction caused by cultivation operations can be confined by establishing controlled traffic operations, which limit compacted areas to specific points in the paddock. Controlled Traffic systems facilitate zero till operations and allow the use of shielded sprayers for in-crop weed control.



Controlled Traffic "tramway" -planting into sunflower stubble.  
(Photo: Kevin McCosker, QDPI&F, Emerald)

## PLANT POPULATIONS AND SEED SIZES

As sunflower is now grown in more marginal country and under tougher conditions than in the past, lower plant populations are now recommended. In the more marginal areas such as west of the Newell Highway in NSW, plant populations of 20,000 -25,000 are recommended.

For regional detail, see the section on Planting Recommendations.

## SEED SIZES

The Australian Sunflower Association in conjunction with the hybrid seed companies has adopted a recommended seed sizes list. The common seed sizes available are:

ASA Seed Size	Description	Seeds/kg
7/8	Small	15-22,000
8/10	Medium	12-16,000
10/14	Large	10-14,000

Under dryland situations, 7/8th's are recommended as they have the best "get up and go" and become established quickly. They are also cheaper than larger seed.

## ROW SPACING

Several row spacing configurations have been tried in sunflower, including skip row (every third row missed), wide rows (1.5m spacing) and the standard 0.75m spacing. Preliminary trials conducted by Pioneer Hi-Bred Australia and the Department of Primary Industries in Central Queensland indicate that wide rows of 1.5m spacing can offer better utilisation of moisture when available moisture is scarce, while maintaining good yields. Other benefits include more even flowering and maturity (each up to 10 days quicker), cleaner harvest and lower planting seed costs. Weed control is however more difficult under wide row spacings.

(For further information, contact Ian Morgan, Pioneer Hi-Bred Australia)



Grass weeds are an ever-increasing problem in a sorghum dominated farming system. (Photo: Kevin McCosker, QDPI&F, Emerald)



# **TREATED SUNFLOWER SEED IMPROVES YIELD**

***Growers who have discovered the advantages of treated grain sorghum seed can now enjoy the same benefits from sunflower seed treated with an insecticide.***

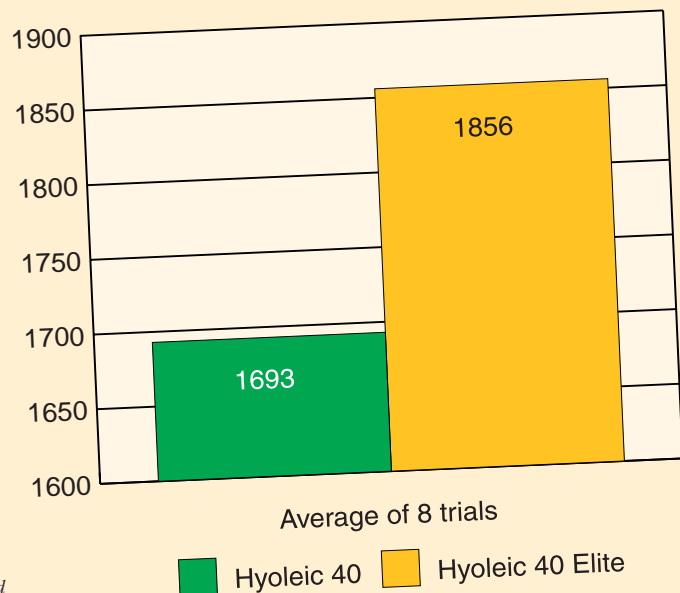
## **What are the advantages of treated sunflower?**

- Sunflower seed is treated with Gaucho insecticide specifically formulated to control soil insects
- Only seed with the highest quality and highest genetic and physical integrity is treated
- The chemical is applied as a professional treatment with even application at the correct rate
- Accurate and correct treatment rates ensure maximum efficacy and minimum environmental impact
- As the seed is treated by the seed company, there is a reduction in the health & safety issues of treating seed on farm or in store. There is no need for farmers or agents to handle and mix insecticides.
- Following treatment, the seed is retested and quality information is advised with germination etc.
- A combination of different treatments can be applied at once
- Trials have shown extra yield potential
- Yield advantage of \*Elite Hyleic 40 is 163 kg/ha @ \$400/mt = \$65.20/ha
- Extra investment in Elite treatment seed = \$5.00/ha
- This gives Elite an extra net return of \$60.20 per hectare

## **SUMMARY**

- Highest quality product
- Enhanced performance
- Full warranty on product
- No excess chemicals
- No handling of chemicals
- Seed is treated if the germination is greater than 90%
- Gives peace of mind on soil insects, except true wireworms and cutworms
- Seedling emergence % is enhanced
- More even germination
- More even flowered
- More even ripening
- More \$/ha at the end of the day.

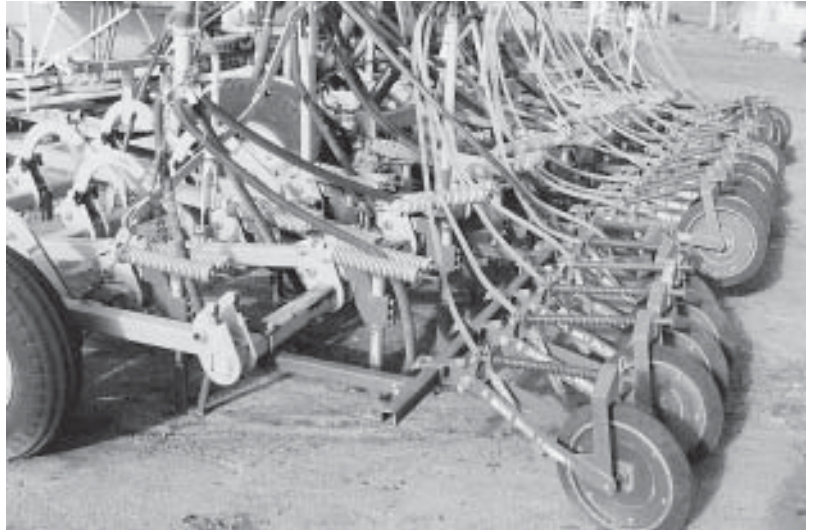
*\*Elite is the registered Trade Name of Pacific Seeds Pty Ltd.  
Check with your agent for more details on treated sunflower seed.*



## PLANTING DEPTH

Prefer 3-4 cm to provide a quick even emergence. If deeper plantings are necessary prefer the 10/14 seed size which will give a better percentage emergence compared to smaller seeds.

*Equipped with press wheels, and preferably press wheel planters, airseeders are well suited to planting the larger areas of sunflowers, common in central and south west Queensland and north west NSW.*



## WEED MANAGEMENT

(refer Weed Management section)

If grass weeds are the major problem, sunflower is a preferred crop because of the number of options available for grass control.

Broadleaf weeds need to be controlled prior to crop emergence due to the lack of in-crop herbicides for broadleaf weeds in sunflower.

Inter-row cultivation is a valuable aid to weed control. Hand chipping of isolated areas of broadleaf weeds, eg Datura and Noogoora Burr will reduce the risk of contamination in the harvested sample.

## DISEASE MANAGEMENT

Most of the diseases which can effect sunflower can be avoided or their effect minimised by the use of resistant hybrids, crop rotation and consideration of planting time.

The recommended planting strategies for each disease is outlined in the Disease Management section.

## INSECT MANAGEMENT

Losses due to insects in sunflower crops are not frequent and therefore crop monitoring for insects is often not as diligent as it should be.

When insect populations do build up, losses can be severe so regular crop monitoring is a must if these losses are to be avoided. Refer Insect Management.

## BEEES

Bees play a valuable role in our environment and are often seen in sunflower crops in large numbers. Therefore care needs to be taken when spraying with insecticides during flowering. The impact of bees on the yield of current hybrids is relatively small except for potential small increases in yield and oil content in high yielding crops.

Therefore the introduction of bees to a commercial crop is rarely warranted, the exception being hybrid seed production fields where bees are essential.

## USING THE SOUTHERN OSCILLATION INDEX (SOI) (refer Whopper Cropper section)

Throughout the Big Black Sunflower Pack we have spoken about having one metre of soil moisture before planting. However we all know that seasons can turn around and top crops can be achieved without a metre of sub soil moisture to begin with.

Whilst a metre of moisture at planting is preferred, the SOI Index is one of the weather tools that can be used to determine the likelihood of beneficial rain and therefore when we might risk planting on less moisture and when the metre of stored moisture rule followed.

Opinion as to the value of SOI in forecasting rainfall potential rainfall varies from state to state and area to area.

The following guidelines are for those growers who follow the SOI.





## SOI Consistently Positive During Winter

If this is the situation there is a good chance of winter, early summer rain, therefore the decision to plant on less than one metre of sub soil (eg. 60cm) may be considered.

## SOI Strongly Consistently Positive During Summer

Suggests a high likelihood of summer rain and a summer (Dec-Feb) planting on less than one metre of subsoil moisture may be considered a low risk option. If the SOI is positive, though not strongly so, then the risk is greater.

## SOI Inconsistently Positive (i.e. choppy)

This occurred during the 1996/97 summer and we experienced patchy good rain. In these situations it is preferable to have the security of one metre of stored moisture at sowing.

## SOI Consistently Negative

This indicates a low percentage chance of beneficial rain and one metre of stored moisture at planting is strongly recommended.



*This simple aeration system with internal ducting and an inexpensive time switch is ideal to ensure safe storage of all grains.*

## El Niño/La Niña Southern Oscillation

127 years - 1876 - 2003

