Soybean grower
Training manual

Burdekin, Proserpine
and Mackay regions

FutureCane
Partners in a sustainable cane industry

Queensland Government
Soybean grower Training manual

Burdekin, Proserpine and Mackay regions

Mike Hanks
and
John Hughes

Queensland Primary Industries and Fisheries
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This publication has been compiled by Mike Hanks and John Hughes of FutureCane, Primary Industries and Fisheries.


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About this manual

This manual was originally compiled in 2005 by the authors as a reference tool for Queensland coastal sugarcane growers keen to diversify into complimentary fallow legume grain crops, in this case soybeans. Increasing demand and interest in grain legumes as a rotational crop saw the need to revise the manual for an additional series of soybean growing courses held in 2008.

The manual consists of course notes separated into nine modules, for both ease of information transfer and ability to insert future information updates.

Use this manual in conjunction with these additional reference materials:
- ‘What soybean insect is that?’ DPI&F (Brier et al., 2004). Available from QPIF Business Information Centre 13 25 23
- www.dpi.qld.gov.au look for plants>field crops>soybean

The authors would like to acknowledge that the course notes have been collated from an extensive range of industry sources, including DPI&F Crop Notes, NSW DPI Agfacts, Australian Oilseeds Federation (AOF) and Cargill Australia.

The authors would also like to thank the following individuals for their assistance in providing valuable information for this manual: Mike Lucy, Mike Bell, Jim Barnes, Greg Mills, Prue Tatt, Andrew McCarrol (QPIF); Alan Garside (BSES); Andrew James (CSIRO); and Pat McKey (Bettacrop). The authors would particularly like to thank Hugh Brier for the generous use of the updated IPM section.

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Why grow soybeans in the cane fallow?

There are a number of real benefits including:

- to break soil borne disease cycles from continuous cane monoculture. There is a consequent improvement in soil health and increases in root extension and the efficiency of nutrient and water uptake.
- the legume crop’s ability to fix atmospheric nitrogen and supply this nutrient to the following crop. With recent large increases in fertiliser prices, legume nitrogen can be a cost effective way of supplying nitrogen.
- a general increase of 15-30% in the following plant cane crop yield.
- providing a source of valuable organic matter (OM). Organic matter:
  - is an important driver of biological diversity
  - improves the cation exchange capacity (CEC) of the soil and improves the ability of the soil to hold nutrients
  - enhances the water holding capacity of the soil
  - reduces surface crusting
  - improves water infiltration and earthworm populations.
- an opportunity to control specific weeds prevalent in cane monoculture.
- an opportunity to improve cash flow with grain production.
- environmental benefits from reduced inorganic fertiliser inputs and a reduction in soil erosion.

Breaking the cane monoculture with legume fallow cropping is one of three fundamental principles of an ‘integrated farming system’ promoted by the research findings of the Sugar Yield Decline Joint Venture (SYDJV). The other two philosophies involve the implementation of:

1. controlled traffic systems (matching row spacing to machinery wheel centres)
2. reduced/zero tillage (to conserve organic matter and maintain soil structure)

Please note: This course manual was produced for both the central coastal and Burdekin districts. As such, not all sections of this course will be relevant for both districts due to differences in the production systems (such as irrigation).

The aim of this course manual and associated reference material is to provide committed growers with sufficient information to enable them to grow a good crop of soybeans.
Pre-season checklist

1. Select ploughout blocks destined for fallowing prior to commencement of cane harvest. Consider previous usage of residual herbicides like atrazine, and Velpar K4 which may have very long plant back periods for legume crops like soybeans.

2. Consider the possibility of amalgamating smaller blocks into bigger entities to facilitate efficient harvesting if the decision is made to harvest soybeans for grain.

3. Preferably harvest cane on light/sandy soil types early to allow root knot nematode (RKN) numbers to decline in a controlled bare fallow prior to the planting of the fallow soybeans. RKN can reduce soybean and cane yields.

4. Harvest cane from blocks with a history of vine, perennial grasses and nutgrass problems early to allow weed control, so reducing the weed seed bank prior to soybean planting.

5. The early removal of cane from ploughout blocks will permit laser levelling operations, soil testing based on soil type and application of ameliorants such as ash and mill mud prior to the planting of the soybean crop.

6. Ensure you have access to the necessary machinery required for soybean production (bed-formers, planters, fertiliser applicators, sprayers, harvesters etc).

7. Determine which soybean variety you require and order seed and inoculant early. As a guide, assume 60 kg/ha planting rate then determine the final sowing rate using seed size and germination % information for the seed you purchase.

8. Determine likely crop protection products (herbicides, insecticides and desiccants) needed for the season and order in advance.

9. Know where you will sell your grain crop. Consider making marketing arrangements before planting.

10. Consider which crop you intend to plant after your soybeans.
## Soybean activity planning calendar for a summer planted crop

<table>
<thead>
<tr>
<th>Month/July</th>
<th>Activity</th>
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| June/July  | • select ploughout blocks for fallowing  
|           | • determine suitability of block size for grain production and ease of harvesting  
|           | • consider amalgamation of blocks for improved grain harvesting logistics  
|           | • cut cane from light, sandy soil types early to reduce root knot nematode numbers  
|           | • soil test blocks according to soil type after cane harvest  
|           | • determine soybean seed variety, quality and availability with supplier  
|           | • control weeds (perennial grasses, vines and nutgrass) |

<table>
<thead>
<tr>
<th>Aug/Sep</th>
<th>Activity</th>
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</table>
| Aug/Sep    | • laser level blocks if required  
|           | • ensure tabulation of all input and seedbed preparation costs  
|           | • apply ameliorants, fertiliser and mill mud as per soil test  
|           | • prepare ground – rip, offset as required  
|           | • determine desired row spacing  
|           | • bed forming operation (1.8 – 2m) preferably on controlled traffic configuration  
|           | • pre-irrigate if necessary to stimulate germination of weeds  
|           | • spray with knockdown herbicide to control weeds, repeat if necessary  
|           | • organise planters, contractors and harvesting equipment as required |

<table>
<thead>
<tr>
<th>Oct/Nov (early Dec)</th>
<th>Activity</th>
</tr>
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</table>
| Oct/Nov (early Dec)  | • pre-irrigate if necessary to stimulate germination of weeds  
|                      | • spray with knockdown herbicide to control weeds, repeat if necessary  
|                      | • assess market opportunities and identify potential buyers of the crop  
|                      | • check status of seed order |

<table>
<thead>
<tr>
<th>Dec</th>
<th>Activity</th>
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</table>
| Dec      | • obtain germination certificate for your particular line of seed  
|          | • calibrate planter to achieve desired planting density and depth  
|          | • adhere to seed inoculation (rhizobium) procedures  
|          | • apply pre-emergent herbicide as required  
|          | • ensure availability of crop protection products |

<table>
<thead>
<tr>
<th>Jan/Feb</th>
<th>Activity</th>
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| Jan/Feb  | • monitor for weeds and assess the requirement for post emergence weed control  
|          | • monitor crops for disease and insects once a week until flowering  
|          | • make the 'green or grain' decision based on market outlook, water availability, weather predictions and input costs relative to potential returns |

<table>
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<tr>
<th>March/April</th>
<th>Activity</th>
</tr>
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| March/April | • monitor twice a week for disease and insects during flowering, pod formation and seed development  
|             | • initiate integrated pest management (IPM) program if required  
|             | • check status of harvesting and transport contractors  
|             | • irrigate as required |

<table>
<thead>
<tr>
<th>April/May</th>
<th>Activity</th>
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| April/May  | • monitor once a week after pods have filled until harvest maturity  
|            | • monitor crop for physiological maturity  
|            | • apply final irrigation if required  
|            | • desiccate crop if required  
|            | • harvest |