

# SRDC Grower Group Innovation Project

## Final Report

**SRDC project number:** GGP024

**Project title:** Validation of fibre cropping in rotation with sugarcane by Mackay Fibre Producers

**Group name:** Mackay Fibre Producers

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**Due date for report:** August 2008

**Funding Statement:** This project was conducted by [*Mackay Fibre Producers Pty Ltd*] in association with the Sugar Research and Development Corporation (SRDC).  
SRDC invests funds for sugar R&D derived from the sugar industry and the Australian Government.



**Australian Government**  
Sugar Research and  
Development Corporation

The [*Mackay Fibre Producers Pty Ltd group*] is not a partner, joint venturer, employee or agent of SRDC and has no authority to legally bind SRDC, in any publication of substantive details or results of this Project.

## **Body of Report**

### **Executive Summary:**

(An overview of the aim, conduct, key results and learnings from the project. Maximum 500 words)

The ultimate aim of this project was to investigate the feasibility of improving the profitability, sustainability, and robustness of the sugar industry in the central region through the incorporation of fibre rotation crops.

MFP (Mackay Fibre Producers) and its partners have investigate production and processing systems of Kenaf (*Hibiscus cannabinus*), Sunn Hemp (*Crotalaria juncea*) and Industrial Hemp (*Cannabis sativa*) in the central region. Through out the life of this project the group members have been enthusiastic in relation to answering the many questions that are attributed from these new crop options. The local and whole sugar industry community have also been keen to keep abreast of the findings of this project.

Fibre cropping in rotation with sugar cane has been extremely successful with a number of key finding emerging, one of the key finding is Sunn Hemp which is a new legume rotational crop option, its traits like root knot nematode resistance, its drought tolerance, it high bio-mass and nitrogen fix and short cropping cycle all attribute to its ability to become a real legume cropping option for the sugar cane cycle. Another finding is the effect that Kenaf has to address packametra spores in the soil in a normal Kenaf cropping cycle. The science of why this effect happens, is a research question still to be answered, the evidence that MFP group has compiled is that in two different trial sites in different years there was a significant reduction in packamtrea spore counts. One of the important findings is the economic impact that fibre crops have on the following cane crops, there is a significant improvement in gross margins and will impact positively on growers bottom line.

When developing a new crop option in any industry there are many challengers to over come and this has been no difference in the case of fibre crops. For a new crop option the agronomics are important and will determine the cost of production, this is coupled with the yield achieved as both of these aspects are important for the future viability of that crop option. Marketing of that particular crop option also plays a significant role to its future viability, in the case of the Fibre crops, marketing will play an important role to its sustainability and its future role in the sugar industry.

### **Background:**

(Why did you need to do this project?)

Fibre Crops (Kenaf, Industrial Hemp, and Sunn Hemp) have been grown in the central region in rotation with Sugar cane in trial proportions and have encouraged the group to further investigate this rotational crop option. The ability for the production cycle fits exceptionally well, planting in October – November and harvesting in April –May and utilising the existing harvesting and hauling equipment also adds value to all sectors within the sugar industry. Fibre has the ability to be used as building material such as Fibre Board and Particle Board. Toyota has also experimented with its use in the interior components of its vehicles and has displayed a vehicle at Tokyo Motor show that has the car body made from Kenaf fibre. Fibre also is currently being use in plastic by National Panasonic for its bio-degradable, heat resistance and natural strength qualities as well as being a natural renewable source. Fibre crops have a huge potential in many marketing lines, these plants have high cellulose properties which enhances it ability to be used for ethanol production as well as high quality paper. The ladesma milling company in Argentina produce sugar as well as high quality paper, the original feedstock for the long fibre in the paper production initially came from eucalyptus trees it now comes from Kenaf which is handled with the existing sugar cane fleet.

Mackay Fibre Producers has been a dedicated group of growers that has 6 years of accomplished trial work in fibre production; the group is very keen to investigate the incorporation of fibre crops in sugar cane systems, potentially the following benefits could be delivered:

- Improve soil health
  - Break the disease cycle of soil born pathogens such as packymetra and nematodes

- Increase the nitrogen fixation and reduced requirements for fertiliser by subsequent cane crops.
- Increased organic matter in the soil due to the extraneous matter.
- Improved soil structure due to tap root breaking any compacted layers in the soil.
- Reduced soil erosion due to zero till in the fallow.
- Improve profitability and sustainability of sugarcane production due to the incorporation of a complementary break crop.
- Improve utilisation of capital equipment such as Cane harvesters, haulout vehicles, and mill transport infrastructure to improve the profitability of all sectors of the sugar industry.

### **Aims:**

(Include the Aim and the expected benefits that were listed in Section 2 of your original Application)

The ultimate aim of this project is to investigate the feasibility of improving the profitability, sustainability, and robustness of the sugar industry in the central region through the incorporation of fibre rotation crops. MFP (Mackay Fibre Producers) and its partners will investigate production and processing systems of Kenaf and other fibre crops in the central region and if successful to the wider sugar industry.

The specific objectives of this project are:

- To quantify the capital and variable costs and benefits of various fibre crops (Kenaf, Industrial Hemp and Sunn Hemp)
- To determine and quantify the agronomic benefits of various fibre crops (Kenaf, Industrial Hemp and Sunn Hemp) including
  - Ability to fixate nitrogen
  - Ability to minimize the impacts of pests and diseases (including pachymetra and nematodes)
  - Ability to break down compacted layers in the soil.
  - Impact of the fibre rotation crops of subsequent cane yields
- To communicate the findings of this project to a broader audience across all sugar growing regions, to promote the implementation of a more profitable, sustainable and robust sugarcane farming system.
- To source Sunn Hemp seed and investigate the benefits as a legume rotational crop and a fibre source.
- Build capacity of cane growers to create a more sustainable and diverse farming enterprise

### **Methodology:**

(How was the project conducted?)

The Mackay Fibre Producers Grower Group with its partners has developed a two year strategy to investigate the issues and record the input costs that are attributed to producing fibre crops in the central region.

- The project will prepare an agronomic assessment, investigate and demonstrate the crop operation requirements used in producing fibre crops in rotation with sugarcane with emphasis on:
  - Minimum / zero till planting of fibre crops in rotational with sugarcane
  - Planter type (accurate seed placement to control plant density and stalk size)
  - Monitor the nitrogen-fixation ability of Sunn Hemp for the following cane crop.
  - Monitor pests and diseases in relation to fibre cropping (nematode levels within crop cycle and carried over into the next cane crop)

Harvesting fibre crops with a sugarcane harvester and identifying the modifications that may be required for commercialisation

## Year 1 Trial plan

MFP has broken the trials into five different components;

1. Planting systems
  - a. Zero till verses cultivation
  - b. Zero till verses Minimum till
2. Ability to nitrogen fixate
  - a. Soy Bean verses Sunn Hemp, Guar and Bare fallow
3. Herbicide (pre-emergent)
  - a. Kenaf
  - b. Sunn Hemp
4. Soil Health
  - a. Effects of a nemocide treatment
  - b. Monitor Packametra spores in a Kenaf cropping cycle
5. Propagating Sunn Hemp Seed
  - a. Determine propagation issues for Sunn Hemp in the central region.
6. Compare the effects of fibre crops on the following cane crops

## Year 2 Trial plan

1. Sunn Hemp Nitrogen fixation rates
2. Planting rates of Sunn Hemp Linked to bio-mass achieved
3. Kenaf cropping effects on Packametra spore counts
4. Harvester losses utilising Forage harvester verses Cane harvester
5. Propagation of,
  - a. Sunn Hemp
  - b. Kenaf
  - c. Industrial Hemp

## Project Workplan

1. Host information session to current growers to produce fibre crops with grower contracts to supply and purchase of fibre crops
2. Investigate and purchase vacuum plate planter with the ability to direct drill through varying thickness of cane trash in a zero till planting operation.
3. Develop year 1 trial plan that will incorporate
  - i. Planting fibre crops in rotation with sugar cane in different soil types and conditions
  - ii. Nitrogen fixation ability of Sunn Hemp compared to Soy bean
  - iii. Pre-emergent herbicide compatibility with fibre crops
  - iv. Understand the effects that soil born pests have on the production levels of fibre crops
4. Develop an evaluation plan
5. Investigate the possibility of importing Sunn Hemp seed and any relevant plant issues
6. Inspect trial sites and soil test in preparation for planting
7. Plant trials sites determined in trial plan and conduct demonstration of planter and planting of fibre crops
8. Source Kenaf seed from Nature Trust Australia
9. Develop trial recording sheets

10. Monitor trial sites and coordinate
11. Schedule irrigation
12. Weed management
13. Nutrient application
14. Pest and disease
15. Crop maturity
16. Harvesting and transport
17. Conduct field walk of trial sites
18. Harvest trial sites and conduct demonstration of harvesting.
19. Document harvester modification and product handling issues
20. Document trial data
21. Input production costs
22. R&D issues related to producing fibre crops within a cane rotation system
23. Develop a system to measure yield of
24. fibre crops
25. Present trial data results to growers
26. Develop year two trial plans to address documented issues from year 1 trial results
27. Design and plant trial sites and conduct demonstration
28. Develop trial recording sheets to collect data
29. Monitor trial sites and coordinate
30. Harvest and collect trial information for trial sites
31. Prepare agronomic assessment of fibre cropping in rotation with sugar cane
32. Prepare economic analysis of fibre crops in rotation of fibre crops
33. Document feasibility to produce fibre crops
34. Communicate project findings to the broader grower community utilising communication strategy identified.
35. Final report accepted By SRDC

### **Results and Outputs:**

(What results were produced by the Project? The results should include data collected, articles or reports written, events held and anything else you see as relevant to the industry. Relevant files including photographs should be provided on a CD. If there is any protected Project Technology, eg information that has been kept confidential, such as equipment specifications, patentable knowledge please outline and discuss this with SRDC)

The workplan achievement criteria has been documented in order of the project workplan and listed below.

#### ***Criteria 1***

Mackay Fibre producer Pty Ltd (MFP) conducted a general meeting (17/08/2006) to determine area planted to Kenaf and Sunn Hemp. Discussions with Nature Trust Australia (NTA) determined that 35 ha's would be planted to Kenaf and supply contracts agreed to between MFP members and NTA. All members of MFP(as per group contact details) would establish fibre cropping in 2006/2007; trial plan will outline the trial designs and purpose. MFP will also establish Sunn Hemp trial sites on three farms particularly to propagate seed and understand the cropping requirements

#### ***Criteria 2***

MFP investigated the purchase of direct drill vacuum plate planter to enable planting into a full trash blanket. Planter suppliers were contacted such as; McDonald Murphy Machinery Mackay, David Evans Group Gatton, Hodge Industries Mackay and Austil Equipment Dalby and options were evaluated. The planter set up criteria was as follows;

- Vacuum plate seed distributor system (accurate placement of seed)
- Trash Whipper facility
- V type press wheels
- Inoculant injection system
- Monitor (Dickey John radar monitor)
  - Area meter

- Blocked feeder tubes
- Calibration, seed planting rates on the move
- End tow facility with traffic lights
- Ability to adjust from 1.5m to 2m row spacing.

Evaluation conducted:

- All planter criteria met and available
- Demonstration conducted
- Price and availability
- Service and backup
- Quality of workmanship

The group decision was to demonstrate an Austil vacuum plate planter, two demonstration were conducted, the first on July 10<sup>th</sup> and the second on the Sept 9<sup>th</sup>. The first demonstration conducted proved to be unsuccessful in the terms of the trash whipper working well, allowing the removal of trash and placement of seed without pinning trash with the coulter. (Figure 1) The second demonstration was successful with trash removed with 900mm wheel rake specially built for raking cane trash from the plant area eliminating pinning of trash with the coulter. (Figure 2)

**Figure 1** Austil Planter demonstration July 10, 2006



**Figure 2** Austil Planter demonstrations Sept 9, 2006-10-03



Austil Planter purchased on the 7<sup>th</sup> of November 2006.at a cost of \$39,902.50. The planter is at the commissioning stage, with some minor issues to address such as;

- Press wheel operation (not covering in clay type soil)
- Brackets to lift spray tanks to allow adjustment of culters.

### *Criteria 3*

## Mackay Fibre Producers Pty Ltd

### Detailed trial plan (2006)

#### Project aim.

The project will investigate and prepare an economic analysis and an agronomic assessment of a fibre rotation crop in sugarcane farming systems to achieve economic and sustainability benefits to sugarcane farmers and the sugar industry.

- The project will prepare an agronomic assessment, investigate and demonstrate the crop operation requirements used in producing fibre crops in rotation with sugarcane with emphasis on:
  - Minimum / zero till planting of fibre crops in rotational with sugarcane
  - Planter type (accurate seed placement to control plant density and stalk size)
  - Monitor the nitrogen-fixation ability of Sunn Hemp for the following cane crop.
  - Monitor pests and diseases in relation to fibre cropping (nematode levels within crop cycle and carried over into the next cane crop)

Harvesting fibre crops with a sugarcane harvester and identifying the modifications that may be required for commercialisation

## Year 1 Trial plan

MFP has broken the trials into five different components;

7. Planting systems
8. Ability to nitrogen fixate
9. Herbicide (pre-emergent)
10. Soil Health
11. Propagating Sunn Hemp Seed

## Planting systems

Trial 1

Zero till verses cultivation

Trial 2

Zero till verses Minimum till

## Ability to nitrogen fixate

Trial 3

Soy bean verses Sunn hemp verses Kenaf

## Year 1 trial plan con't

## Herbicide (pre-emergent)

Trial 4

Dual gold pre – emergent

Trial 5

Stomp / trefulan pre - emergent

## Soil Health

Trial 6

Nemocide verses non treated soil

Trial 7

Furidan treatment of seed verses non treated soil.

## Propagate Sunn hemp seed

Trial 8

Full Cultivation

Trial 9

Zero till

## Fibre Crop comparison

Trial 10

Industrial Hemp verses Kenaf verses Sunn Hemp

All trials documented with grower conducting trial and record sheets applicable to collect information for each trial.

The trials highlighted in green will also be monitored by Central Qld University (Masters Student to be assigned). The workplan CQU will be undertaking is as follows.

Pre-planting soil analysis (to include total soil N and C, mineralised N as NO<sub>3</sub> and NH<sub>4</sub>, plus available P), and infiltration (the latter if no-till is one of the treatments).

Fortnightly or three-weekly (depending upon funds for sampling) for the following:

- Light interception (LI %)
- Aboveground biomass (0.5 m<sup>2</sup> per plot) including distribution, LAI, SLA, branching pattern
- Petiole NO<sub>3</sub>, and/or chlorophyll measurement
- Leaf photosynthesis/transpiration with IRGA
- Soil water content with installed micro-gopher tubes
- Canopy temperature with IR thermometry
- Phenological stage
- Presence of disease, insects

Not sure how irrigation rate/timing is to be determined, but would be useful to employ crop coefficients based upon the LI data, and a running average of the previous 3-4 days ETO if weather stations are in place.

At least once, about 2/3 of the way through the crop, to sample root distribution with soil cores.

Close to the end of the crop, I would expect to have some fortnightly sampling that also included samples for fibre quality:

- chemical
- physical
- total plant nutrient status

And final soil chemical properties.

If sun hemp is to be included, then perhaps some N abundance samples to gain an idea of N fixation?

### **Criteria 5**

***Import Sunn hemp seed and investigate any relevant plant issues.***

Mackay Fibre Producers Pty Ltd has purchased 400 Kg of Sunn-Hemp (*Crotalaria juncea*) seed from a Brazilian seed supplier this seed order was airfreighted to Brisbane Qld; Australian Custom Brokers was consigned by Mackay Fibre Producers to imported the seed into Australia.

The Australia Quarantine Inspection Service (AQIS) after routine lab testing conducted by Queensland seed Technology Laboratory (University of Queensland) identified an unidentified Convolvulaceae possibly *Ipomoea Sp*, Mackay Fibre Producers were immediately notified that the Sunn-Hemp seed had other seed contamination. Three options were given to MFP

Option 1 – destroy the shipment of seed

Option 2 – return the shipment to sender

Option 3 – retest the seed to establish if the foreign seed is a prohibited plant in Qld Australia.

MFP chose the third option and had a second sample taken. This seed test once completed recognised that the foreign seed was not a prohibited plant; the requirement was then to further clean the seed to remove the foreign seed.

After written correspondence to AQIS (appendix 1) it was established that members of MFP would hand clean the foreign seed from the shipment.

Members of MFP travelled to the AQIS facility in Brisbane on the 14 th ,15 th & 16 th of December to manually hand clean the seed to remove the contamination , repack the bags and have the shipment retested before Christmas . After retesting the seed was released from Quarantine the seed was delivered to Mackay Fibre Producers on the 28/12/2006  
Approximately 750,000 seed were in a 20kg bag, MFP removed thirty foreign seeds



Figure 1 Foreign seed hand separated from crotalaria shipment

### ***Criteria 6***

#### ***Inspect trial sites and soil test in preparation for planting***

Mackay Fibre Producers members developed Year 1 Trial plans.  
Year 1 trial plan 2006

Russell Gibson Mackay *Fibre Producers*

Planting systems

Trial 1

- Zero till verses Min till cultivation (replicated, 0.5ha treatments)
- Kenaf G4

Lawrence Bugeja Mackay *Fibre Producers*

***Planting systems***

Trial 2

- Zero till verses Minimum Till (replicated, 0.5ha treatments)
- Kenaf G4

J, J&AF Muscat Mackay *Fibre Producers*

***Nitrogen Fixation Trial***

Trial 3

- Comparison between Soy bean (Leichhardt), Soy bean (Ashgrove), Sunn hemp (crotalaria juncea), and Guar to assess the nitrogen fixation ability of the 3 crops and bare fallow (replicated)
- Zero till

*David George Mackay Fibre Producers*

**Herbicide pre-emergent**

Trial 4 & 5

- Comparison between Dual Gold pre-emergent, Treflan / Stomp and untreated (replicated)
- Full cultivation
- Kenaf

*John & Dennis Werner Mackay Fibre Producers*

**Herbicide pre-emergent**

2006 (year 1 trial)

Trial 4 & 5

- Comparison between Dual Gold pre-emergent, Triflurine / Stomp and untreated
- Full cultivation
- Kenaf and Sunn Hemp

*Andrew & Tubby Cappello Mackay Fibre Producers*

**Soil Health**

Trial 6 & 7

- Comparison between Nemocide (Ruby) treatment and untreated (replicated)
- Zero till
- Kenaf

*David Ellwood Mackay Fibre Producers*

**Soil Health**

Trial 6 & 7

- Comparison between Nemocide (Ruby) treatment of seed and untreated (replicated)
- Zero till
- Kenaf

*J, J & AF Muscat Mackay Fibre Producers*

Propagating Sunn Hemp (crotalaria juncea)

Trial 8

- Propagating Sunn Hemp seed (zero till)
- Crotalaria juncea

*Werner Farming Mackay Fibre Producers*

Propagating Sunn Hemp (crotalaria juncea)

Trial 9

- Propagating Sunn Hemp seed (full cultivation)
- Crotalaria juncea

*Russell Gibson Mackay Fibre Producers*

Propagating Sunn Hemp (crotalaria juncea)

Trial 10

- Propagating Sunn Hemp seed (full cultivation)
- Crotalaria juncea

*J, J & AF Muscat Mackay Fibre Producers*

***Fibre Crops comparison Rotational benefits***

Trial 11

- Comparison between Industrial Hemp, Kenaf, Sunn Hemp and bare fallow (replicated)
- Zero till

All trials sites were inspected prior to planting and assistance was provided to set out the trial design by Joe Muscat. Some trial sites have been varied to the original trial design to allow for paddock variations or supply of products. Soil assays, packymetra spore counts and nematode counts were established for each of the trial sites In a number of trial sites each core taken has been GPS located to sub meter accuracy, which will enable these cores to be taken in the same location for a more accurate comparison to determine the crop effects.

***Criteria 7***

***Source Kenaf seed from Nature Trust Australia***

Mackay Fibre Producer members signed individual kenaf growing contracts with Nature Trust Australia.

The contract detailed that NTA would supply seed & purchase the crop.

A condition of the contract mentioned the commercial in confidence nature of the contract crop pricing agreement .Also a planting time frame for the kenaf fibre crop.

The kenaf fibre year 1 trials have been planted.

***Criteria 8***

***Plant trial sites determined in trial plan and conduct demonstration of Planter and planting of fibre crops***

Mackay Fibre Producers PtyLtd has purchased an Austil Seeder on the 7 th of November.

(Details of purchase of planter listed in Milestone 2 report)

A demonstration day for group members was held on Saturday the 11 th of November .The day was to setup the planter on Muscat 's tractor, demonstrate planter ,make adjustments & identify commissioning problems.



Figure 2 Commissioning and demonstrating of the Austil planter by Mackay Fibre Producers

Mackay Fibre Producers members have planted year 1 trial sites 1,2,3,4,5,6,7, & 11 as determined in trial plan .( Detailed plan documented in milestone two )  
 Trials 8 , 9 & 10 are for Seed Production and require planting in February , early March time frame.  
 The planter has been open for inspection . Demonstration of planter and planting of fibre crops while planting trail sites .

**Criteria 9**

***Develop trial recording sheets***

Trial recording booklets have been issued for all of the planted trial Sites.  
 All trials documented with grower conducting trial and record sheets applicable to collect information for each trial (trial record booklets sample supplied in milestone 2 report) These data collection booklets have been developed exclusively (by Joe Muscat) for each trial site to allow for accurate data collection.

**Criteria 10**

***Monitor trial sites and coordinate***

- ***Schedule irrigation***
- ***Weed management***
- ***Nutrient application***
- ***Pest and disease***
- ***Crop maturity***
- ***Harvesting and transport***
- ***Conduct field walk of trials***

All trial sites are currently being monitored by the individual grower involved in that particular trial in close association with Joe Muscat and Nature Trust Australia and EcoFibre Industries.

### **Criteria 11**

#### Schedule irrigation

The group will install tensiometers in one trial site and monitors growth rates and schedule irrigation with the drop off in growth. To date very little irrigation has been required, with the fibre crops being rain fed.

### **Criteria 12**

#### Weed management

Weed management has proven to be difficult with the extended rain periods currently being experienced. Some trial sites have been developed with pre-emergent treatments which are closely monitored for control of broadleaf and grasses.

### **Criteria 13**

#### Nutrient application

Currently some trial sites have been pre –fertilised which have shown signs that nutrient uptake by the fibre plants have been slightly erratic with symptoms indicating yellowing in some areas. Dunder one shot applied to the surface and irrigated in has been utilised some pre and post planting, some trial sites have utilised granular fertiler and some trial sites are yet to be fertilised. This could pose some problems with the current wet weather.

### **Criteria 14**

#### Pest and disease

Three trial sites have identified Red Shoulder Leaf Beetles in medium numbers, each grower has been contacted and currently close monitoring will be undertaken.

#### Life cycle

The Red shouldered leaf beetle is 7 mm long, a golden yellow in colour, with a red spot on each wing and a red band on the wings directly behind the head. The adult lays her eggs in the soil mainly where grass pasture is growing and the larvae (which grow to 5 mm) feed on the grass roots. The larvae then pupates in the soil and the adult beetle emerges from the soil after good rains. The lifecycle takes about 2 months.

The Red shouldered leaf beetle is usually active from October to April and has 3-4 generations per year.

#### Damage

Adults chew on flowers and leaves. New growth flushes are particularly susceptible and damaged leaves are left with just a network of veins. Adults also chew the skin of maturing fruit, leaving a brown corky scar.

When this pest occurs in swarms they can do a lot of damage within hours of feeding.

The Black swarming leaf beetle *Rhyparida* spp., also causes similar damage throughout Queensland. It is 3-5 mm long and is a shiny brown or black colour.

#### Control

##### Chemical

Carbaryl sold under the trade name ‘Carbaryl WP’ is registered for use in the home garden for the control of the Red shouldered leaf beetle on avocados and macadamias. Carbaryl is also registered for control of Red shouldered leaf beetles in Kenaf.

### **Criteria 15**

#### Crop maturity

All the fibre crops are still at early stages of crop growth with an average of about 45 days of crop growth.

### **Criteria 16**

#### Harvesting and transport

Harvesting and transport of the fibre crops are being considered with the issue of transloading from a cane haulage vehicle to a road transport vehicle being investigated, this will be imperative to the success of this project.

### **Criteria 17**

#### Conduct field walk of trials

Due to the rain fall currently being experienced in the Mackay region field walks have been postponed to a more suitable time frame.

### **Criteria 18 & 19**

- **Harvest trial sites and conduct demonstration of harvesting.**
- **Document harvester modification and product handling issues**

Harvesting of Kenaf trial sites began on the 24<sup>th</sup> of April and concluded on the 5<sup>th</sup> of May. Harvesting of Kenaf was conducted with an Austoft cane harvester with an underslung base cutter mechanism. One of the harvesting issues noted in previous years is the wrapping of the Kenaf around the base cutter legs. The harvesting operation this year, which harvested almost 30 hectares, proceeded without any issues.

**Figure 1**



**Figure 1**

Harvesting Kenaf at Lawrence Bugeja's property 24/04/2007.

This crop yielded 16.14 ton of dry matter per ha

The trial site was visited by an information bus trip conducted by Mackay Group Extension Program jointly operated by BSES limited and MAPS (Mackay Area Productivity Services) 52 growers attended the demonstration which highlighted the harvesting and hauling of Kenaf with conventional cane harvesting equipment. The Information bus trip was conducted on the 24<sup>th</sup> of April 2007.

*Figure 2*



*Figure 2*

Lawrence Bugeja from Mackay Fibre Producers explains to 52 Mackay cane growers the implications of producing Kenaf in rotation with sugar cane

The Kenaf crop was hauled with conventional elevating tippers and tipping equipment without any problems. All Kenaf was transported to a central location which meant that trans-loading from the elevating tippers to 90cb/meter walking floor semi trailers was required to transport the harvested Kenaf more than 20 km in distance.

*Figure 4*



*Figure 5*



Figure 3 and 4 highlight the trans-loading operation that allowed shifting of the harvested Kenaf to a central location.

Sunn Hemp was also incorporated into the trial plan this year, which allowed MFP the ability to also investigate harvesting options for this crop. Three different harvesting options were investigated.

#### Option 1

Utilising Cane harvesting equipment was the preferred option by the group, this highlighted some issues mainly the harvesting loss experienced. The observation was that the extractor losses proved too high for efficient removal of the crop. Another crop characteristic was that the leaf of the Sunn Hemp plant is harder to remove from the stem and meant that it stayed attached to the harvested billet which is not desirable when separating fibre. The Sunn Hemp in this trial was planted at 400,000 plants per ha which meant that the sunn hemp stems were thinner in diameter than preferred, this be addressed in year two trials

**Figure 6**



Figure 6

Harvesting Sunn Hemp with conventional cane harvesting equipment.

Issues

- High Harvesting Losses
- Leaf attached to Sunn Hemp billets
- Thin Sunn Hemp stems

**Option 2**

The harvesting method utilised in option 2 is similar to hay baling which mowed and condition the Sunn Hemp, sun dried the product by raking and turning, then baling the product into 4x4 round bales. This method requires specialist equipment which is not readily available in the sugar industry and also exposed the crop to the risk of wet weather at the dry down of the material. The losses experienced in this method also were not acceptable with product being left behind in the raking and baling treatments

**Figure 7**



Figure 7

Mowing and conditioning Sunn Hemp in preparation for drying and baling.

Issues

- Slow harvesting process
- Wet weather risk

**Option 3**

This harvesting method also utilised non conventional equipment to the sugar industry, but highlighted another option to investigate. The Sunn Hemp was foraged in this process which required for the sunn hemp crop to be chemically desiccated which killed the plant and dried it down in the field. This reduced the risk of losing the crop to a rainfall event. The losses experienced were also more acceptable which also highlights more work required for the product handling component of this method.

*Figure 8*



Figure 8

Foraging Sunn Hemp at Muscat's Trial site.

Issues

- Specialist equipment
- Product handling issues

### Harvest summary

Harvesting Fibre crops with conventional cane harvesting equipment is definitely achievable as has been identified. The timing of the harvest for fibre crops is critical from the perspective of over maturity, when fibre crops are over mature then the fibre component of the stems, which is the outer layer of the plant, becomes very hard to handle and causes wrapping of the harvester components cause chokes within the harvester.

Some of the weeds present in some of the trial sites also had the potential to cause chokes in the harvester, as with any cropping system weed management is paramount to achieve efficient harvesting operations. Generally the MFP group was happy with the performance of the harvesting of the Kenaf crop with limited issues that will be required to address.

### Product Handling

The Kenaf billets was handled in the same manner as sugar cane is and did not pose any issues with the elevating tipper or the side and rear tippers utilise in shifting the crop. The walking floor semi-trailers and front loading full track transporter also handled the Kenaf billets without any issues. The billet flow from the hauling equipment highlighted that this equipment is suitable for handling kenaf and Sunn Hemp billets effectively.

### *Criteria 20 & 21*

#### *Document trial data*

#### *Input production costs*

Mackay Fibre Producers members developed Year 1 Trail plans.

#### Year 1 trial plan 2006

- **Planting systems**
- **Nitrogen Fixation**
- **Herbicide (pre-emergent)**
- **Soil Health**
- **Propagation of Sunn hemp**
- **Fibre Comparison**

#### *Lawrence Bugeja Mackay Fibre Producers*

#### **Planting systems**

##### Trial 2

- Zero till verses Minimum Till (replicated, 0.5ha treatments)
- Kenaf G4

- Trial evaluation
  - Input cost comparison
  - Measure yield ( dry matter per ha) comparison
  - Cane yield in following cane crop

**Trial aim:**

The trial objective was to investigate the Kenaf performance when comparing planting a zero till treatment verses a min till treatment. The planting technic was conducted after a cane crop which was sprayed out in what would normally be a fallow period in the sugar cane cycle. The min till operation comprised of a single ripper leg through the sprayed out stool area, once.

**Trial results:**

Three hand cut samples were taken from each treatment in each replicate. Three reps were incorporated in this trial. Trial measurements are outlined in table 3, there is no statistical difference in the results between the min till and zero till treatments. A single two row ripper treatment cost \$56.00 per ha, In this case the return from the min till treatment would reduce the gross margin by \$56.00 per ha. From the samples taken it indicated that a higher plant population was established in the zero till treatment after planting at the same seeding rate.

**Table 1**

<b>L Bugeja Min Till Verses Zero Till 4.13 ha</b>			
<b>Time</b>	<b>Treatment</b>	<b>Cost</b>	<b>Cost/ha</b>
	7L/ha PowerMax 67.90/ha	280.43	67.9
	Flat boom 9m 6640 New Holland	58.44	14.15
	5L/ha PowerMax 48.5	200.31	48.5
	Flat boom 9m 6640 New Holland	58.44	14.15
6hrs	3 row rake	81.53	19.74
2hrs	2 leg ripper (2.06ha)	135.32	65.69
6hrs	3.05m Austil Planter (2 row) G240 New Holland	245.45	59.43
	Dunder Mid N 3.5cu / ha (tractor) (124.48/m3)	1799.36	435.68
16hrs	200L amocide 10.72	10.72	2.60
	Labour 16x20	320	77.48
	Harvesting 1331.00		
	Hauling 1405.00		
	transport 297	3033	734.38
<b>Total cost</b>		6222.98	1539.70
<b>Gross Return</b>	135x14.13x4.13	7878.18	1907.55
<b>Gross Margin</b>		1655.20	367.85

**Russell Gibson Mackay Fibre Producers**

**Planting systems**

**Trial 1**

- Zero till verses Min till cultivation (replicated, 0.5ha treatments)
- Kenaf G4

- Trial evaluation
  - Input cost comparison
  - Measure yield ( dry matter per ha) comparison
  - Cane yield in following cane crop

**Trial aim:**

The trial objective was to investigate the Kenaf performance when comparing planting a zero till treatment verses a min till treatment. The planting technic was conducted after a cane crop which was sprayed out in what would normally be a fallow period in the sugar cane cycle. The min till operation comprised of a single ripper leg through the sprayed out stool area, once.

**Trial results:**

Three hand cut samples were taken from each treatment in each rep. Two rep were incorporated into this trial This trial indicated that a 27% increase in yield in the Min till treatment. This result indicates that in this soil type Min till treatment is warranted.

**Table 2**

<b>Russ Gibson Min till verses Zero till Farm 2483 Block no 8-2 (4ha)</b>					
<b>Date</b>	<b>Treatment</b>	<b>cost</b>	<b>Cost/ha</b>	<b>Min till</b>	<b>Cost/ha</b>
25/11/2006	Yeoman 2 leg ripper x 2			516.72	
1/12/2006	3 row wheel rake x2	157.92	19.74		
4/12/2006	Roller 1 row			87.4	
	6.7L/ha PowerMax (\$10.15/Litre) = \$68.00/ha				
	1L/ha Surpass (\$4.95/Litre) = \$4.95/ha				
13/12/2006	0.6L Li 700 (\$1.10)	292.4	73.1		
13/12/2006	7.5m flat boom	36.4	9.1		
14/12/2006	Fertiliser box 2row	101.68	25.42		
14/12/2006	CK 1205 787kg/ha @ 547/ton	1721.92	430.48		
15/12/2006	Austil seed planter 2 row	179.08	44.77		
19/12/2006	Irrigation Winch 0.75meg @ \$65.00/meg	48.75	12.19		
5/02/2007	Harvest	3413.33	853.33		
	<b>Total cash cost</b>	6555.6	1638.90		
	<b>Min Till cost</b>	6555.6	1576.42		
	<b>Zero Till cost</b>	5951.48	1468.13		
	<b>Gross Return Min till</b>	3379	1689.5		
	<b>Gross Return Zero till</b>	2464.5	1232.25		
	<b>Gross Margin Min Till</b>		113.08		
	<b>Gross Margin Zero till</b>		-235.88		

Table 3

**L Bugeja harvest date 23/04/2007 Kenaf trial site (Min till verses Zero till) 1.525m row spacing**

Paddock area 4.13ha		Rep 1		Rep 2		Rep 3		min till average	zero till average	average result
		Min till	Zero till	Min till	Zero till	Min till	Zero till			
<b>Total bio-mass weight kg</b>	sample1	11	6.2	9	10	7.5	14.5	<b>9.75</b>	<b>10.16</b>	<b>9.96</b>
	sample 2	9.75	8	10	10.5	8.5	11.5			
	sample 3	10	9.5	11.5	10.25	10.5	11			
	<b>Total</b>	10.25	7.9	10.17	10.25	8.83	12.33			
<b>Stripped weight kg</b>	sample 1	6	4.2	6.5	6.25	6.5	8.5	<b>6.83</b>	<b>6.77</b>	<b>6.80</b>
	sample 2	7.5	6	8	6.5	6	8.25			
	sample 3	7.5	6.5	7.5	6.25	6	8.5			
	<b>Total</b>	7	5.57	7.33	6.33	6.17	8.42			
<b>Wet weight grams</b>	sample 1	1506	887	579	892.55	914	862	<b>22</b>	<b>23</b>	<b>23</b>
	sample 2	976	684	1217	1154	1270	1110			
	sample 3	1658	740	1500	1262	1021	1201			
	<b>Total</b>	1380	770.33	1098.67	1102.85	1068.33	1057.67			
<b>Dry sample grams</b>	sample 1	433.72	287.35	158.88	258.12	186.16	261.76	<b>144262</b>	<b>150820</b>	<b>147541</b>
	sample 2	287.35	178.25	337.13	321.14	363.1	320.79			
	sample 3	480.62	184.48	469.11	363.87	321.55	369.76			
	<b>Total</b>	400.56	216.69	321.71	314.38	290.27	317.44			
<b>No of stalks</b>	sample 1	19	16	21	22	23	33	<b>28.49</b>	<b>28.88</b>	<b>28.69</b>
	sample 2	28	21	21	28	15	24			
	sample 3	18	19	28	20	26	25			
	<b>Total</b>	22	19	23	23	21	27			
<b>Plants / ha</b>		144262	124590	150820	150820	137705	177049	<b>71.51</b>	<b>71.12</b>	<b>71.31</b>
<b>Dry weight % of wet weight</b>		29.03	28.13	29.28	28.51	27.17	30.01	<b>29.92</b>	<b>33.17</b>	<b>31.54</b>
<b>Moisture %</b>		70.97	71.87	70.72	71.49	72.83	69.99	<b>44.81</b>	<b>44.41</b>	<b>44.61</b>
<b>% of bio-mass returned to the soil</b>		31.71	29.54	27.87	38.21	30.19	31.76	<b>12.80</b>	<b>12.89</b>	<b>12.84</b>
<b>Wet yield tons / ha</b>		45.90	36.50	48.09	41.53	40.44	55.19	<b>14.08</b>	<b>14.18</b>	<b>14.13</b>
<b>Dry weight yield tons / ha 0% moisture</b>		13.32	10.27	14.08	11.84	10.99	16.56			
<b>Dry weight yield Tons of dry matter / ha 10% moisture</b>		14.66	11.29	15.49	13.02	12.09	18.22			

**Table 4**

**Rubysell Pty Ltd (Russell Gibson) Min Till versus Zero Till Kenaf 1.5 row spacing**

Harvest date 02/05/2007

Paddock area 4.0ha

		Rep 1		Rep 2		min till	zero till	average result
		min till	zero till	min till	zero till			
Total bio-mass weight kg	sample 1	6.25	5.5	9.5	6.25	6.25	4.88	5.56
	sample 2	5.5	5.75	6.75	3.5			
	sample 3	4.75	3.25	4.75	5			
	<b>Total</b>	5.5	4.83	7.00	4.92			
Stripped weight kg	sample 1	4.25	4.25	7.25	4.5	4.63	3.46	4.04
	sample 2	4	4	5	2.5			
	sample 3	3.75	2.5	3.5	3			
	<b>Total</b>	4.00	3.58	5.25	3.33			
Wet weight grams	sample 1	622.65	676.65	673.65	710.65	156667	155555.4	156111
	sample 2	806.65	778.65	1242.65	580.65			
	sample 3	709.65	837.65	665.65	1039.65			
	<b>Total</b>	714.65	764.32	860.65	776.98			
Dry sample grams	sample 1	199.17	221.58	215.74	225.35	32.16	31.35	31.76
	sample 2	259.72	240.81	421.06	187.36			
	sample 3	233.98	249.69	189.54	325.11			
	<b>Total</b>	230.96	237.36	275.45	245.94			
No of stalks	sample 1	23	25	29	23	24	23.3	23.4
	sample 2	28	24	20	21			
	sample 3	27	18	14	29			
	<b>Total</b>	26.0	22.33	21.0	24.3			
	Plants / ha	173333.16	148888.74	139999.86	162222.06	156667	155555.4	156111
	Dry weight % of wet weight	32.32	31.06	32.00	31.65	32.16	31.35	31.76
	Moisture %	67.68	68.94	68.00	68.35	67.84	68.65	68.24
	% of bio-mass returned to the soil	27.27	25.86	25.00	32.20	26.14	29.03	27.58
	Wet yield tons / ha	26.67	23.89	35.00	22.22	30.83	23.06	26.94
	Dry weight yield tons / ha 0% moisture	8.62	7.42	11.20	7.03	9.91	7.23	8.57
	Dry weight yield Tons of dry matter / ha 10% moisture	9.48	8.16	12.32	7.74	10.90	7.95	9.42

***Nitrogen Fixation Trial***

**Trial 3**

- Comparison between Soy bean (Leichhardt), Soy bean (Ashgrove), Sunn hemp (crotalaria juncea), and Guar to assess the nitrogen fixation ability of the 3 crops and bare fallow (replicated)
- Zero till
- Cane yield in the following cane crop
- Trial Evaluation
  - Observation assessment
  - Nitrogen fixation (soil test)
  - Bio- Mass (sample)

**Trial Aim:**

The objective of this trial is to evaluate the benefit of Sunn Hemp as a legume rotation crop option when compared to Soy bean and Guar. Soy bean has been selected because it represents current industry best practice in relation to a legume rotational crop with sugar cane that fits in with the fallow window. Guar was selected because it is root knot nematode resistant and has a higher value bean in the market place. This trial site will be monitored in the following cane crop with the comparison made in the replicated trial strips of the different legume treatments.

**Trial results:**

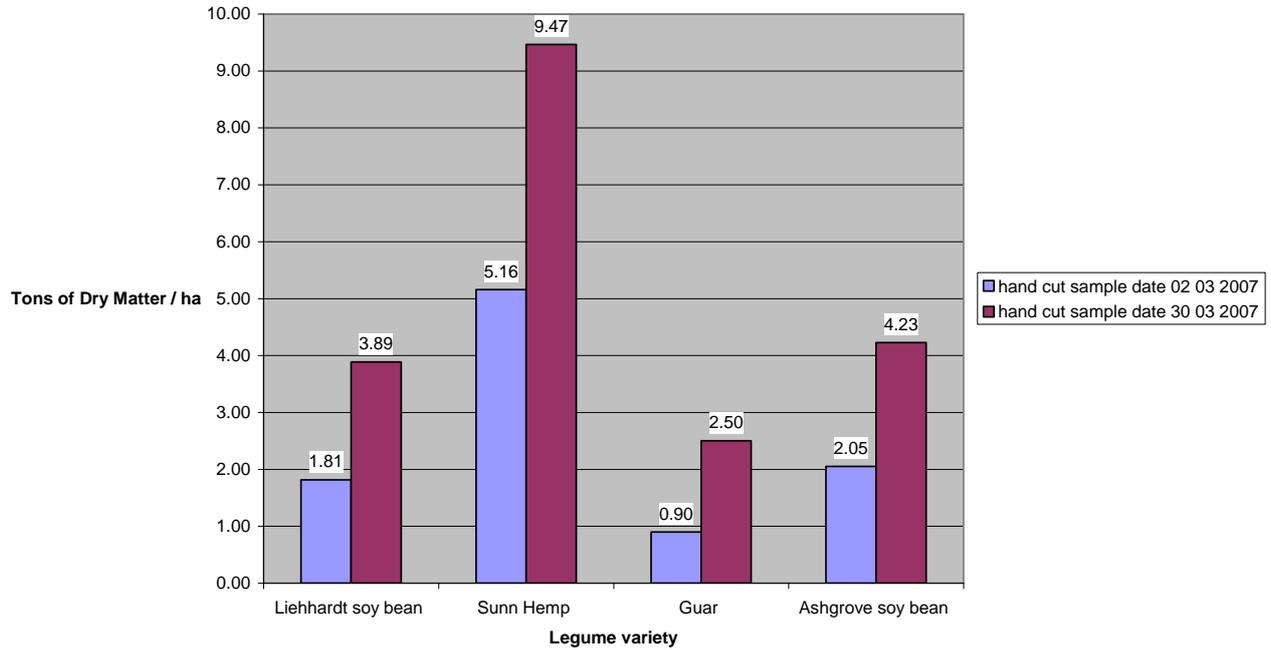
Bio-mass and nutrient samples were taken on the 2/03/2007 (60 days old) and on the 30/03/2007 (88 days old), table 5 highlights that the bio-mass results taken from the Sunn Hemp achieved, indicate that at 60 days 5.16 tons of dry matter was produced, this represents 39.7% more bio-mass than the Ashgrove soy bean which was the next highest. The nitrogen produced by the Sunn Hemp at 2/03/2007 (60 days) also is presented in table 6 which indicates that 55% more nitrogen has been produced when compared to the best result that Ashgrove soy bean has produced.

At 30/03/2007 (88days) the bio-mass produced from the Sunn Hemp was 9.47 ton of dry matter per ha representing 55.3% more bio-mass with 11.7% less nitrogen from the Sunn Hemp compared with the Ashgrove soy bean. This result may indicate that at 88 days the optimum nitrogen fixation of Sunn hemp may be achieved at an earlier period. This will be investigated in the year 2 trial plan.

Table 7 highlights that the Guar achieved the highest plant established and produced least amount of bio-mass and the lowest amount of nitrogen fixed. Year 2 trials could further investigate the linkage of planting rates to bio-mass and fixed nitrogen mainly in Sunn Hemp as this work has been completed in Soy bean.

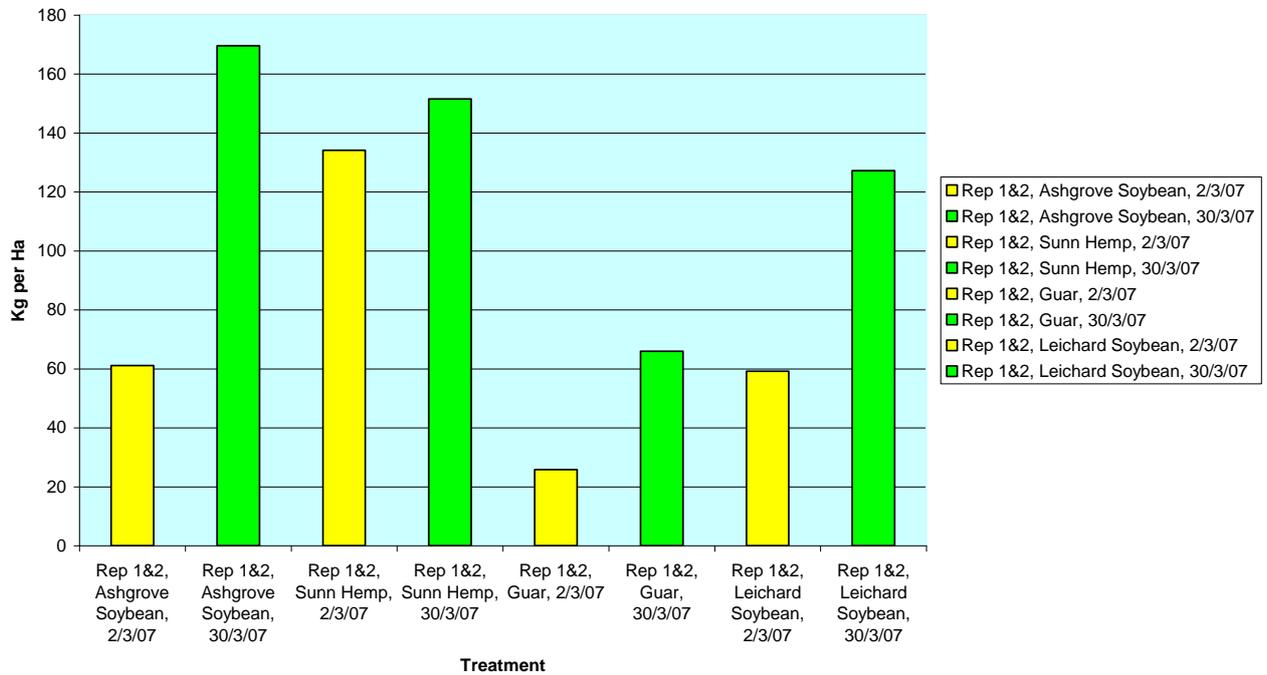
**Table 5**

**Legume Trial Bio-Mass results  
Mackay Fibre Producers year 1 (J,J &AF Muscat)**

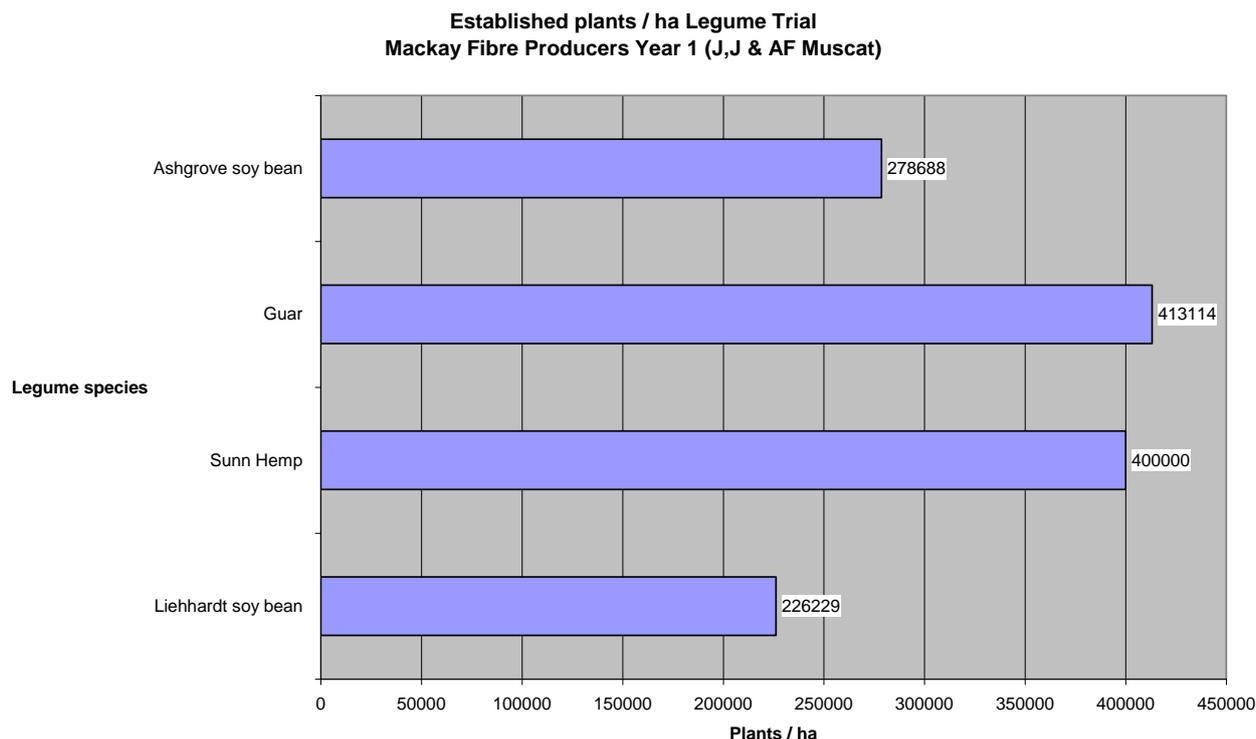


**Table 6**

**Available Nitrogen**



**Table 7**



*John & Dennis Werner Mackay Fibre Producers*

**Herbicide pre-emergent**

2006 (year 1 trial)

Trial 4 & 5

- Comparison between Dual Gold at 1 & 1.5 L/ha pre-emergent, Treflan at 3L/ha, Stomp at 2.5L/ha and untreated treatments
- Full cultivation
- Kenaf and Sunn Hemp

**Trial Aim:**

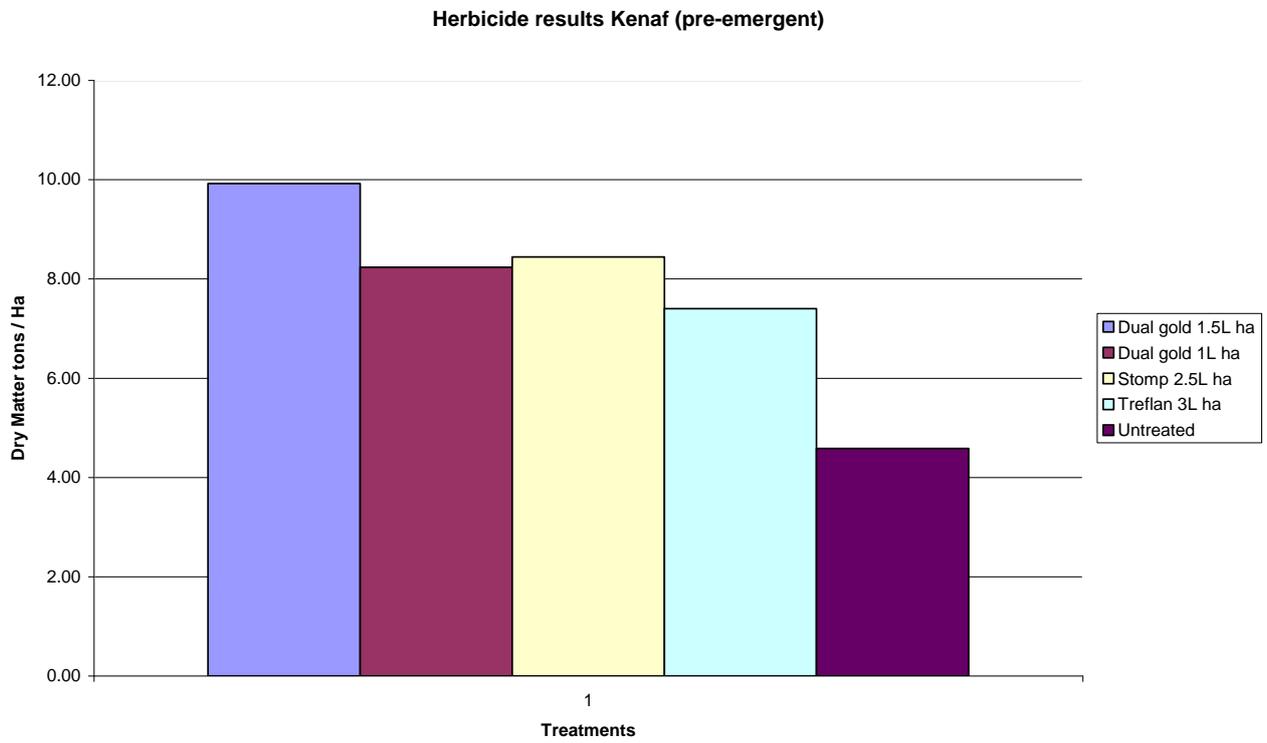
The objective of this trial site was to establish the effects of both Kenaf and Sunn Hemp yield when applying different pre-emergent chemicals when compared to no pre-emergent treatment. It was also determined by the group to apply Dual Gold at two different rates, to establish if the yield of both the Kenaf and Sunn Hemp would be affected.

**Trial result:**

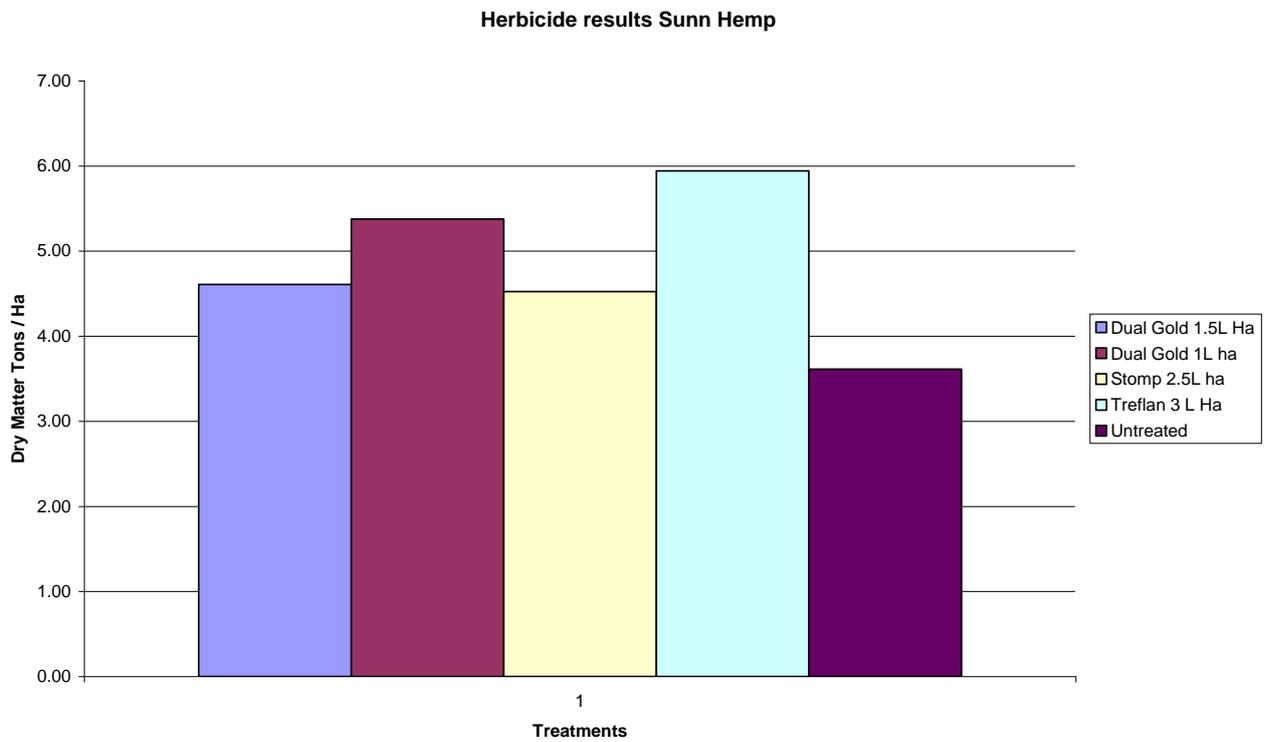
Table 8 indicated that the Kenaf yield highest achievement was in the Dual Gold at 1.5L/ha treatment. It also may highlight that with the yield achieved (9.92 tons dry matter / ha) being below the average yield achieved (12.71 tons dry matter / ha) in the other trial sites it could indicate that the pre-emergent treatments had an effect on the Kenaf yield.

Table 9 presents the trial results of the same pre-emergent treatments on the Sunn Hemp. The highest yield achieved was in the Treflan 3L/ha treatment This also indicates a difference in crop response to the pre-emergent treatments as the Sunn Hemp performance was the greatest with the Treflan treatment when the Kenaf responded better in the Dual gold treatment. This trial also re-enforces that no weed management effects yield considerably.

**Table 8**



**Table 9**



David George Mackay Fibre Producers

**Herbicide pre-emergent**

Trial 4 & 5

- Comparison between Dual Gold pre-emergent, Treflan / Stomp and untreated (replicated)
- Full cultivation
- Kenaf

This trial site was destroyed in relation to high rainfall in the early stages of the trial which prevented ideal management strategies.

Andrew & Tubby Cappello Mackay Fibre Producers

**Soil Health**

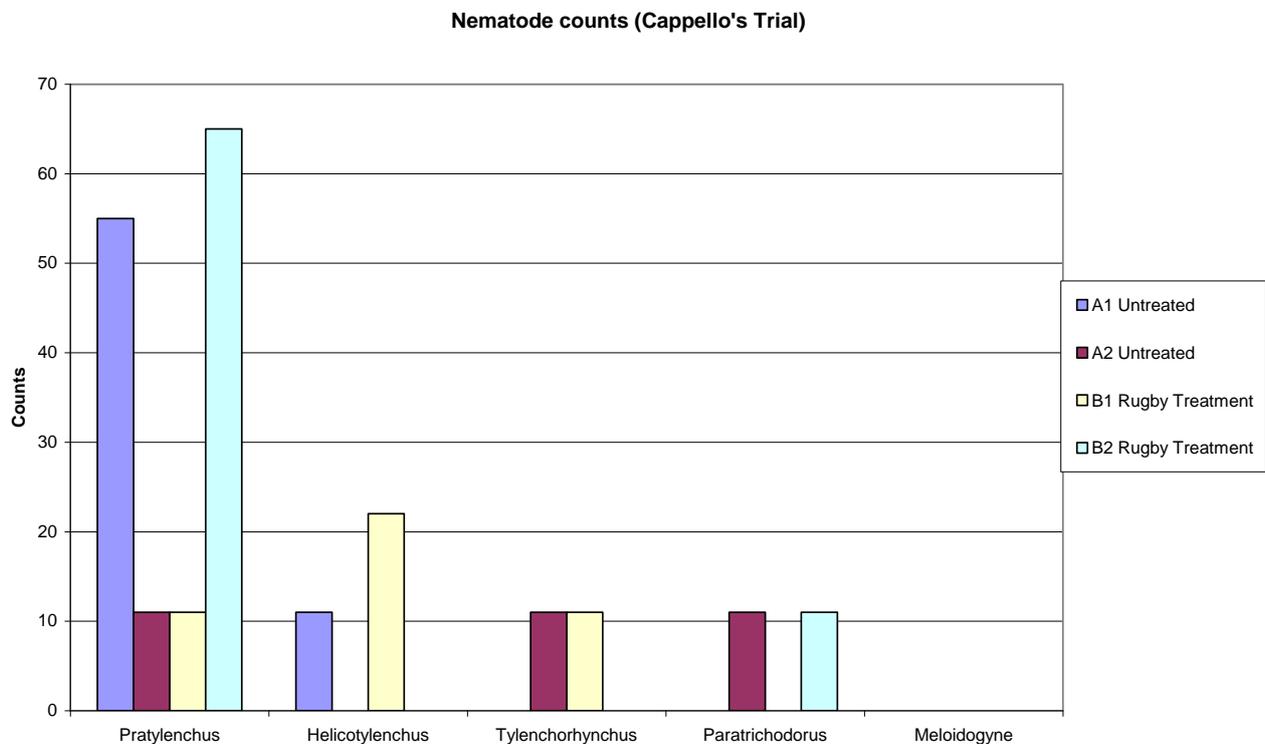
Trial 6 & 7

- Comparison between Nemocide (Rugby) treatment and untreated (replicated)
- Zero till
- Kenaf

Trial Aim:

Past trials of Kenaf planted in the Mackay region in rotation with sugar cane have shown reduction of yield in relation to the effects of root knot nematodes. The objective of trial 6 & 7 was to examine the effects of a nemocide application in a crop of Kenaf. Trial 6 (Cappello) also suffered from high rainfall in the early stages of the crop which impacted on the yield results. The Nematode samples taken on the 14/12/2006 indicate that the nematode counts were well below the thresh hold for sugar cane. Table 10 highlight the results.

**Table 10**



Nematode counts well below the thresh hold for sugar cane in 250grams of soil.

Table 11

A Cappello Kenaf trial site Rugby treatment verses Untreated (nematode trial )					
1.525m row spacing					
	Rep 1		Rep 2		
	Rugby	Untreated	Rugby	Untreated	
Total bio-mass weight kg sample1					
	5.2	2.8	2.2	2.4	
sample 2	5.8	2.4	6.2	5.2	
<b>Total</b>	<b>5.5</b>	<b>2.6</b>	<b>4.2</b>	<b>3.8</b>	
<b>Stripped sample applied average</b>	<b>3.94</b>	<b>1.86</b>	<b>3.01</b>	<b>2.72</b>	
<b>Dry weight % of wet weight</b>	<b>27.22</b>	<b>27.22</b>	<b>27.22</b>	<b>27.22</b>	
<b>Wet yield tons / ha</b>	<b>25.82</b>	<b>12.21</b>	<b>19.72</b>	<b>17.84</b>	
<b>Dry weight yield tons / ha 0% moisture</b>	<b>7.03</b>	<b>3.32</b>	<b>5.37</b>	<b>4.86</b>	
<b>Dry weight yield Tons of dry matter / ha 10% moisture</b>	<b>7.73</b>	<b>3.65</b>	<b>5.90</b>	<b>5.34</b>	
	<b>4.85</b>	<b>3.2</b>	<b>4.03</b>		
	<b>3.47</b>	<b>2.29</b>	<b>2.88</b>		
	<b>22.77</b>	<b>15.02</b>	<b>18.90</b>		
	<b>6.20</b>	<b>4.09</b>	<b>5.14</b>		
	<b>6.82</b>	<b>4.50</b>	<b>5.66</b>		

Trial Results:

The measured yield results indicate that the rugby treatments yielded higher than the untreated strips by 34% which is substantial. The Kenaf crop yield in this trial site is very low from the high rainfall early in the crop which could be highlighting other issues, e.g. high weed pressures.

*David Ellwood Mackay Fibre Producers*

***Soil Health***

Trial 6 & 7

- Comparison between Nemocide (Ruby) treatment of seed and untreated (replicated)
- Zero till
- Kenaf

Trial Aim:

This trial was also set up to examine the effects of a nemocide treatment in relation to cost of treatment verses yield result. As the yield results indicate the treated area performed higher than the untreated area. When this block was sampled the nematode counts were well below the thresh hold limits for sugar cane. The groups experience in this area have shown increased nematode counts as the crop age increases

Trial results:

The yield achieved in this trial site indicates a small increase in the treated area of nearly 1 ton of dry matter per hectare. The net return of this trial site is also increased by \$61.00 per hectare after paying for the cost of the nemocide. The group acknowledges that in the year two trials further investigation would be required to re-enforce if this would be acceptable practice. The sampling process utilised in the two trial sites was that the core samples were GPS located before the treatment, which would allow the cores to be revisited after the treatment and the crop was produced.



***Figure 9***

***Rugby Nemocide being applied at planting***

**Table 12**

<b>David Ellwood Kenaf Rugby treatment verses Untreated Farm 3181 Block 1-1 (2.2ha)</b>				
<b>Date</b>	<b>Treatment</b>	<b>cost</b>	<b>cost/ha</b>	
	spray out (9m boom)			
	5L/ha PowerMax 48.5/ha			
	0.3L/ha Atril 8.12/ha			
	Activator 10.80	134.53	61.15	
	Flat boom 9m 866 Inter	31.13	14.15	
	Slasher (1.8m)	114.44	52.02	
	Rugby 15L/ha (\$14/L)	231.00	210	
18/12/2007	3.05m Austil Planter (2 row) G240 New Holland(12.84kg/ha)	130.75	59.43	
	wheel rake (4.8m)	74.95	34.07	
	Irrigation			
	Water 0.66meg 53.50			
	H 0 units 0.1764			
19/12/2006	L 287units 0.0971	313.99	142.72	
5/01/2007	fertiliser spreader	25.17	11.44	
5/01/2007	462 growforce (700kg/ha) 490/ton	754.6	343	
	Irrigation			
	Water 0.66meg 53.5/meg			
	H 0 units 0.1764			
14/01/2007	L 287units 0.0971	313.99	142.72	
25/04/2007	Harvest Kenaf	983.334	446.97	
Total cash cost (treated)		3107.88		
Gross return (treated)		2018.72	1517.67	
Gross Margin (treated)			317.53	
Total cash Cost (untreated)		2876.88	1307.67	
Gross return (untreated)		1720.35	1563.95	
Gross Margin (untreated)			256.28	

Table 13

**D Ellwood Harvest date 25/04/2007 Kenaf Trial site Rugby verses Untreated (nematode)  
1.6m row spacing**

Paddock area 2.2ha		Rep 1		Rep 2		average result	Average result Rugby	Average result Untreated
		Rugby	Untreated	Rugby	Untreated			
Total bio-mass weight kg	sample 1	7.5	8	7.25	7	7.72	7.75	7.5
	sample 2	8	8	9	7			
	<b>Total</b>	7.75	8	8.13	7			
Stripped weight kg	sample 1	4.75	5.25	5	5	5.16	5.19	5.13
	sample 2	5	5.5	6	4.75			
	<b>Total</b>	4.88	5.38	5.50	4.88			
Wet weight grams	sample 1	577	705	220	596	25	24	26.75
	sample 2	633	683	851	467			
	<b>Total</b>	605	694	535.5	531.5			
Dry sample grams	sample 1	161.08	226.99	155.51	156.62	157813	148438	167187.5
	sample 2	168.02	204.43	257.17	119.43			
	<b>Total</b>	164.55	215.71	206.34	138.03			
No of stalks	sample 1	29	29	16	27	30.70	32.87	28.53
	sample 2	27	28	23	23			
	<b>Total</b>	28	28.5	19.5	25			
	Plants / ha	175000	178125	121875	156250	69.30	67.13	71.47
	Dry weight % of wet weight	27.20	31.08	38.53	25.97	33.14	34.70	31.58
	Moisture %	72.80	68.92	61.47	74.03	32.23	32.42	32.03
	% of bio-mass returned to the soil	37.10	32.81	32.31	30.36			
	Wet yield tons / ha	30.47	33.59	34.38	30.47			
	Dry weight yield tons / ha 0% moisture	8.29	10.44	13.25	7.91	9.97	10.77	9.18
	Dry weight yield Tons of dry matter / ha 10% moisture	9.12	11.49	14.57	8.70	10.97	11.84	10.09

## Propagation of Sunn hemp

MFP chose to plant three different sites to propagate Sunn Hemp (*crotalaria juncea*) two reduce the risk that one site could have on achieving its aim. The aim was to multiply seed to produce a supply of seed to the wider grower community. The three sites chosen were in the Oakenden, Septimus and Pinnacle areas and all sites were planted early April, on a reducing day length to decrease the biomass to allow for ease of harvesting.

The planting technic utilised in each site was different, the Oakenden site was a min till situation with the grow zone area being tilled, the Septimus site was a full cultivation which left the pinnacle site planted in a zero till situation. All sites achieved excellent germination and were planted at 12.26kg/ha.

**Figure 10**  
***Planting Sunn hemp Oakenden***



**Figure 11**  
***Sunn Hemp Germination***



**Figure 12**  
***Sunn hemp 4 weeks old at Septimus***



In June these Sunn Hemp sites received more 200mm of rain followed by several frosts, the result of this extreme weather pattern caused the Sunn Hemp plants to display a fungus or bacteria like symptom. The end result is that the plants didn't produce pods as would be expected. Samples were sent to BSES Limited pathology as well as DPI Toowoomba pathology which didn't identify the symptoms as either a fungus or a bacteria, the pathologists indicated that as a result of the extreme weather conditions that the plant shut down.

**Figure 13**  
***Sunn Hemp flowering without developing pods***



**Figure 14**  
***Sunn Hemp with Fungus, bacteria type symptoms***



Currently the warmer weather being experienced is allowing the Sunn Hemp to lightly start developing pods which will be observed closely and harvested if possible. To date the Oakenden site is the only site still planted as the Septimus and Pinnacle sites were destroyed.

Table 14 highlights the cash input costs to produce Sunn Hemp with each treatment itemised and costed. As this crop is still in the field harvesting has not been conducted and included into the cash cost.

**Table 14**

<b>Sunn Hemp Propagation 1.8ha</b>			
<b>J,J &amp; Af Muscat Block 1-3 Farm 4533</b>			
<b>Date</b>	<b>Treatment</b>	<b>Cost</b>	<b>Cost / ha</b>
	Spray out cane		
	7.2L/ha Glyosphate (450) 46.66 / ha (83.99)		
	1.25L/ha Ester 13.92 / ha (25.06)		
19/09/2006	0.5L Activator 5.43	114.48	63.6
19/09/2006	7.625m Flat boom (5row) Fiat 600 (41.16/ha)	74.088	41.16
	3.5 L / ha wipe out 22.68/ha (40.82)		
	1L / ha Atril 27.05/ha (48.69)		
10/03/2007	0.5 L Wetter 5.43	89.51	49.73
10/03/2007	7.625m Flat boom (5row) Fiat 600 Lo	74.088	41.16
31/03/2007	3.2m Rotary hoe 66% (grow zone) 98.99/ha	117.594	65.33
	1.5L / ha Dual Gold 42.59/ha (76.66)		
14/04/2007	2 L / ha PowerMax 19.40/ha (34.92)	111.58	61.99
14/04/2007	7.625m Flat boom (5row) Fiat 600 Lo	55.64	30.91
	Plant Sunn Hemp		
14/04/2007	12.26kg/ha (14.75/kg)	180.84	100.47
14/04/2007	3.05m Austil Planter (2 row) G240 New Holland	106.974	59.43
	Irrigation winch 1.29 noz 60 hp 11hrs		
	water 0.91 meg 54.62/meg (49.70)		
	Power H - 0 units 0.1986c/unit		
21/04/2007	L - 500 units 0.0703c/unit (35.15)	84.85	47.14
23/05/2007	Applied Dunder @ 3.3 cu/ha (Tractor) (46.69 / m3)	277.34	154.08
25/05/2007	Applied Liquid calcium 55L / ha (\$3.65/L)	361.35	200.75
25/05/2007	7.625m Flat Boom (5 row) Fiat 600 Lo	55.64	30.91
	Irrigation winch 1.56 noz 60 hp 14hrs		
	water 1.61 meg 54.62/meg (87.94)		
	Power H - 334 units 0.1986c/unit (66.33)		
30/05/2007	L - 421 units 0.0703c/unit (29.59)	183.86	102.14
13/06/2007	Insecticide Telstar 856ml/ha 27.87/ha	50.16	27.87
13/06/2007	Helicopter spray 40/ha	72	40
	Irrigation winch 1.46 noz 12hrs		
	water 1.27meg 54.62/meg (69.37)		
	Power H - 37 0.1986c/unit (7.35)		
25/08/2007	L - 608 0.0703c/unit (42.74)	119.46	66.37
Cash Cost		2129.45	1183.03

**Fibre Comparison**

The aim of this trial site was to evaluate the benefits in the following cane crop after four different treatments, Treatment 1 Kenaf, Treatment 2 Sunn Hemp, Treatment 3 Industrial hemp and the control treatment as a bare fallow. Fibre yield comparison will be measure between the 3 different fibre crops to determine the dry matter per hectare achieved.

Year 1 trial plan 2006

*J,J & Af Muscat Mackay Fibre Producers*

***Fibre Crops comparison Rotational benefits***

2006 (year 1 trial)

Trial 11

Trial strip co ordinates

149.0012335 E

21.3040426 S

- Comparison between Industrial Hemp, Kenaf, Sunn Hemp and bare fallow (replicated)
- Zero till
- Yield comparison of the following cane crop
  - Each rep area will be greater than 0.5ha to allow yield monitoring of the cane crop.(2007)
- Trial Evaluation
  - Planting rate
    - Industrial hemp
    - Kenaf
    - Sunn Hemp
  - Yield, Tons of dry matter per ha
  - Growth rate
  - Plant population achieved
  - Input cost comparison

**Table 15**

<b>Fibre crop</b>	<b>Plant date</b>	<b>Seed rate</b>	<b>Germination</b>	<b>Nutrient applied</b>	<b>Observation</b>
Industrial Hemp	07/12/2006	145 seeds / sq meter @90% germ	Poor	N 204.8 kg/ha K 95.4 kg/ha S 14.4 kg/ha	With poor germination high competition with grass and weeds
Kenaf	05/12/2006	12.84 kg/ha	Good	N 204.8 kg/ha K 95.4 kg/ha S 14.4 kg/ha	Crop vigour lacking, red shouldered leaf beetle present, spray drift present (suspect 24D)
Sunn Hemp	30/12/2006	33kg/ha	Very good	K 95.7kg/ha	Uneven crop growth, struggled with water ponding area

Figure 15



J,J &AF Muscat trial site 24/01/2007 CHG Industrial Hemp (Rep 2)

49 days old

As is evident in this photo germination is poor and weed pressure exists, 102 mm of rain and 30mm irrigation (applied 06/12/2006), 132mm in total. Trial site at planting was dry and in my experience required irrigation for good germination, industrial hemp is sensitive to irrigation applied after planting and prefers pre watering which was not an option because of the size of the block, requires 6 nights to irrigate.

Kenaf strip can be seen in the right hand side of this photo which has germinated well and growing well, exposed to the same treatment as the Industrial hemp.

Figure 16



J,J &AF Muscat Trial site  
Industrial hemp strip (Rep 1) 03/02/2007  
61days old

Another 402 mm of rain has fallen in the last 12 days and distinct yellowing of the crop is evident. At this point the growing point is drooping and Industrial hemp is severely stressed, grass and weeds growing quickly competing with Industrial Hemp. At this stage noticeable darkening of stems was evident although root system looked OK.

Kenaf and Sunn Hemp also exposed to the same rain fall events, Kenaf 63 days old and Sunn Hemp 35 days old have tolerated the rainfall. In Figure 15 Sunn Hemp trial strip is directly left of the Industrial Hemp and Kenaf on the far right of this photo.

Figure 17



J, J &AF Muscat Industrial hemp strip trial (Rep 1) 14/02/2007

72days old

Industrial Hemp at this stage is dying; this photo shows drooped growing point and darkening of stems. Plant samples were taken and sent to two pathology labs to identify the possible cause. No conclusive results were attained from pathology that positively identified the cause of death.

Table 16

**Frank Muscat & Co Fibre comparison trial (kenaf & Sunn Hemp) 1.525 row spacing (Farm 4533)**

Harvest date 25/04/2007

		Rep 1		Rep 2		average result Kenaf	average result Sunn Hemp
		Kenaf	Sunn Hemp	Kenaf	Sunn Hemp		
<b>Paddock area 2.2 ha</b>							
<b>Total bio-mass weight kg</b>	sample 1	5.25	5	8	4.75	<b>6.50</b>	<b>4.54</b>
	sample 2	6.75	4.75	6.25	4		
	sample 3	8.25	5.75	4.5	3		
	<b>Total</b>	<b>6.75</b>	<b>5.17</b>	<b>6.25</b>	<b>3.92</b>		
<b>Stripped weight kg</b>	sample 1	3.5	3	5.5	2.25	<b>4.58</b>	<b>2.58</b>
	sample 2	4.5	2.5	4.25	2.5		
	sample 3	6	3	3.75	2.25		
	<b>Total</b>	<b>4.67</b>	<b>2.83</b>	<b>4.50</b>	<b>2.33</b>		
<b>Wet weight grams</b>	sample 1	619.65	243.65	734.65	228.65		
	sample 2	701.65	295.65	892.65	297.65		
	sample 3	1023.65	315.65	618.65	198.65		
	<b>Total</b>	<b>660.65</b>	<b>284.98</b>	<b>748.65</b>	<b>241.65</b>		
<b>Dry sample grams</b>	sample 1	194.48	102.66	221.45	98.95		
	sample 2	237.27	125.21	278.6	134.59		
	sample 3	340.69	141.45	176.59	94.74		
	<b>Total</b>	<b>257.48</b>	<b>123.11</b>	<b>225.55</b>	<b>109.43</b>		
<b>No of stalks</b>	sample 1	27	73	31	56	<b>28</b>	<b>62.3</b>
	sample 2	28	57	26	67		
	sample 3	27	62	31	59		
	<b>Total</b>	<b>27.3</b>	<b>64</b>	<b>29.3</b>	<b>60.7</b>		
	<b>Plants / ha</b>	179234.78	419671.68	192349.52	397813.78	<b>185792</b>	<b>408742.73</b>
	<b>Dry weight % of wet weight</b>	38.97	43.20	30.13	45.28	<b>34.55</b>	<b>44.24</b>
	<b>Moisture %</b>	61.03	56.80	69.87	54.72	<b>65.45</b>	<b>56.80</b>
	<b>% of bio-mass returned to the soil</b>	30.86	45.16	28.00	40.43	<b>29.43</b>	<b>42.79</b>
	<b>Wet yield tons / ha</b>	30.60	18.58	29.51	15.30	<b>30.05</b>	<b>16.94</b>
	<b>Dry weight yield tons / ha 0% moisture</b>	11.93	8.03	8.89	6.93	<b>10.41</b>	<b>7.48</b>
	<b>Dry weight yield Tons of dry matter / ha 10% moisture</b>	13.12	8.83	9.78	7.62	<b>11.45</b>	<b>8.22</b>

Table 17

<b>Mackay Fibre Producers (Fibre Comparison Trial) 4.44 ha</b> <b>J, J &amp; Af Muscat Farm 4533 BL 1-2</b> <b>Kenaf BL 1-2 1.09ha</b> <b>Kenaf BL 1-3 1.8ha</b>				
Date	J,J & AF Muscat Farm 4533 Block 1.2	Cost	Cost/ha	
	Sprayout cane			
	7L/ha Glysoate (450) 45.36/ha			
	1.25L/ha Ester 800 13.91/ha			
10/09/2006	0.5L Activator 5.43	112.55	25.35	
10/09/2006	7.625m Flat Boom (5row) Fiat 600 Lo	137.24	30.91	
	3L/ha Glysoate (450) 19.44/ha			
	2kg/ha Baton 27/ha			
12/11/2006	0.5L Activator 5.43	144.75	32.60	
12/11/2006	7.625m Flat Boom (5row) Fiat 600 Lo	137.24	30.91	
	Spray Edges			
	10L wipeout 64.80			
	2.5L Atril 67.63			
10/02/2007	0.5L Activator 5.43	137.86	31.05	
<b>Sub total</b>		<b>669.64</b>	<b>150.82</b>	
	<b>Kenaf 1-2 &amp; 1-3 2.89ha Farm 4533</b>			
	3L/ha Glysoate (450) 19.44/ha			
	1.25L/ha Ester 800 13.91/ha			
21/11/2006	0.5L Activator 5.43	65.07	22.52	
21/11/2006	7.625m Flat Boom (5row) Fiat 600 Lo	89.33	30.91	
22/11/2006	Dunder Mid N 3.6cu / ha (truck) (100.27/m3)	1043.21	360.97	
27/11/2006	Wheel rake stools 3 row (MF 290) x 2	57.0486	19.74	
5/12/2006	3.05m Austil Planter (2 row) G240 New Holland	171.7527	59.43	
31/04/2007	Harvest Kenaf	1708.25	591.09	
		165.902	150.82	
<b>Sub Total cash cost</b>		<b>3300.56</b>	<b>1235.48</b>	
<b>Gross return</b>	11.61x155x2.89	<b>5200.70</b>	<b>1799.55</b>	
<b>Gross Margin</b>		<b>1900.14</b>	<b>564.07</b>	
	<b>Kenaf Treatments 1.1ha (2x0.55ha strips)</b>			
<b>Date</b>		<b>Cost</b>	<b>Cost/ha</b>	
22/11/2006	Dunder Mid N 3.6cu / ha (truck) (100.27/m3)	397.07	360.97	
27/11/2006	Wheel rake stools 3 row (MF 290) x 2	21.714	19.74	
5/12/2006	3.05m Austil Planter (2 row) G240 New Holland(12.84kg/ha)	65.373	59.43	
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs 54.62x1.5=81.93			
	Power H 310 units 310x0.1986=61.57			
18/01/2007	L 390 units 390x0.0703=27.42	157.21	85.91	
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs			
	Power H 310 units			
21/01/2007	L 390 units	157.21	85.91	
31/04/2007	Forage Harvest Kenaf 37.78x14.50	650.20	547.81	
			150.82	
<b>Sub Total cash cost</b>		<b>1448.78</b>	<b>1310.59</b>	
<b>Gross return</b>	\$45.00/1m3	<b>1870.11</b>	<b>1700.10</b>	
<b>Gross margin</b>		<b>421.33</b>	<b>389.51</b>	

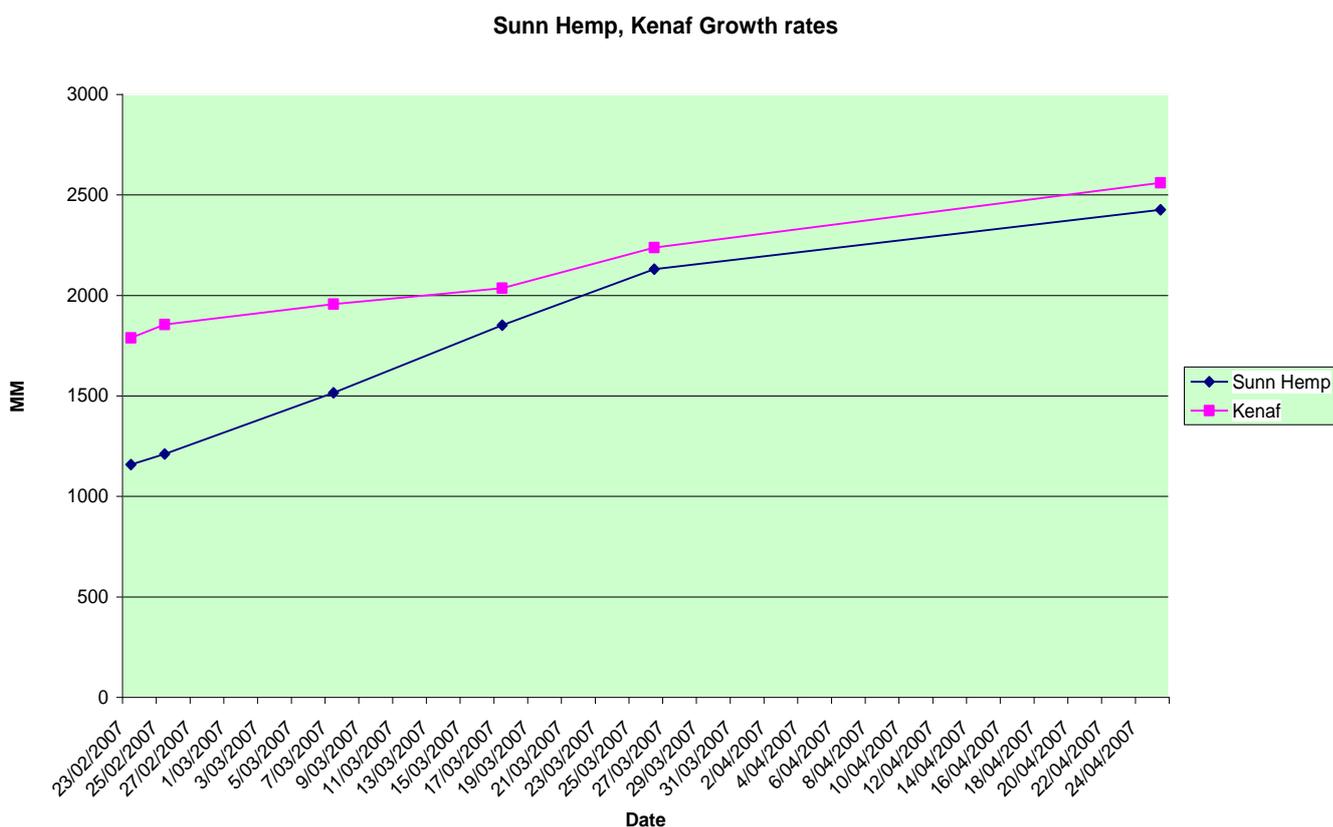
<b>Sunn Hemp Treatments 1.1ha (2x0.55ha strips)</b>			Cost	Cost/ha
<b>Date</b>				
22/11/2006	Bio-dunder 3.3cu/ha (truck) (\$42.87 / m3)		311.23	282.94
	3L/ha Glyosphate 450 19.44/ha			
	0.9kg/ha Baton 12.15/ha			
24/12/2006	0.5L activator 5.43		38.235	34.76
24/12/2006	7.625m Flat Boom (5row) Fiat 600 Lo		34.00	30.91
27/11/2006	Wheel rake stools 3 row (MF 290) x 2		21.714	19.74
30/12/2007	3.05m Austil Planter (2 row) G240 New Holland (33kg/ha)		65.373	59.43
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs			
	Power H 310 units			
18/01/2007	L 390 units		157.21	85.91
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs			
	Power H 310 units			
21/01/2007	L 390 units		157.21	85.91
	Mower conditioner Sunn Hemp 1.1ha			
	Raked and Dry			
25/04/2007	Bale 4x4 round bales 20 bales @ \$25.00 / bale \$500			0.00
1/05/2007	Harvest Cane Harvester 1 row \$72.34			0
	1.5L/ha Regone (5rows)			
	1.5L/ha Gromoxone 12/ha			
19/05/2007	0.5L activator 5.43			
14/07/2007	Forage Harvest Sunn Hemp 27.12x14.50		432.564	393.24
				150.82
<b>Sub Total cash cost</b>			<b>906.31</b>	<b>823.92</b>
<b>Gross return</b>	\$45.00/1m3		<b>1401.51</b>	<b>1220.4</b>
<b>Gross margin</b>			<b>495.20</b>	<b>396.48</b>

<b>Industrial Hemp 1.1ha's (2x 0.55 ha Strips)</b>			Cost	Cost/ha
<b>Date</b>				
22/11/2006	Dunder Mid N 3.6cu / ha (truck) (100.27/m3)		397.0692	360.97
27/11/2006	Wheel rake stools 3 row (MF 290) x 2		21.714	19.74
	3.05m Austil Planter (2 row) G240 New Holland			
7/12/2006	145 seeds / sq m		65.373	59.43
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs			
	Power H 310 units			
18/01/2007	L 390 units		157.21	85.91
	Irrigation Winch 13hrs (0.5 cane) Treatment A1			
	Water 1.5megs			
	Power H 310 units			
21/01/2007	L 390 units		157.21	85.91
	6L/ha PowerMax 58.20/ha			
	1L/ha Atril 27.05/ha			
15/02/2007	2L Activator 21.70		109.655	99.69
15/02/2007	7.625m Flat Boom (5row) Fiat 600 Lo		34.00	30.91
				150.82
<b>total</b>				<b>893.37</b>

**Bare Fallow Treatment 1.1ha's (2x 0.55ha strips)**

Date		Cost	Cost/ha
	6L/ha PowerMax		
	1L/ha Atril		
15/02/2007	2L Activator	109.655	99.69
15/02/2007	7.625m Flat Boom (5row) Fiat 600 Lo	45.276	41.16
			150.82
<b>Sub Total</b>			<b>291.67</b>
<b>Cash Cost Kenaf</b>			<b>1525.19</b>
<b>Cash Cost Sunn Hemp</b>			<b>1121.98</b>
<b>Bare Fallow</b>			<b>462.99</b>
<b>Cost per ton /dry matter Kenaf</b>			<b>133.20</b>
<b>Cost per ton of dry matter Sunn Hemp</b>			<b>136.49</b>

**Table 18**



**Trial result summary;**

The results achieved in this trial site indicate that further work is required, the trial site lived through some extremities of weather which killed the Industrial Hemp, the results of Sunn Hemp and Kenaf are highlighted in Table's 16 & 17, Tons of dry matter per hectare and the cost of production are compatible as is the growth rate achieved by the two fibre crops. The following cane crop will also be monitored to establish if any benefits are achieved. The block has been planted to Q200 sugar cane.

**Table 19 Frank Muscat & Co Commercial Kenaf 1.525 row spacing (Farm 4530) Harvest date 29/04/2007**

Paddock area 3.17ha		commercial	average result
Total bio-mass weight kg	sample 1	9	9.06
	sample 2	9.9	
	sample 3	11.42	
	sample 4	5.92	
	<b>Total</b>	<b>9.06</b>	
Stripped weight kg	sample 1	6.32	6.88
	sample 2	7.72	
	sample 3	9.08	
	sample 4	4.38	
	<b>Total</b>	<b>6.88</b>	
Wet weight grams	sample 1	1175.65	
	sample 2	1255.65	
	sample 3	1575.65	
	sample 4	1135.65	
	<b>Total</b>	<b>1285.65</b>	
Dry sample grams	sample 1	401.77	
	sample 2	398.57	
	sample 3	521.87	
	sample 4	380.14	
	<b>Total</b>	<b>425.59</b>	
No of stalks	sample 1	23	22.5
	sample 2	19	
	sample 3	29	
	sample 4	19	
	<b>Total</b>	<b>22.5</b>	
	Plants / ha	147540.83	<b>147540.83</b>
	Dry weight % of wet weight	33.10	<b>33.1</b>
	Moisture %	66.90	<b>66.9</b>
	% of bio-mass returned to the soil	24.12	<b>24.12</b>
	Wet yield tons / ha	45.08	<b>45.08</b>
	Dry weight yield tons / ha 0% moisture	14.92	<b>14.92</b>
	Dry weight yield Tons of dry matter / ha 10% moisture	16.42	<b>16.42</b>

<b>Table 20</b>		<b>J,J &amp;AF Muscat Farm 4530 BL 1-3 3.19 ha</b>		
<b>Date</b>	<b>Treatments</b>	<b>Cost</b>	<b>Cost/ha</b>	
10/09/2006	7L/ha wipeout (7x6.48) 45.36/ha 0.5L Activator 5.43 7.625m Flat boom (5row) Fiat 600	150.13 131.30	47.06 41.16	
11/11/2006	5L/ha wipeout (6.48x5) 32.4/ha 7.625m Flat boom (5row) Fiat 600 3.05m Austil Planter (2 row) G240 New	103.36 131.30	32.4 41.16	
13/11/2006	Holland(12.84kg/ha)	189.58	59.43	
13-14/11/2006	Wheel rake stools 3 row (MF 290) x 3	188.91	59.22	
22/11/2006	Dunder Mid N 3.6cu / ha (tractor) (103.77/m3)	1191.69	373.57	
23-24/11/2006	Irrigation Winch 54mm 19.75HRS Water 2.13megs (54.62) Power H 222 units (0.1986) L 982 units (0.0703)	229.46	71.93	
29/04/2007	3L Basta 69 1.5hrs 30 Harvest Kenaf	99 1885.58	31.03 591.09	
<b>Total cash cost</b>		4300.31	1348.06	
<b>Gross return</b>	16.42x135x3.19	7071.27	2216.70	
<b>Gross Margin</b>		2770.96	868.64	

### *Input cost summary*

<b>Kenaf price matrix</b>					
	<b>Cash cost / ha</b>	<b>Gross Margin / ha</b>	<b>Yield (2007) Dry Tons / ha (10%)</b>	<b>\$ / Ton</b>	<b>Yield (2006) Dry Tons / ha (6%)</b>
	1255.98	543.57	11.61	155	20.87
	1374.37	400.38	11.45	155	14.54
	1348.06	868.64	16.42	135	15.89
	1539.7	367.85	14.13	135	11.17
	1563.07	482.18	15.15	135	11.35
	1307.67	392.68	10.97	155	18.43
	1233.88	714.47	12.57	155	16.24
					16.06
					13.74
					11.07
<b>Average</b>	<b>1374.68</b>	<b>538.54</b>	<b>13.19</b>	<b>146.43</b>	<b>14.94</b>

As with all cropping situations the gross margins are determined by the yield and the selling price, the contact arrangement of MFP is highlighted in the Kenaf price matrix as being viable. If a break even point was to be established then at \$100.00 per ton of dry matter as the sell price 13.74 tons of dry matter per hectare would be the break even point.

### **Criteria 22**

#### ***R&D issues related to producing fibre crops within a cane rotation system***

- Wrapping of fibre around harvesting components e.g. Base cutter legs
- Kenaf Losses with mechanical cane harvesting
- Sunn Hemp leaf hard to remove in its green state
- Different planting rates for Sunn Hemp (bio-mass achieved)
- Timing of harvest (over mature crops)
- Compacted soils require min till operation
- Identify nitrogen fixing rate of Sunn Hemp and how many days required to maximise results
- Does planting rates determine nitrogen fixing amounts
- Weed Management is paramount to maximise yield
- Kenaf cropping and the effects to packametra spore counts
- Propagation issues of Sunn Hemp on, podding, cold temperature and insecticide management

### **Criteria 23**

#### ***Develop a system to measure yield of fibre crops***

Developing a system to determine fibre crop yield will be ongoing and will reflect onto the harvesting concept utilised. The process must be unbiased to either party or one that reflects accurate results. The process used in the 2006 / 2007 seasons has been as follows:

- Representative hand cut samples
  - Total bio-mass measured
  - Stripped sample measured
  - Sub sample taken
- Determine moisture content
  - Sub sample dried in de-hydrating oven to constant weight (0% moisture)
  - $(\text{Wet weight} - \text{Dry weight}) / \text{Wet weight} \times 100$



***Figure 18 Hand cut sample***



***Figure 19 Sample weighed***



**Figure 20** *Sample stripped and re – weighed*



**Figure 20** *Sub sample weighed and dried*

#### **Criteria 24**

Mackay Fibre Producers has been successful in attracting a Regional Community project which will enable the grower group to enter into the first commercial arrangement from its fibre production in rotation with sugar cane. This project will supply seed funding for equipment required to produce a garden mulch product line as well as equipment to produce and store seed. MFP would like to highlight that without SRDC's investment into Grower group Innovation project the RCP project would not have been possible. The GGIP program is delivering real outcomes and this project is living proof of that success.

#### **Criteria 25**

Every opportunity has been taken to keep growers updated with the progress and findings of this project. The GIVE (Grower Innovation Virtual Expo) 2006 was attended was MFP and a presentation delivered to approx 300 growers and industry representatives, the presentation session was presented twice with both sessions well attended.

At the Land Care conference MFP delivered a presentation to growers and community people from all over Australia updating the progress of the group in producing and handling fibre crops, at this conference we had only just completed our first legume comparison trial which encouraged the group members and spark large interest in the results that Sunn Hemp had delivered in relation to a legume crop option.

#### **Criteria 26**

***Develop year two trial plans to address documented issues from year 1 trial results***

#### ***R&D issues related to producing fibre crops within a cane rotation system***

- Wrapping of fibre around harvesting components e.g. Base cutter legs
- Kenaf Losses with mechanical cane harvesting
- Sunn Hemp leaf hard to remove in its green state
- Different planting rates for Sunn Hemp (bio-mass achieved)
- Timing of harvest (over mature crops)
- Compacted soils require min till operation
- Identify nitrogen fixing rate of Sunn Hemp and how many days required to maximise results
- Does planting rates determine nitrogen fixing amounts
- Weed Management is paramount to maximise yield
- Kenaf cropping and the effects to packametra spore counts

- Propagation issues of Sunn Hemp on, podding, cold temperature and insecticide management

### *Year 2 trials*

6. Sunn Hemp Nitrogen fixation rates
7. Kenaf cropping effects on Packametra spore counts
8. Harvester losses utilising Forage harvester verses Cane harvester
9. Propagation of,
  - a. Sunn Hemp
  - b. Kenaf
  - c. Industrial Hemp

#### Year 2 trial 1

Mackay Fibre Producers

J,J &AF Muscat (trial 1)

#### Trial aim

To monitor the nitrogen rate of Sunn Hemp at 30,40,50,60,70,80,90 and 100 days to determine the optimum crop length period to maximise the nitrogen rate

#### Trial evaluation

- Determine plant establishment
- Investigate plant nutrient uptake at 10 day intervals from 30 days through to 100 days
- Record bio-mass achieved at each 10 day interval
- Observation assessment

#### Year 2 trial 1

Mackay Fibre Producers

Lawrence Bugeja (trial 2)

#### Trial aim

To monitor the nitrogen rate of Sunn Hemp at 30,40,50,60,70,80,90 and 100 days to determine the optimum crop length period to maximise the nitrogen rate

#### Trial evaluation

- Determine plant establishment
- Investigate plant nutrient uptake at 10 day intervals from 30 days through to 100 days
- Record bio-mass achieved at each 10 day interval
- Observation assessment

#### Year 2 trial 2

Mackay Fibre Producers

Trial 2

#### Trial aim

The aim of this trial is to investigate the effects of a Kenaf fibre crop to the packametra spore counts in a fallow rotation situation. Core samples will be GPS located and revisited before and after the Kenaf crop to determine the Kenaf crop effects.

#### Trial evaluation

Sample fallow block before and after the Kenaf crop and compare packametra spore counts

Year 2 trial 3  
Mackay Fibre Producers  
Trial 3

#### Trial aim

The aim of this trial is to propagate seed from three different fibre crops, namely Kenaf, Sunn Hemp and Industrial Hemp. Compare input costs to produce seeds.

#### Trial evaluation

- Source seed from three different fibre crops
- Document production cost of three fibre crops
- Document production issues
- Observation assessment

### ***Criteria 27***

#### ***Design and plant trial sites and conduct demonstration***

Trial sites have been design to align with year 2 trial plan, trials are currently being planted to meet the objectives of the year 2 plan.

Planting demonstration has been conducted with industry people from the DPI Future Cane and Yield Decline group conducting a field trip that inspected MFP planter. 42 industry people attended this field trip. The MFP planter is state of the art with the following componentary;

- Vacuum plate distributor system
- Inoculant injection system
- Zero till ability
- Ability to plant from 1.5m to 2.0 m row spacing
- Vee type trash rake fitted to the planter
- Ability to plant Fibre , Soy bean and Peanuts
- Full monitoring system
  - Shoot blockage alarm
  - calibration check
  - Area meter
  - Vee Type press wheels

*Figure 1 Inspecting MFP planter*



**Figure 2**  
***Sugar Industry researchers and extension people obtain the facts on MFP vacuum plate planter***



*Criteria 28 Develop trial recording sheets to collect data*

The following is an example of the record sheets that were developed to capture the trial information for the trials that were conducted through out the life of the project.

## Year 1 trial plan 2006

### *Russell Gibson Mackay Fibre Producers* Propagating Sunn Hemp (*crotalaria juncea*) Trial 8

- Propagating Sunn Hemp seed (full cultivation)
- *Crotalaria juncea*
- Planting Seed Rate \_\_\_\_\_
- Planting date \_\_\_\_\_
- Trial evaluation
  - Input cost recorded
  - Measure yield ( tons per ha)
  - Soil assay
    - Nutrient before and after
    - Nematode count before and after
    - Pacyametra count before and after
  - Cane yield in following cane crop

***Paddock Details***

Farm Number		Soil Type	
Block Number		Plant Date	
Variety		Block Area	
Fibre crop			

**Tractor ID**

<b>Tractor</b>	<b>Make/model</b>	<b>HP</b>	<b>Fuel use</b>	<b>Purchase value</b>	<b>Current engine hours</b>
Tractor 1					
Tractor 2					
Tractor 3					
Tractor 4					
Tractor 5					
Tractor 6					
Tractor 7					
Tractor 8					

**Implement register – include cultivation equipment, planters, spray equipment etc**

Implement type	Width of implement	% of workload on tractors used			Purchase price
		Tractor 1	Tractor 2	Tractor 3	

### Land preparation

Date	Trial –	Implement	Tractor ID	Time to use in paddock	Average speed

### Pre-plant application of lime, mill mud, ash, dunder etc

Date	Trial ID	Product	Rate	Cost per m <sup>3</sup>

**Land preparation**

<b>Date</b>	<b>Trial –</b>	<b>Implement</b>	<b>Tractor ID</b>	<b>Time to use in paddock</b>	<b>Average speed</b>

**Pre-plant application of lime, mill mud, ash, dunder etc**

<b>Date</b>	<b>Trial ID</b>	<b>Product</b>	<b>Rate</b>	<b>Cost per m<sup>3</sup></b>

### Planting

Date	Trial -	Tractor ID	Planter type	Time to plant	Average tractor Speed

### Fertiliser applied at planting

Date	Trial ID	Products used	Rate applied	\$/t or m <sup>3</sup>	Equipment used	Tractor ID	Time to apply	Average speed

## Fertiliser

<b>Date</b>	<b>Trial –</b>	<b>Product used</b>	<b>Rate applied</b>	<b>\$/t or m<sup>3</sup></b>	<b>Fertiliser equipment used</b>	<b>Tractor ID</b>	<b>Time to apply</b>	<b>Average speed</b>

## Weed control

<b>Date</b>	<b>Trial –</b>	<b>Product or cultivation used</b>	<b>Rate applied</b>	<b>\$/litre or kg</b>	<b>Spray equipment used</b>	<b>Tractor ID</b>	<b>Time to apply</b>	<b>Average tractor speed</b>

### **Insect and disease control**

<b>Date</b>	<b>Trial –</b>	<b>Product used</b>	<b>Rate applied</b>	<b>\$/litre or kg</b>	<b>Equipment used</b>	<b>Tractor ID</b>	<b>Time to apply</b>	<b>Average speed</b>

**Irrigation [cost per unit High tarrif\_\_\_\_\_ Low tarrif\_\_\_\_\_]**

<b>Date</b>	<b>Irrigation method</b>	<b>Water costs \$/ML</b>	<b>Pump KW</b>	<b>Electricity meter reading</b>	<b>Water meter reading (or nozzle size &amp; pressure)</b>	<b>Diesel pump fuel use</b>	<b>Irrigation time</b>
				H ----- L			
				H ----- L			
				H ----- L			
				H ----- L			
				H ----- L			
				H ----- L			
				H ----- L			
				H ----- L			

## *Harvest details*

<i>Farm no</i>	
<i>Block no</i>	
<i>Harvest date</i>	
<i>Moisture content</i>	
<i>Crop presentation</i>	
<i>Yield</i>	
<i>Observations</i>	

*Criteria 29 & 30*  
*Monitor trial sites and coordinate*  
*Harvest and collect trial information for trial sites*

Year 2 trial 1  
Mackay Fibre Producers  
J,J &AF Muscat (trial 1)

**Trial aim**

To monitor the nitrogen rate of Sunn Hemp at 30,40,50,60,70,80,90 and 100 days to determine the optimum crop length period to maximise the nitrogen rate

**Trial evaluation**

- Determine plant establishment
- Investigate plant nutrient uptake at 10 day intervals from 30 days through to 100 days
- Record bio-mass achieved at each 10 day interval
- Observation assessment

Year 2 trial 1  
Mackay Fibre Producers  
Lawrence Bugeja (trial 2)

**Trial aim**

To monitor the nitrogen rate of Sunn Hemp at 30,40,50,60,70,80,90 and 100 days to determine the optimum crop length period to maximise the nitrogen rate

**Trial evaluation**

- Determine plant establishment
- Investigate plant nutrient uptake at 10 day intervals from 30 days through to 100 days
- Record bio-mass achieved at each 10 day interval
- Observation assessment

Two trial sites were established, J,J & AF Muscat and L Bugeja, both these trial sites were managed to examine the nitrogen fix ability of Sunn hemp when compared to Soy bean. Bio-mass samples were taken at 72 days after planting, 83 DAP, 100 DAP, 115 DAP and 134 DAP. Both trial sites were exposed to extremely high rain fall, which in the first two months of 2008 produced the annual average rainfall. In the first two months of the 2008 3 days of clear sun light was achieved all the rest were overcast or raining. The Sunn Hemp yield achieved was hampered because of the high rainfall, this crop doesn't perform well in a water logged situation.



Leichhardt Soy bean

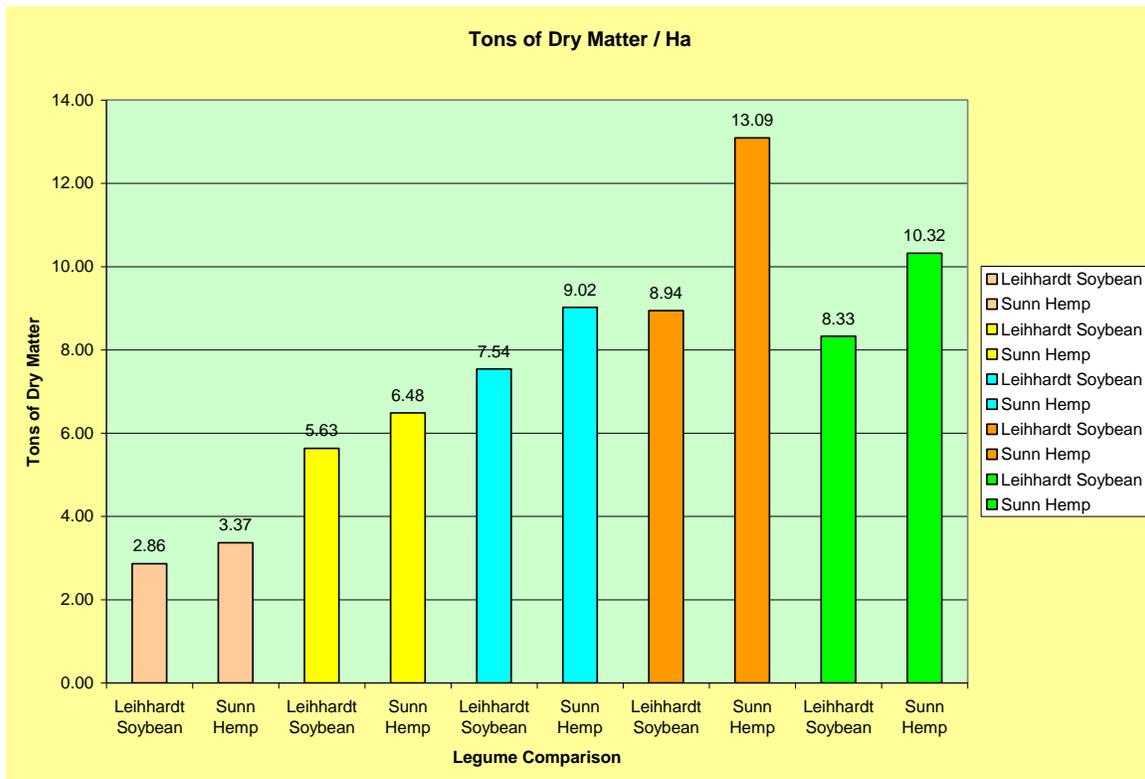


Sunn Hemp

Muscat trial site 23rd January 2008

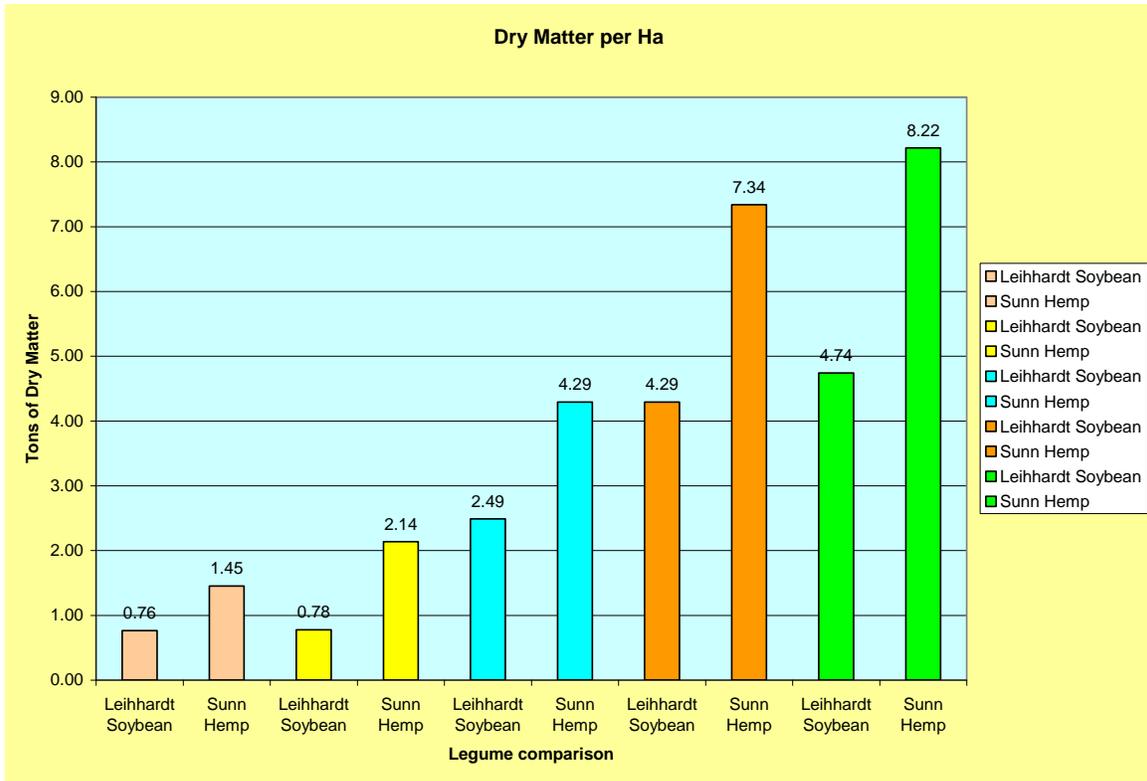
The Leichhardt Soybean performed very well under the same conditions in this trial site which achieved 8.94 tons of dry matter per ha and 2.3 tons of grain per ha. Table 1 and 2 demonstrates the direct comparison of dry matter per ha produced in each of the sampling dates. The results highlight the ability for the Sunn Hemp to produce more biomass than the Leichhardt soybean right through the growing cycle. Tables 4 and 5 demonstrate the direct comparison of the nitrogen fix between the sunn Hemp and the Leichhardt soybean.

Table 1



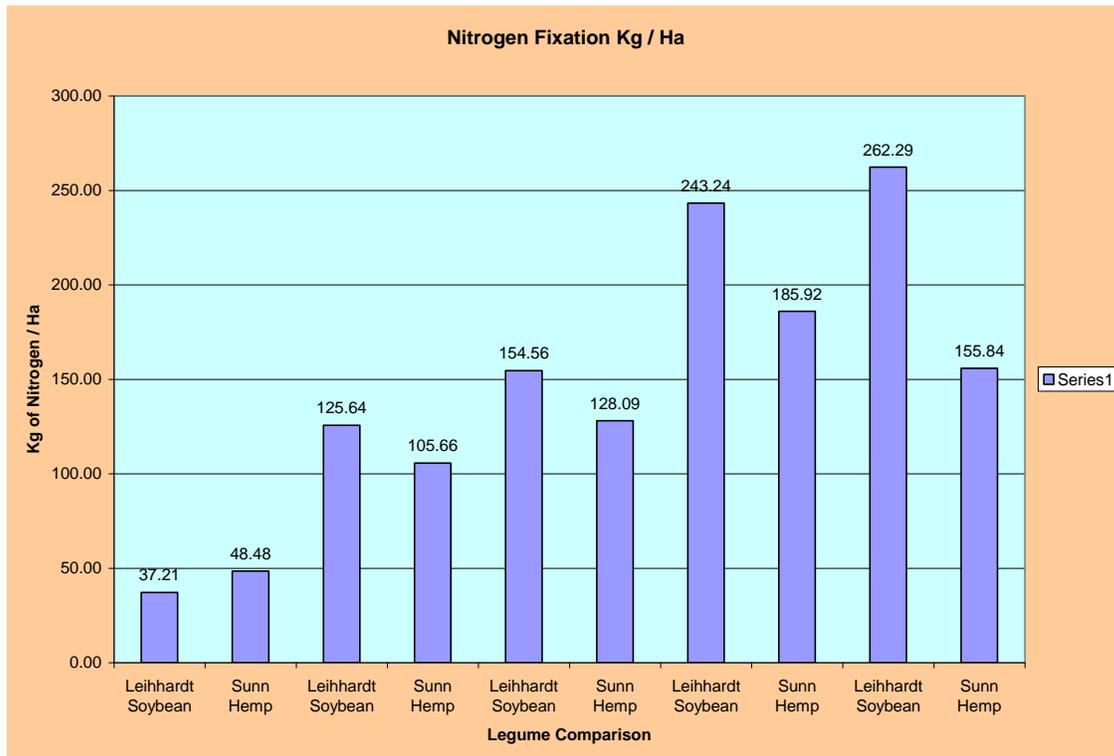
Muscat's trial site (Dry Matter per Ha)

Table 2

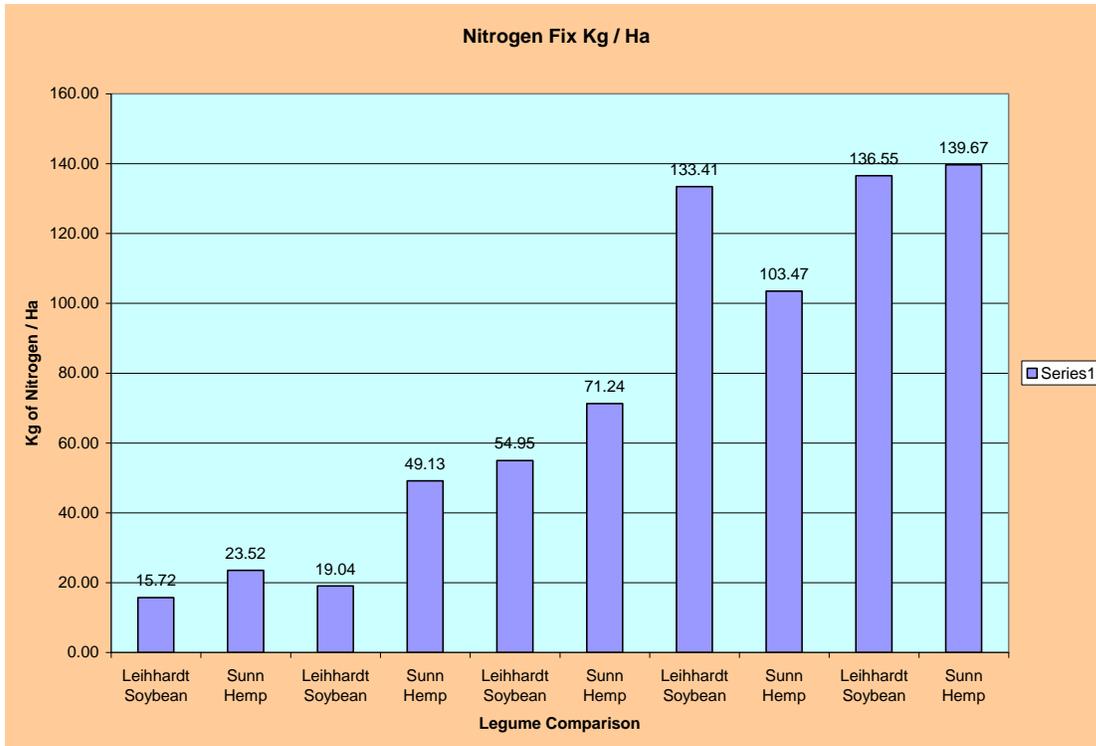


Bugeja's trial site (Dry Matter per Ha)

Table 4

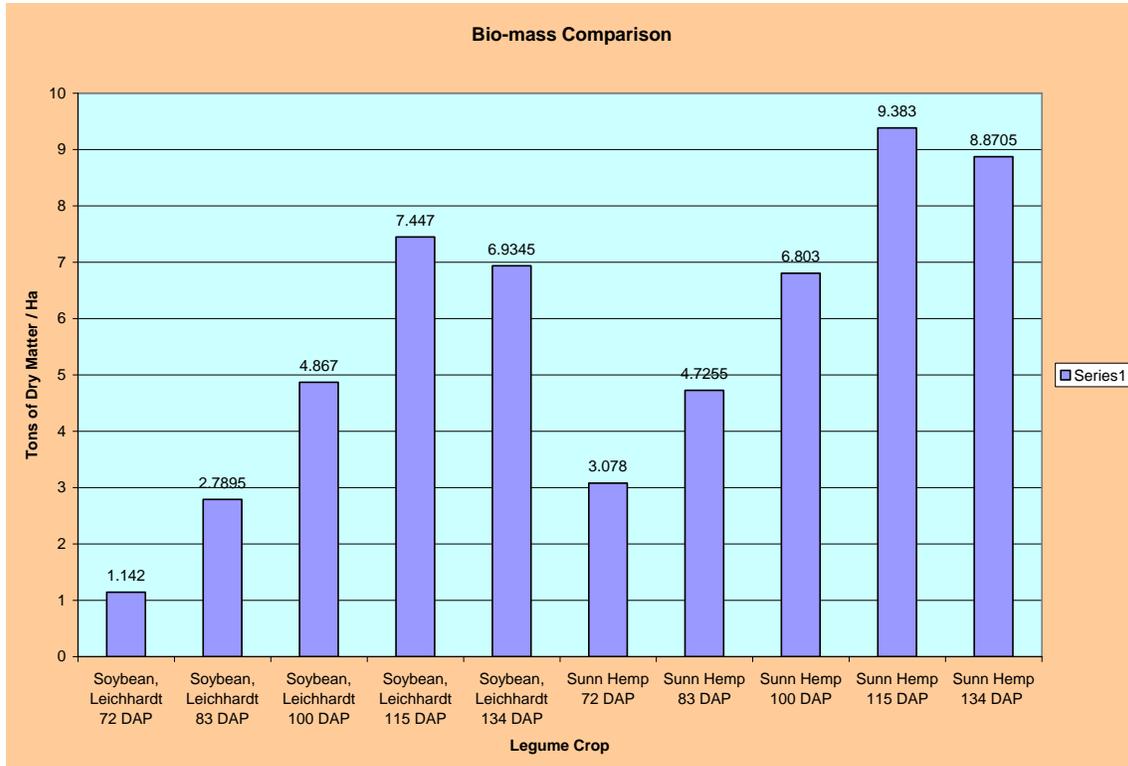


Muscat's Trial Site (Nitrogen fix kg / ha)  
Table 5



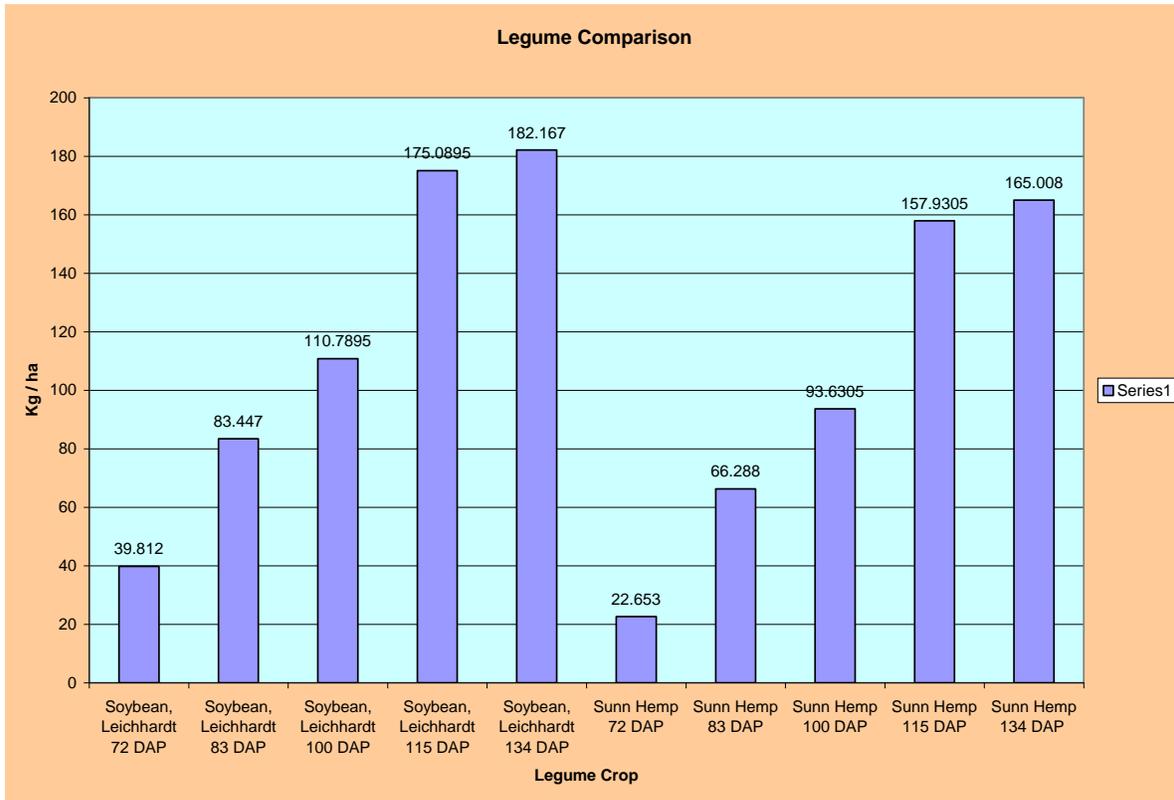
Bugeja's Trial site (Nitrogen fix kg / ha)

Table 6



Accumulated Bio-mass results Tons / ha (Muscat & Bugeja)

Table 7



Accumulated Nitrogen fix kg / ha (Muscat & Bugeja)

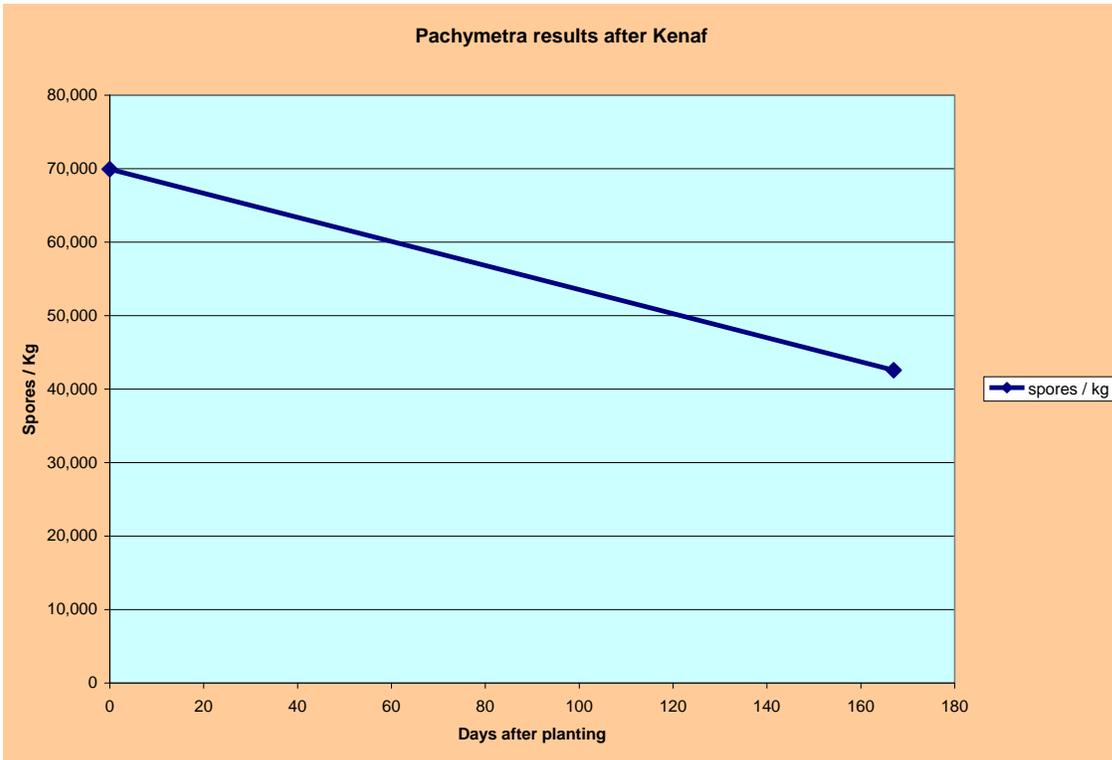
Table 6 and 7 are the accumulated results for both trial sites in relation to the Nitrogen fix (kg/ha) and the bio-mass produced (tons per ha). These results demonstrate that there is no significant difference between the nitrogen fix of the Leichhardt soybean and the Sunn Hemp, although there is a significant difference in the bio-mass produced, Sunn Hemp has produced more bio-mass per ha than the Leichhardt soybean.

### Kenaf cropping effects on Packametra spore counts

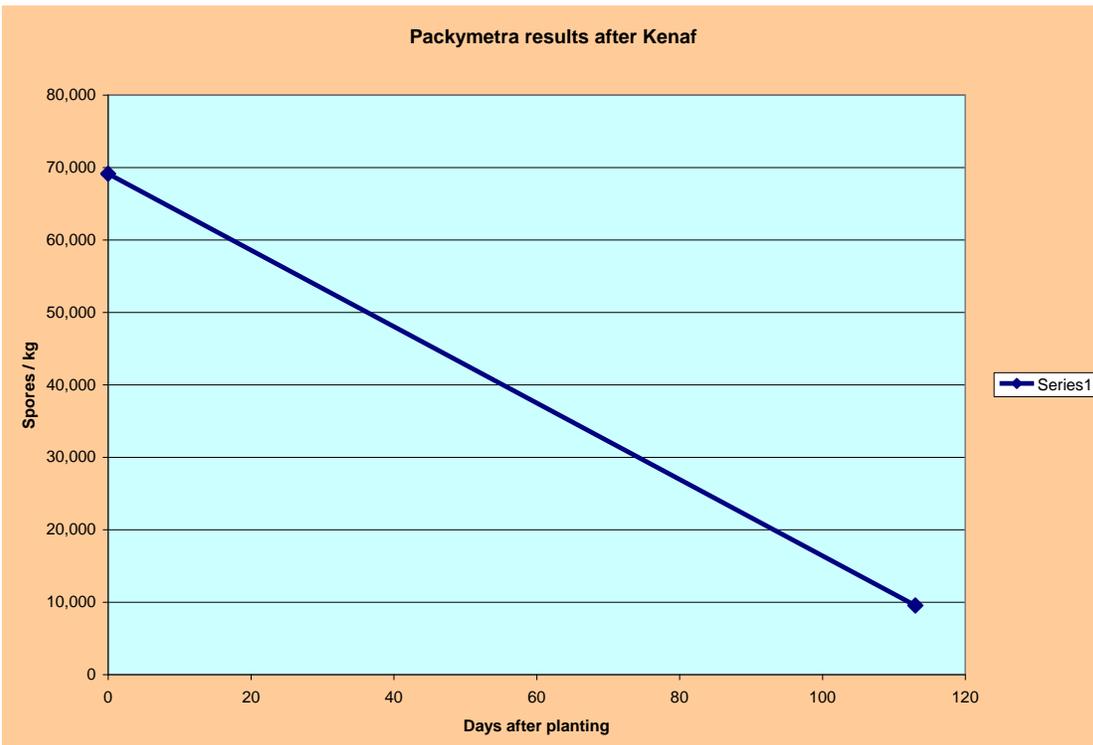
A significant finding of this project has been the effect of Packametra spores after planting Kenaf, two trial sites were monitored over the life of the project where Packametra spore counts were taken before and after planting Kenaf in rotation with sugar cane.

The results were outstanding, the first trial site counts were 69,930 and after 167 day Kenaf crop cycle the counts were reduced to 42,563, this was a reduction of 40%. The results of the second trial site were more outstanding with the pre planting counts at 69,142 and after 113 days Kenaf crop cycle reduced the counts to 9,534 a reduction of 86%. MFP don't understand the science behind these results and recommend that this be investigated more thoroughly as ability to reduce packametra in sugar cane will have a major impact on productivity for the Australian sugar industry.

Table 1



Trial 1 Kenaf planted after Q124



Trial 2 Kenaf planted after Q157

A number of Kenaf and Sunn Hemp crops were produced in 2008, input costs of production with the harvest weight achieved and gross margins identified are documented below. The 2008 season produced some disappointing results with the extremely high rainfall experienced in the early part of the 2008 year. As the results demonstrate the majority of the fibre produced returned a negative gross margin, these margins are highlighted in red.

Mackay Fibre Producers (Fibre trial economics) 2008

Kenaf Fibre production Plant date 8/12/2007 (122days)

L Bugeja 5.6ha				5.6
Date	Treatment	Cost	Cost / ha	
	Herbicide			
	Round up CT 6L/ha (cost \$6.00/L)	201.6	36	
	Herbicide application			
	Flat boom	41.83	7.47	
	Herbicide			
	Round up CT 4L/ha (cost \$6.00/L)	134.4	24	
	Herbicide application			
	Flat boom	41.83	7.47	
	Stool rake (3 row)	86.35	15.42	
	Stool rake (3 row)	86.35	15.42	
	Min till Rip grow zone	320.82	57.29	
	Rotary hoe grow zone (600mm)	314.27	56.12	
	Plant Kenaf 17.59 Kg /ha (98kg)			
	Planter (3.02m)	378.39	67.57	
	Irrigation			
	water 2.7mg @ 27.50 / mg(\$74.25)			
	diesel 26hrs @13.5 L/hr 351L @ 1.35 / L (\$473.85)			
	50 hp electric(\$102.94)	651.04	116.26	
	Hand spray vines Amine 625 (6.50/L)	181.5	32.41	
	Fertiliser			
	350kg/ha Hifert 161 (\$560/ton)			
	N 103kg/ha			
	P 9 kg/ha			
	K 62 kg/ha			
	s 1 Kg/ha	1097.6	196	
	Fertiliser application (3 row stool splitter)	100.58	17.96	
	Harvesting (\$3.00 / m3)			
	Fuel \$1.12 m3	2945.8	526.04	
	Total	6582.37	1175.42	
	Gross return	10,367.50	1851.34	
	Gross margin	3,785.13	675.92	
	12.5 Dry tons / ha (38.68 tons / ha wet)			
	yield m3	715	127.68	

# L Bugeja Sunn Hemp & Soy Bean Legume Comparison

1.77

Plant date 13/12/2007 (117 days) Fibre Production (Sunn Hemp)			
Date	Treatment	Cost	Cost / ha
	Herbicide		
	Round up CT 6L/ha (cost \$6.00/L)	63.72	36
	Herbicide application		
	Flat boom	13.22	7.47
	Stool rake (3 row)	27.29	15.42
	Stool rake (3 row)	27.29	15.42
	Min till Rip grow zone	101.40	57.29
	Rotary hoe grow zone (600mm)	99.33	56.12
	Plant Sunn Hemp 30.13 kg / ha (53.33kg)		
	Planter (3.02m)	119.60	67.57
	Irrigation		
	Water 1.7meg @27.50/meg (\$46.75)		
	Diesel 17hrs @ 13.5L / hr @\$1.35 / L (\$309.82)	356.57	101.88
	Harvesting (\$3.00 / m3)		
	Fuel \$1.12 m3	441.12	249.22
	<b>Total</b>	<b>1249.55</b>	<b>606.39</b>
	<b>Gross return</b>	<b>1595</b>	<b>901.13</b>
	<b>Gross margin</b>	<b>345.45</b>	<b>294.74</b>
	6.11 Dry tons / ha (18.83 wet tons / ha)		
	yield m3	110	62.15

Plant date 13/12/2007 Leihhardt Soy bean			
Date	Treatment	Cost	Cost / ha
	Herbicide		
	Round up CT 6L/ha (cost \$6.00/L)	63.72	36
	Herbicide application		
	Flat boom	13.22	7.47
	Stool rake (3 row)	27.29	15.42
	Stool rake (3 row)	27.29	15.42
	Min till Rip grow zone	101.40	57.29
	Rotary hoe grow zone (600mm)	99.33	56.12
	Plant Leihhardt Soy Bean 62 kg / ha (\$1.20 / kg)	131.69	74.4
	Planter (3.02m)	119.60	67.57
	Irrigation		
	Water 1.7meg @27.50/meg (\$46.75)		
	Diesel 17hrs @ 13.5L / hr @\$1.35 / L (\$309.82)	356.57	101.88
	Harvesting		
	<b>Total</b>	<b>940.12</b>	<b>431.57</b>

# Andrew Cappello Kenaf

4.5

Plant date 13/12/2007 (117 days) Fibre Production

Date	Treatment	Cost	Cost / ha
	Rotary hoe grow zone (600mm)	231.75	51.5
	Fertiliser		
	LOS Dunder 3.5m <sup>3</sup> / ha		
	N 164.9 kg/ha		
	K 93.3 kg/ha		
	S 16 kg/ha	2835	630
	Plant Kenaf 17.59 Kg /ha (79.15kg)		
	Austil 3.05m 2 row planter	304.07	67.57
	Spray Basta		
	3.5L/ha (\$80.25 / ha)		
	0.5 L wetter (\$2.26 / ha)	371.30	82.51
	4 row spray rig 6m 50hp	48.6	10.8
	Forage harvest Kenaf (\$3.00 / m <sup>3</sup> )		
	Fuel \$1.12 m <sup>3</sup>	1298.4	288.53
	<b>Total</b>	<b>5089.11</b>	<b>1130.91</b>
	<b>Gross return (320 m<sup>3</sup> x \$14.50)</b>	<b>4640</b>	<b>1031.11</b>
	<b>Gross margin</b>	<b>-449.11</b>	<b>-99.80</b>
	7.00 Dry tons / ha (21.54 tons / ha wet)		
	Yield m <sup>3</sup> / ha	320	71.11

# J,J & AF Muscat Sunn Hemp & Soy Bean Legume comparison

Plant date 14/11/2007 Sunn Hemp BI 9-1 (177 days)

2.47

Date	Treatment	Cost	Cost / ha
	herbicide		
	spray Reglone at 2L/ha (\$19.22 / L)	94.95	38.44
	7.625m Flat boom (5row) Fiat 600	26.68	10.8
	Feriliser 2.5m3 dunder (hemp/soy)	624.09	252.67
14/11/2007	Plant Sunn Hemp 25kg/ha		
	Austil Planter 3 row (G 240)	143.61	58.14
	Herbicide		
	spray basta 3L / ha (\$68.79 / ha)		
19/11/2007	wetter 0.5 L (\$2.26 / ha)	175.49	71.05
19/11/2007	7.625m Flat boom (5row) Fiat 600	26.68	10.8
	Irrigation		
	water 4.48megs (54.54 / meg) \$244.33		
	Power H 225.85 units (21.043 cents) \$47.53		
	L 1930.84 units (7.414 cents) \$143.15		
20-22/12/2007	60hp 30 / meg \$134.40	221.48	89.67
	Herbicide		
	Groxome 1.4L/ha (\$10.55 / ha)		
	Direx 0.5 kg/ha (\$6.05 / ha)		
	Amocide 625 1.3L/ha (\$8.22 / ha)		
24/12/2007	Activator 0.5L (\$2.26 / ha)	66.89	27.08
24/12/2007	Fiat 600 Hi 4 row irvin boom hoods	39.08	15.82
	Spray out Sunn hemp		
	3.5L ha Glyphsate (17.50/L) 61.25 / ha		
3/04/2008	Activator 0.5 L (\$2.26 / ha)	156.87	63.51
3/04/2008	Helicopter spray (\$40 / ha)	188.83	76.45
	Decacate Sunn Hemp		
28/04/2008	2L / ha Regalone (\$19.22 / L)	94.95	38.44
28/04/2008	Helicopter spray (\$40 / ha)	188.83	76.45
	Forage harvest Sunn Hemp (\$3.00 / m3) 177m3		
	Haulouts 3 x \$40 / hr (3.5hrs)		
11/05/2008	Fuel \$79.64 / ha (\$1.12 m3)	847.71	343.20
	<b>Total</b>	<b>2896.13</b>	<b>1172.52</b>
	Gross return 177 m3 x \$14.50 / m3	2566.5	1039.07
	Gross Margin	-329.63	-133.45
	7.05 Dry tons / ha (21.71 tons / ha)		
	Yield m3	177	71.66

Date	Plant date 14/11/2007 Soy Bean BI 9-2 (168 days) Treatment	Cost	Cost / ha
	herbicide		3.88
	spray Reglone at 2L/ha (\$19.22 / L)	149.15	38.44
	7.625m Flat boom (5row) Fiat 600	41.90	10.8
	Ferliliser 2.5m3 dunder (hemp/soy)	980.36	252.67
14/11/2007	Plant Soy Bean Leihhardt 68kg/ha (1.20/kg)	316.6	81.60
	Austil Planter 3 row (G 240)	225.58	58.14
	Herbicide		
	spray basta 3L / ha (\$68.79 / ha)		
19/11/2007	wetter 0.5 L (\$2.26 / ha)	275.67	71.05
19/11/2007	7.625m Flat boom (5row) Fiat 600	41.90	10.8
	Irrigation		
	water 4.48megs (54.54 / meg) \$244.33		
	Power H 225.85 units (21.043 cents) \$47.53		
	L 1930.84 units (7.414 cents) \$143.15		
20-22/12/2007	60hp 30 / meg \$134.40	347.92	89.67
	Herbicide		
	Groxome 1.4L/ha (\$10.55 / ha)		
	Direx 0.5 kg/ha (\$6.05 / ha)		
	Amocide 625 1.3L/ha (\$8.22 / ha)		
24/12/2007	Activator 0.5L (\$2.26 / ha)	105.07	27.08
24/12/2007	Fiat 600 Hi 4 row irvin boom hoods	61.38	15.82
	Irrigation		
	water 3.2megs (54.54 / meg) \$174.53		
	Power H 547.5 units (21.043 cents) \$115.21		
	L 917.50 units (7.414 cents) \$68.02		
21/03/2008	60hp 30 / meg \$96.00	453.76	116.95
	Spray insecticide Soy Bean		
	1.3L / ha Lannate (\$11.45 / L) \$14.88 / ha		
	340ml / ha Demethowaite (\$8.41 / L) \$2.85 / ha		
3/04/2008	Activator 0.5 L (\$2.26 / ha)	77.56	19.99
3/04/2008	Helicoper spray (\$76.45 / ha)	296.63	76.45
	Decacate Soy Bean		
28/04/2008	2L / ha Regalone (\$19.22 / L)	149.15	38.44
28/04/2008	Helicoper spray (\$76.45 / ha)	296.626	76.45
	Harvest Soy Bean (\$115 / ha)		
11/05/2008	Fuel \$24.35 / ha	540.678	139.35
	Transport (\$100/ton)	892	229.90
	Total	5251.94	1353.59
	Gross return (\$800 / ton)	7120	1835.05
	Gross Margin	1868.06	481.46
	Yield	8.92	2.30

# J,J & AF Muscat Kenaf

Date	Plant date 09/12/2007 Kenaf BI 2-1&2 (177 days) Treatment	Cost	Cost / ha
	Herbicide spray out 7 L / ha round up (17.5 / L) 122.50 /ha		
	0.5 L activator 2.26 / ha	603.84	124.76
	7.625m Flat boom (5row) Fiat 600	52.27	10.8
	Apply Mill mud/ash 150 T/ha 362.50 / ha (45%)	789.55	163.13
	Slashed cane residue 7ft 75hp	149.89	30.97
	Wheel rake stools 3 row (MF 290)	95.54	19.74
	Wheel rake stools 3 row (MF 290)	95.54	19.74
	Fertiliser 2.5m3 dunder (hemp/soy)	1222.92	252.67
	Herbicide spray out 5 L / ha round up (17.5 / L) 87.50 /ha		
	0.5 L activator 2.26 / ha	434.44	89.76
	7.625m Flat boom (5row) Fiat 600	52.27	10.8
9/12/2007	Planted Kenaf 25kg /ha		
	Austil Planter 3 row (G 240)	281.40	58.14
	Irrigation water 1.89mg at 55.05 / mg		
13/12/2007	Power 91.99	196.03	40.50
	Irrigation water 3.65mg at 55.05 / mg		
	Power 132.54	333.47	68.90
	Spray edges Groxx / Diron 150L (13.03)		
	labor 25 / hr	38.03	7.86
	Decicate Kenaf Round up 3.5 L / ha (17.5 L) 61.25 / ha		
	0.5L / ha activator 2.26/ha	210.80	63.51
	Harvesting Forager 485.5 x \$3.00/m3 1456.50		
	Haulout 3x \$40 / hr 6hrs 720.00		
	Fuel 1.12 / m3 543.76	2720.26	562.04
	<b>Total</b>	<b>7276.26</b>	<b>1523.32</b>
	<b>Gross return 14.50 x 485.5</b>	<b>7039.75</b>	<b>1454.49</b>
	<b>Gross margin</b>	<b>-236.51</b>	<b>-68.82</b>
	9.87 Dry tons / ha (30.39 tons / ha wet)		
	Yield	485.5	100.31

# J,J & AF Muscat Kenaf

Date	Treatment	Cost	Cost / ha
	Plant date 09/12/2007 Kenaf BI 8-3&4 (177 days)		3.28
	Herbicide spray out		
	7 L / ha round up (17.5 / L) 122.50 /ha		
	0.5 L activator 2.26 / ha	409.21	124.76
	7.625m Flat boom (5row) Fiat 600	35.42	10.8
	Apply Mill mud/ash 150 T/ha 362.50 / ha (45%)	535.07	163.13
	Slashed cane residue 7ft 75hp	101.58	30.97
	Wheel rake stools 3 row (MF 290)	64.75	19.74
	Wheel rake stools 3 row (MF 290)	64.75	19.74
	Fertiliser 2.5m3 dunder (hemp/soy)	828.76	252.67
	Herbicide spray out		
	5 L / ha round up (17.5 / L) 87.50 /ha		
	0.5 L activator 2.26 / ha	294.41	89.76
	7.625m Flat boom (5row) Fiat 600	35.42	10.8
9/12/2007	Planted Kenaf 25kg /ha		
	Austil Planter 3 row (G 240)	190.70	58.14
13/12/2007	Irrigation	185.91	56.68
	Spray edges		
	Grox / Diron 150L (13.03)		
	labor 25 / hr	38.03	11.59
	Harvesting		
	Forager 216.5 x \$3.00/m3 649.50		
	Fuel 1.12 / m3 242.48	891.98	271.95
	<b>Total</b>	<b>3675.99</b>	<b>1120.73</b>
	<b>Gross return 14.50 x 216.5</b>	<b>3139.25</b>	<b>957.09</b>
	<b>Gross margin</b>	<b>-536.74</b>	<b>-163.64</b>
	6.5 Dry tons / ha (20 ton / ha wet)		
	Yield	216.5	66.01

Table 1  
Forage harvesting Wet Kenaf



Table 2  
Forage harvesting Dry Kenaf



Table 3  
Forage Harvesting Sunn Hemp



Table 4  
Forage Harvesting Sunn hemp



# J,J & AF Muscat 4533 (Seed Propagation)

Date	Treatment	Cost	Cost / ha
	Plant date 02/04/2008 Industrial Hemp seed crop BL 6-3 (129 days)		3.13
	Herbicide		
	Round up CT 6L/ha (cost \$6.00/L)		
	7.625m Flat boom (5row) Fiat 600	33.80	10.8
	Dunder fertiliser (3.6m <sup>3</sup> / ha)	1960.29	626.29
	3.2m Rotary hoe 66% (grow zone) 98.99/ha	204.48	65.33
	Irrigation winch		
	water 1.77megs (55.05 / meg) \$97.43		
	Power H 0.00 units (21.043 cents)		
	L 840.50 units (7.414 cents) \$62.31		
22/03/2008	60hp 30 / meg \$53.10	212.84	68
2/04/2008	Planted Industrial hemp CHG 28.8 kg/ha		
	Austil Planter 3 row (G 240)	181.98	58.14
	Herbicide		
	Stomp Extra 3.3L / ha (12.10 / L) \$39.93 / ha		
	Gromoxone 0.6 L / ha (10.55 / L) \$6.33 / ha		
2/04/2008	Activator 0.5 L / ha \$2.26 / Ha	151.87	48.52
	7.625m Flat boom (5row) Fiat 600	33.80	10.8
	Irrigation winch		
	water 2.66megs (55.05 / meg) \$146.43		
	Power H 150 units (21.043 cents) \$31.56		
	L 1,077 units (7.414 cents) \$79.85		
27/04/2008	60hp 30 / meg \$79.80	337.64	107.87
	Irrigation flood		
9/06/2008	water 3.4 megs (55.05 / meg) \$187.17		
	Insecticide		
	Lannate 2L/ha (11.45 / L) \$22.90 / ha		
26/06/2008	Activator 0.5l/ha \$2.26 / ha	78.75	25.16
	7.625m Flat boom (5row) Fiat 600	33.80	10.8
	Desiccate Industrial hemp		
	2.5 L / ha Reglone (19.22 / L) \$48.05 / ha		
31/07/2008	Activator \$2.26 / ha	157.47	50.31
31/07/2008	7.625m Flat boom (5row) Fiat 600	33.80	10.8
	Harvest Industrial hemp \$115 / ha		
9/08/2008	fuel \$24.35 / ha	436.17	139.35
	Total cost of production	3856.699	1232.17

# J,J & AF Muscat Farm 4533 BL 14-1

2.47

Sunn Hemp seed crop plant date 25/03/2008 2.47ha

Date	Treatment	Cost	Cost / ha
	Hemp / soy dunder	624.09	252.67
	3.2m Rotary hoe 66% (grow zone) 98.99/ha	244.51	98.99
	Pre-plant irrigation		
	Power		
	high units 2 (21.043 cents / unit) \$0.42		
	low units 708 (7.414 cents / unit) \$52.49		
24/03/2008	water 1.54 mg (\$55.05 / mg) \$87.78	140.69	56.96
25/03/2008	Planted Sunn Hemp 24 kg / ha		
	Austil Planter 3 row (G 240)	143.61	58.14
28/03/2008	7.625m Flat boom (5row) Fiat 600	26.68	10.8
	Pre-emerge Sunn Hemp		
	1.5L/ha Dual Gold (28.36/L)		
28/03/2008	0.6L/ha gromoxone (10.55/L)	96.11	38.91
	Irrigate		
	H - 0		
	L - 753 units (7.414 cents / unit) \$55.82		
26/04/2008	Water 1.524 megs (\$55.05 / meg) \$83.90	139.72	56.57
	Herbicide application		
	1L / Ha gromoxone (10.55 / L) \$10.55		
	1L / Ha amocide (6.32 / L) \$6.32		
	0.5kg / Ha Direx (12.10 / Kg) \$6.05		
18/05/2008	0.5L wetter \$2.26 / ha	62.19	25.18
18/05/2008	Fiat 600 Hi 4 row irvin boom hoods	39.08	15.82
	Irrigate		
	H - 0 units		
	L - 783 units (7.414 cents / unit) \$58.06		
1/06/2008	Water 1.756 megs (55.05) \$96.67	154.73	62.64
	Insecticide		
	Gemstar 500mls/ha		
	Lavin 350gram/ha		
24/09/2008	0.5 L/ha wetter		
24/09/2008	7.625m Flat boom (5row) Fiat 600	26.68	10.80
	Irrigate		
	H units 105.65 (\$22.24)		
	L units 312.8 (23.2)		
26/09/2008	Water 0.879 (48.39)	93.83	37.99
	Desicate Industrial hemp		
	2.7 L / ha Reglone (19.22 / L) \$51.89 / ha		
27/11/2008	Activator \$2.26 / ha	128.17	51.89
27/11/2008	7.625m Flat boom (5row) Fiat 600	26.676	10.8
	Harvest Industrial hemp \$115 / ha		
30/11/2008	fuel \$24.35 / ha	344.19	139.35
	Total cost of production	2290.94	927.51

# David Ellwood Kenaf seed crop

2.6

Date	Treatment	Cost	Cost / ha
	Offset	173.13	66.59
	Rotary hoe	156.18	60.07
	Mark out	56.89	21.88
	Plant Kenaf 27kg/ha 13kg/ha		
	Austil Planter 2 row (3.2m)	159.72	61.43
	pre-emergent herbicide		
	Dual gold 1.5 L /ha (28.36 / L)	110.60	42.54
	Flat boom 9m 866 Inter	36.79	14.15
	Fertiliser		
	ratoon 4 500kg / ha		
	160 / N		
	90 / K		
	12 / S	1300	500
	Irrigation Winch		
	2.5 megs @ 80.05 / meg applied	200.13	76.97
	Irrigation Flood		
	5 megs @ 55.05 / meg applied	275.25	105.87
	Desicate Kenaf		
	Regalone (2.5L/ha)	124.93	48.05
	Inter row spray unit	23.92	9.2
	Harvest Kenaf \$115 / ha		
	fuel \$24.35 / ha	362.31	139.35
	<b>Total cost of production</b>	<b>2979.86</b>	<b>1146.10</b>



Sunn Hemp Seed Crop 2008



Kenaf Seed Crop 2008

## Industrial hemp Seed Crop being harvested 2008



Producing seed crops for the three fibre crops has been a challenge and still requires fine tuning. The management of insects and bug damage as well as the harvest timing are two areas which will be improved. Handling the seed / grain is also important with drying and storage facilities being paramount.

## **Agronomic Assessment**

### **Fibre Crops in rotation with Sugar Cane**

#### **Background**

Understanding the crop requirements no matter which crop you are producing is critical to achieving productive results, fibre crops certainly offer as many challenges as any new cropping option offers. This report documents many trial results which has investigated many critical issues to successfully producing fibre crops in rotation with sugar cane. This project has also identified a new legume crop option that will rotate with sugar cane and successfully fix enough nitrogen for the following cane crop.

#### **Planting window**

##### **Fibre crops**

Kenaf, Sunn Hemp and Industrial Hemp when produced for its bio-mass fits into rotation with sugar cane extremely well, the group finding highlights that planting on an increasing day length will maximise yield, for the central region this occurs at the 15<sup>th</sup> of October and takes advantage of establishing the crop before the very illusive wet season sets in, and harvesting in mid April to mid May which allows ample time to replant to sugar cane.

##### **Seed Crops**

Planting seed for fibre crops are not readily available and for the group has posed many problems. The timing of seed crops for Kenaf and Industrial hemp are suited to a March / April plant which would normally be harvested in Late August, planting on a decreasing day length reduces bio-mass and normally allows for good seed multiplication. Sunn hemp has also been planted at this time of the year which has not been successful, in the time line of this project two planting have failed because of a number of reasons;

- Large rainfall event followed by extremely cold weather which has stop the plant production and the pod setting.
- High insect pressure, crotalaria pod borer and crotalaria moth which have not at this stage been controlled successfully.
- A rust or fungus or bacteria which has been present in wet cold conditions.

MFP will attempt to address these issues in the subsequent years by changing the planting window to July. The supply of Sunn Hemp seed in Australia is in very short supply and the small amount that exists makes this a delicate situation.

##### **Seed Bed Preparation**

MFP have investigated zero till, min till and full cultivation, the trial data collected has not indicated that any technique is better than the other, if your system prefers one method from another than this can be achieved without any risk of plant establishment or productivity achieved. Good seed to soil contact is crucial as well as a good moisture profile will deliver the best results and plant establishment.

When planting into a zero till situation, removing the trash on the old cane stool is important as this will reduce the ability of trash being hair pinned with the seed which will effect germination. Sunn Hemp and Kenaf are extremely good germinators, Industrial Hemp on the other hand is very finicky in its germination and must have good conditions, moisture, seed to soil contact and right planting depth (19mm).

### **Planting and planting rates**

Seed placement is paramount for fibre crops, this allows for good stem development and increased yield results. Vacuum plate planter have been utilised by MFP with varying degree's of success, when comparing mechanical plate distributor systems the vacuum plates delivers a superior results. Another finding of the project is the recommendation to utilise V type press wheels which presses either side of the seed rather than directly on top of the seed, in crusting soil types this process will limit germination.

Fibre production planting rates

Kenaf 400,000 to 450,000 plants per ha.

Sunn Hemp 500,000 to 550,000 plants per ha.

Industrial hemp 500,000 to 550,000 plants per ha

Seed Production for fibre crops

Kenaf 400,000 plants per ha

Sunn hemp 500,000 plants per ha

Industrial Hemp 500,000 plants per ha

These planting population are adaptable to which ever row spacing being used in your farming system, continuous planting was investigated by this project which did not offer any benefits to yield, in fact it limited field access which hampered fertilising, insect control and more importantly harvesting.

### **Soil Type**

Soil type selection is important when determining which fibre crop to plant, the wrong soil type will limit yield.

Kenaf prefers good loam and clay type soils, it can handle wet conditions and produces good yields in these soil types. Kenaf doesn't perform well in sandy type soils and normally suffers from root knot nematodes which will dramatically effect yield. Sandy soils are not recommended for Kenaf.

Sunn Hemp produces well on sandy type soils and has very good resistance to root knot nematodes, it produces well on a free draining soil and prefers a dry profile rather than a wet one. Sunn Hemp will not produce in a water log situation and will die out in an extreme wet situation.

Industrial hemp prefers good loam and clay type soils that have the ability to drain well, it will not tolerate a water log situation, flood irrigation needs to be managed well as this can stress the plant and if exposed to lengthy periods will kill the plant.

### **Nutrient Requirement**

Both Industrial Hemp and Kenaf require a full complement of nutrients, producing biomass for removal means that plant nutrient uptake is removed when harvested and needs to be replaced for the next crop can be planted. MFP has produced crop ranges from 24 tons of dry matter per hectare (Industrial Hemp) with a crop average result of 10 tons of dry matter per hectare, Kenaf has ranged up to 21 tons of dry matter per ha and average 12.1 tons of dry matter per ha. Sunn Hemp has up to 13 tons of dry matter per ha and achieved an average of 8 tons of dry matter per ha

Nitrogen requirement: 170 – 200 kg /ha

Phosphorous requirement: 25 – 28 kg /ha

Potassium requirement: 170 – 200 kg/ha

Sulphur requirement: 25 – 30 kg /ha

Calcium requirement: 75 – 80 kg / ha

Sunn Hemp (*Crotalaria juncea*) is a nitrogen fixing plant (legume) and will fix its requirement of nitrogen, it will still require other macro nutrients to produce high biomass yields.

Phosphorous requirement: 15 – 20 kg /ha

Potassium requirement: 150 – 160 kg/ha

Sulphur requirement: 10 – 15 kg /ha

Calcium requirement: 60 – 65 kg / ha

The nutrient requirements have been established by analysing the plant nutrient uptake from a number of trial sites.

## **Weed Management**

Weed management is paramount as is with any cropping situation and will dramatically affect yield if not managed well, a number of pre-emergents were trialled throughout the life of this project, you should be aware that these herbicides **are not registered in any of the fibre crops** trialled, therefore registration is required.

This report highlights pre-emergent trials conducted with Kenaf and Sunn Hemp.

Trial results indicate that Dual Gold at 1.5L /ha controls grasses and a small section of broad leaf and vines and has achieved the highest yield results for Kenaf and Sunn Hemp.

Industrial hemp trial results indicate that Stomp Extra at 3.3L/Ha delivered the best results.

It is paramount that controlling grasses and broad leaf before planting fibre crop should be applied, this method reduces the pressure from grasses and broad leaf in the cropping situation.

## **Insect management**

Kenaf from the four week stage through to the 10 week stage is susceptible to Red Shouldered Leaf Beetle, these beetles can desiccate a crop in a matter of days, they are

normally triggered by a rain fall event. Carbaral is registered to control Red Shoulder Leaf beetle in Kenaf.

Ecofibre Industries Limited also holds a minor use permit to control Heliothis in Industrial Hemp, these caterpillars can also have a devastating result when in large numbers in the grain of Industrial Hemp.

Controlling crotalaria Moth and crotalaria Pod Borer in Sunn Hemp seed production has not been successful to date, these insects have significantly reduced seed yields for the life of this project, MFP will keep investigating methods of control.

### **Irrigation**

Pre – watering is recommended for good germination when planting fibre crops. Irrigation usage will depend on rainfall received, these crops will utilise 6 megalitres in there crop cycle without any rainfall in 100 – 150 days.

Industrial hemp prefers overhead irrigation rather than furrow irrigation, MFP have experienced plants dying in a flood irrigation in good draining soils.

It is not recommended to Flood irrigate Industrial Hemp. Kenaf can handle flood irrigation after week 5 and has achieved good results. Overhead irrigation is recommended in the early stages of fibre crops with small droplets if possible.

Moisture stress in both Kenaf and Industrial Hemp will reduce yield in the tropics and irrigation is recommended.

Sunn Hemp can tolerate dry conditions successfully and will hang in until rain arrives, and is suitable in a rain fed system. It will not tolerate very wet conditions for long periods of time and will die out in this situation.

### **Soil borne pests**

Understanding the effects of soil borne pests and the effects to fibre crops has been a focus point for MFP, Kenaf will host root knot nematodes which when planted into a infected field will reduce yield significantly, we have experienced effects on Kenaf with high counts kill out Kenaf in 75 – 95 days after planting.

Planting Kenaf into a field that could host root knot nematodes should be avoided, sampling will reduce the risk, in this situation planting Sunn hemp will be a better option, Sunn Hemp is resistant to root knot nematodes and will reduce nematode numbers in one crop cycle.

MFP has sampled two different blocks for packymetra root rot before and after planting Kenaf, in both of the two trial sites spore counts have significantly been reduced in a 120 day crop cycle. This is a major break through which will increase cane yields in fields that are infected with packymetra. MFP recommends that further investigation is warranted to understand how this result is achieved.

## Harvesting and handling

MFP has investigated 3 different harvesting systems of which can be utilised successfully depending on the market you are supplying. All 3 different harvesting systems require management of crop losses and must consider moisture content of the crop, our experience when harvesting moisture contents higher than 68% can cause wrapping in a cane harvester and shute blockages in a forage harvester. Timing of harvest of fibre crops is important and needs to be timed before seed set and maturity for Kenaf and at the flowering stage for Sunn Hemp. Timing of harvest of Industrial hemp is also before seed set, if this harvesting window is missed then harvesting problems will be experienced, mature fibres which are the strongest fibres known to man, will cause serious wrapping, its like trying to harvest wire rope!!!

Harvesting method:

Harvesting Kenaf utilising a standard cane harvester works well, in billet form the Kenaf product could be utilised for separated fibre's which could be incorporated into building materials, pulp for paper making, car components and bio plastics.

The moisture content of the crop is important and when high moisture levels are experienced this will cause wrapping on harvester components. Extractor fans are run at very low rpm to avoid crop loss, normally we have topped the crop to remove immature fibres which normally removes the majority of the leaf.

Planting into suitable row spacing is important as any crop which as been knocked down by the harvester will also cause wrapping .

Elevating tippers and side tippers work extremely well when hauling Kenaf billets with no problems experienced what so ever. The ability to utilise cane harvesting machinery adds value to current harvesting sector as the harvesting period for fibre crops is normally from April to June, which is outside the normal harvesting period.

Harvesting fibre crops with a forage harvester also works very well, we have harvested for a market which required wet harvesting of Sunn Hemp and Kenaf, this process when coupled with high moisture levels caused problems in the power shute of the forage harvester. When the fibre crops have been desiccated, the forage harvester operates well and this process is the most economical way of harvesting fibre crops. Market lines need to be aligned with this harvesting system.

MFP have also experimented with baling of fibre crops, this harvesting process is not recommended as high loses are experienced in the drying process when raking and turning of the product. Baling into 4x4 round bales highlighted transport issues as the bale weights achieved ranged from 160 kgs to 230 kgs depending on the type of baling unit, this resulted in not achieving maximum payload.

## **Economic Analysis**

### **Fibre Crops in rotation with Sugar Cane**

#### **Background**

The economic assessment conducted in this project is an accumulation of results collected over a two year period where comparisons of different fibre crops have been accumulated which have been grown in rotation with sugar cane. Mackay Fibre Producers Pty Ltd (MFP) with its project partners, DPI & F, BSES Limited, NTA Group and Ecofibre Industries have worked together to achieve the results presented in this report.

MFP were very keen at the onset of this project to understand the economic impact of the fibre crops and also the effect on the following cane crop. Two trial sites were targeted to investigate the effects on the following cane crop, the first trial site was set up with four different legume species, Leichhardt soybean, A6785 (Ashgrove) soybean, Sunn hemp, Guar, and a bare fallow which were replicated and then planted to Q208<sup>A</sup>. The second trial site was planted with three different fibre crops, Kenaf, Sunn Hemp, Industrial Hemp and a bare fallow and then planted to Q200<sup>A</sup>.

#### Trial 1

*J, J&AF Muscat Mackay Fibre Producers*

#### **Nitrogen Fixation Trial**

#### Trial 3

- Comparison between Soy bean (Leichhardt), Soy bean (Ashgrove), Sunn hemp (crotalaria juncea), and Guar to assess the nitrogen fixation ability of the 3 crops and bare fallow (replicated)
- Zero till
- Cane yield in the following cane crop

#### Trial Aim:

The objective of this trial is to evaluate the benefit of Sunn Hemp as a legume rotation crop option when compared to Soy bean and Guar. Soy bean has been selected because it represents current industry best practice in relation to a legume rotational crop option. Guar was selected because it is root knot nematode resistant and has a higher value bean in the market place.

This trial site will be monitored in the following cane crop with the comparison made in the replicated trial strips of the different legume treatments and the effects on the following cane crop. The economics will also be collated to determine the gross margin over the fallow period and the first cane crop.

**Trial results:**

Bio-mass and nutrient samples were taken on the 2/03/2007 (60 days old) and on the 30/03/2007 (88 days old)

Table 1 highlights that the bio-mass results achieved by the Sunn Hemp indicate that at 60 days after planting, 5.16 tons of dry matter was produced which represents 39.7% more bio-mass than the Ashgrove soy bean which was the next highest. The nitrogen produced by the Sunn Hemp at 2/03/2007 (60 days) also is presented in table 2, this indicates that 55% more nitrogen has been produced when compared to the next best result which was A6785 Ashgrove soy bean.

At 30/03/2007 (88days) the bio-mass produced from the Sunn Hemp was 9.47 ton of dry matter per ha representing 55.3% more bio-mass with 11.7% less nitrogen from the Sunn Hemp when compared with the A6785 Ashgrove soy bean.

In two trial sites which were conducted in 2008 the bio-mass produced and the nitrogen fix of Leichhardt soybean and Sunn Hemp were examined. The results of the nitrogen fix comparison of Leichhardt and Sunn Hemp determined that no significant difference was achieved, while when the bio-mass comparison was examined there was a significant difference between the Sunn Hemp and the Leichhardt in favour of the Sunn Hemp.

**Table 1**

**Legume Trial Bio-Mass results  
Mackay Fibre Producers year 1 (J,J &AF Muscat)**

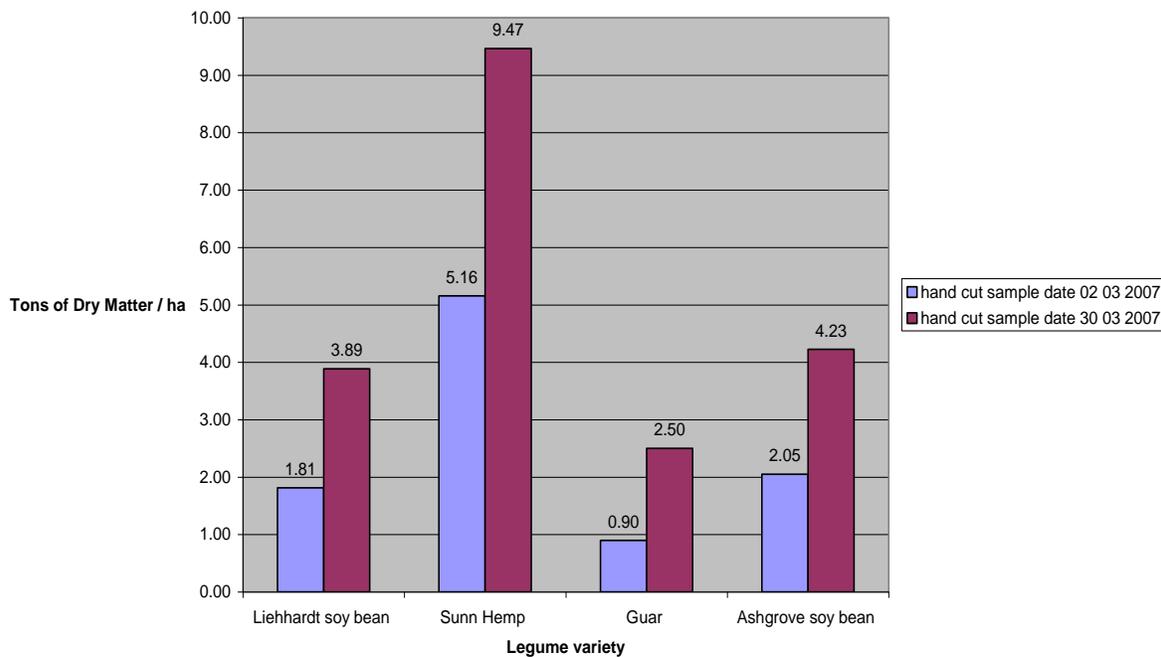


Table 2

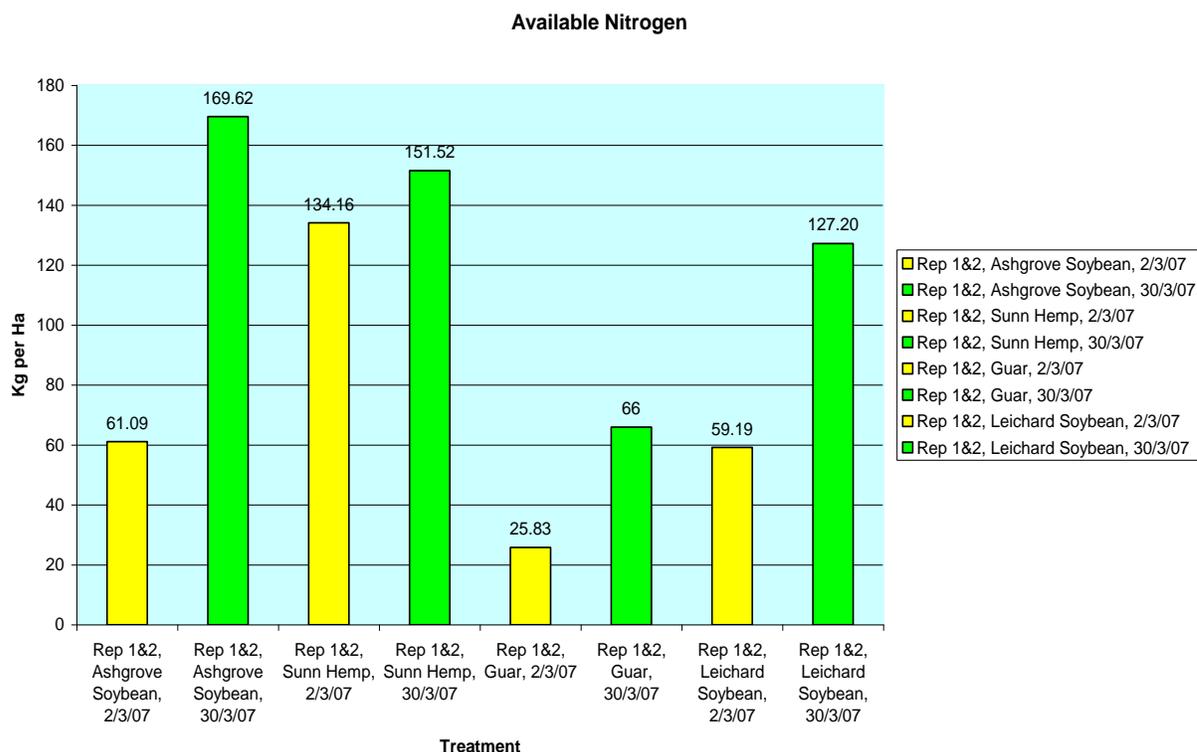
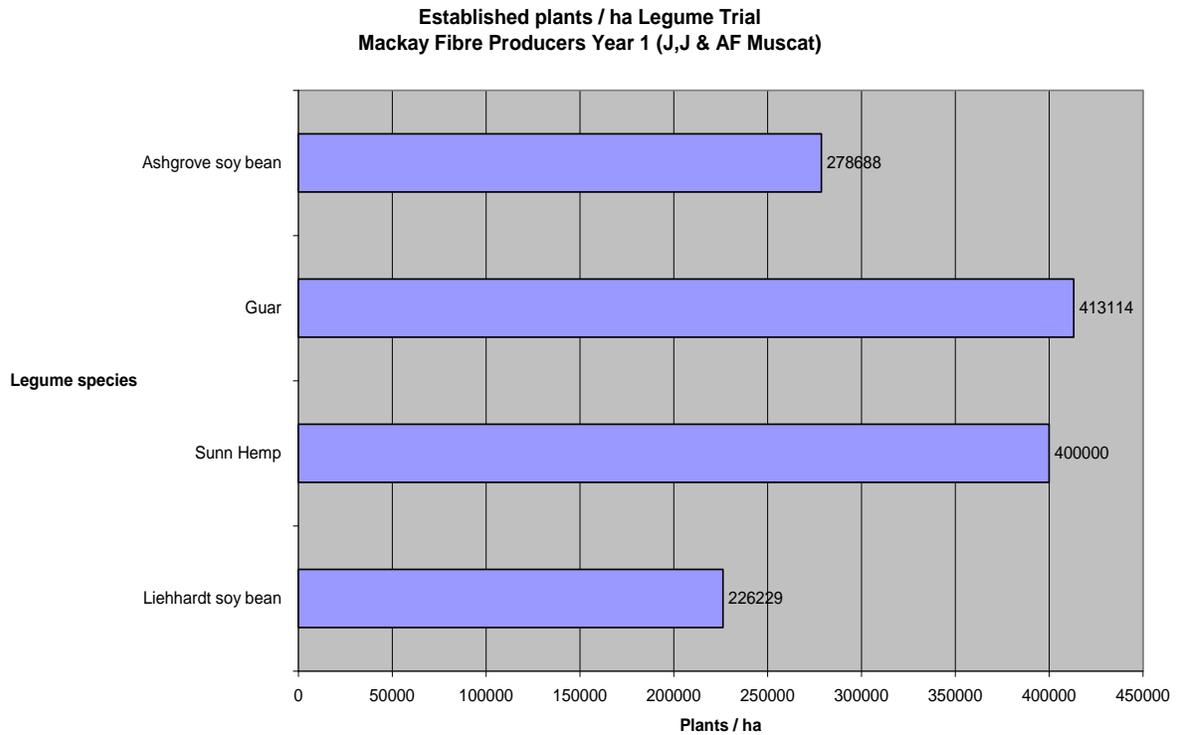


Table 3 highlights the plant establishment of the different legumes, the soybean varieties were planted with a targeted establishment of 275,000 plants per hectare, while Guar and Sunn Hemp were planted at rates to establish 400,000 plants per hectare. Table 3 demonstrates that all targeted rates were achieved except for the Leichhardt soybean, this result may explain why it produced lower amounts of bio-mass and less nitrogen when compared to A6785 Ashgrove and the Sunn Hemp.

The rain fall experienced in February (400mm) destroyed the guar treatments and the majority of the replicated strips were incorporated, a small section was retained for measurement purposes.

Table 3



The legume strips were incorporated with the Sunn Hemp strips requiring two extra treatments to enable the bio-mass to be incorporated successfully. The trial site was planted to Q208<sup>A</sup> and the harvest results were measured. The inputs were collated from the time of spray out of the cane crop in 2006, which included planting and seed costs of the legumes and weed management as well as managing the fallow strips. Table 5 highlights the gross return achieved by the sugar cane, less the harvesting and industry levies, the results exclude the cane crop inputs and the legume and fallow management costs. No significant difference was achieved, the gross return difference was \$78.39 between Guar and Leichhardt .

Table 4

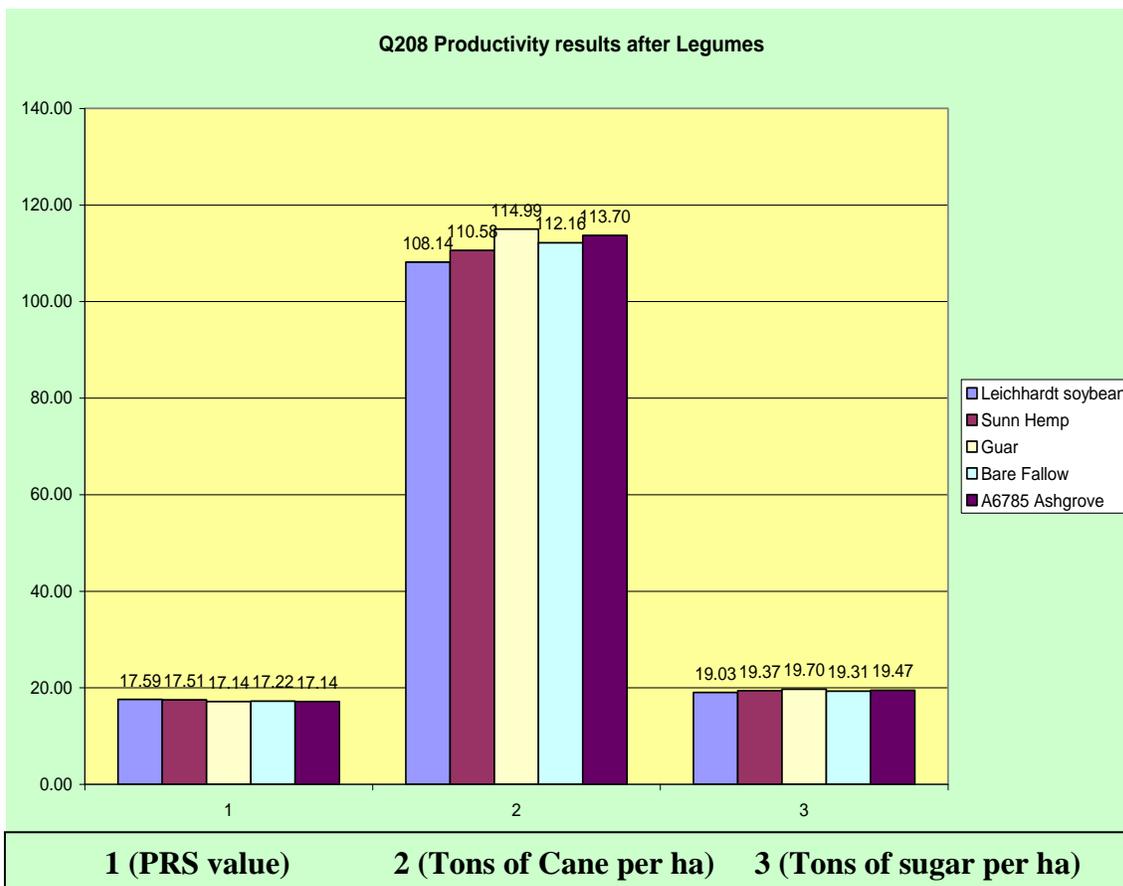


Table 4 demonstrates the results of the Q208<sup>A</sup> harvest results, as can be seen there is no significant difference between the results of the strip treatments but when the economics are collated we can see that when compared to the bare fallow treatments an average increase of \$193.50 per ha has been achieved.

Table 5

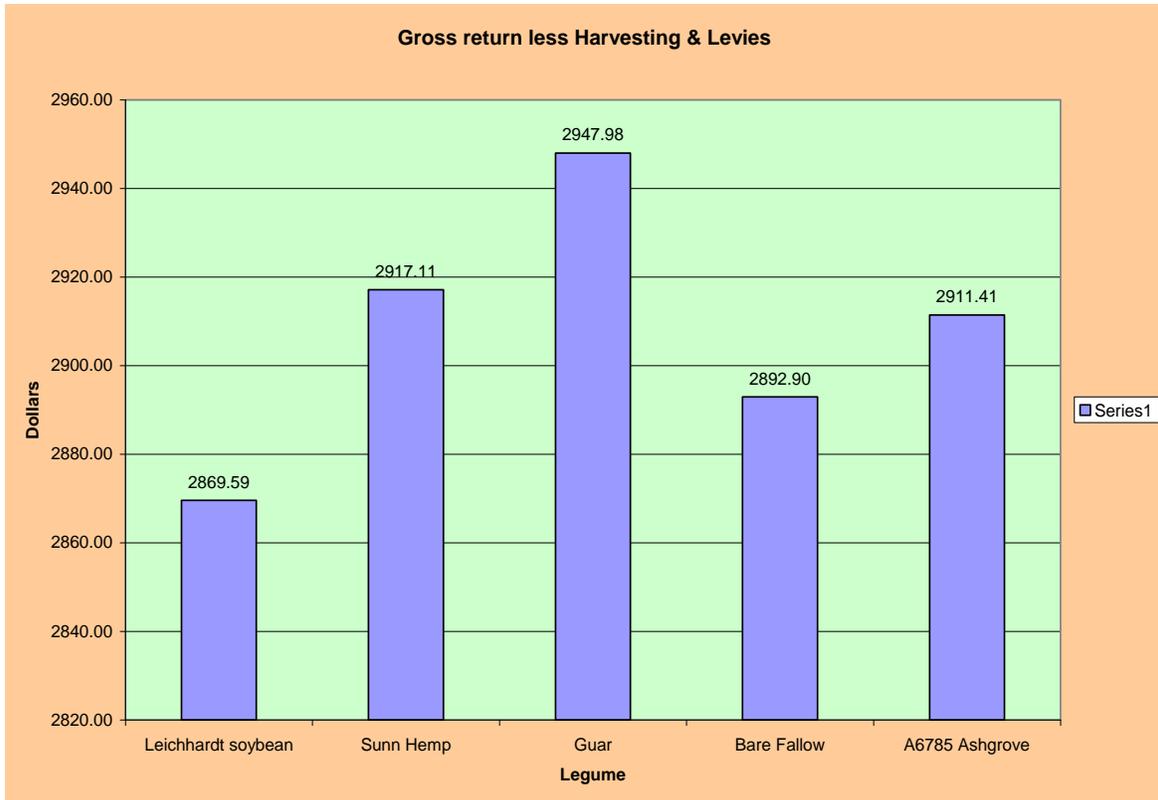
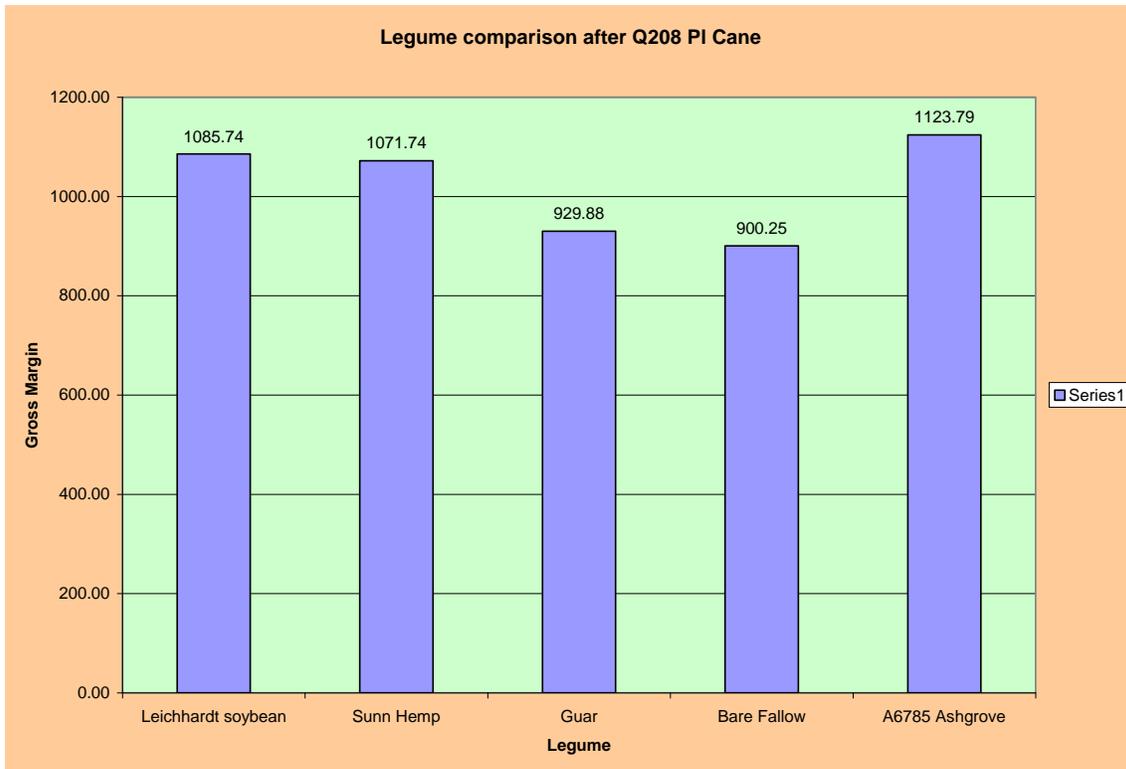


Table 6 introduces all the input costs which takes into count the nitrogen applied, the management costs of the legumes and fallow strips. The Guar treatments were treated as bare fallow because of the failure experienced in the February rainfall event and are not considered. The results achieved are interesting while the bare fallow net returns were \$900.25 per ha, the Q208 cane crop following the legumes achieved increased returns of :

Legume	Net return / ha	Increased return per ha when compared to the Bare Fallow result
A6785 (Ashgrove) soybean	\$1123.79	\$223.54
Leichhardt soybean	\$1085.74	\$185.49
Sunn Hemp	\$1071.74	\$171.49

Table 6



## Trial 2

### **Fibre Comparison and the effects to the following cane crop.**

The aim of this trial site was to evaluate the benefits in the following cane crop after four different treatments;

Treatment 1 Kenaf,

Treatment 2 Sunn Hemp,

Treatment 3 Industrial hemp

Treatment 4 Bare fallow.

Fibre yield comparison will be measure between the 3 different fibre crops to determine the dry matter per hectare achieved and net return.

Year 1 trial plan 2006  
*J,J & Af Muscat Mackay Fibre Producers*  
**Fibre Crops comparison Rotational benefits**  
 2006 (year 1 trial)

- Comparison between Industrial Hemp, Kenaf, Sunn Hemp and bare fallow (replicated)
- Zero till
- Yield comparison of the following cane crop
  - Each rep area will be greater than 0.5ha to allow yield monitoring of the cane crop.(2007)
- Trial Evaluation
  - Planting rate
    - Industrial hemp
    - Kenaf
    - Sunn Hemp
  - Yield, Tons of dry matter per ha
  - Growth rate
  - Plant population achieved
  - Input cost comparison

Trial results

Table 1

<b>Mackay Fibre Producers (Fibre Comparison Trial) 4.44 ha</b>				
<b>J, J &amp; Af Muscat Farm 4533 BL 1-2</b>				
<b>Kenaf BL 1-2 1.09ha</b>				
<b>Kenaf BL 1-3 1.8ha</b>				
<b>Date</b>	<b>J,J &amp; AF Muscat</b>	<b>Farm 4533 Block 1.2</b>	<b>Cost</b>	<b>Cost/ha</b>
	Sprayout cane			
	7L/ha Glysopate (450)	45.36/ha		
	1.25L/ha Ester 800	13.91/ha		
10/09/2006	0.5L Activator	5.43	112.55	25.35
10/09/2006	7.625m Flat Boom (5row)	Fiat 600 Lo	137.24	30.91
	3L/ha Glysophate (450)	19.44/ha		
	2kg/ha Baton	27/ha		
12/11/2006	0.5L Activator	5.43	144.75	32.60
12/11/2006	7.625m Flat Boom (5row)	Fiat 600 Lo	137.24	30.91
	Spray Edges			
	10L wipeout	64.80		
	2.5L Atril	67.63		
10/02/2007	0.5L Activator	5.43	137.86	31.05
<b>Sub total</b>			<b>669.64</b>	<b>150.82</b>

<b>Kenaf Treatments 1.1ha (2x0.55ha strips)</b>				
<b>Date</b>			<b>Cost</b>	<b>Cost/ha</b>

22/11/2006	Dunder Mid N 3.6cu / ha (truck) (100.27/m3)	397.07	360.97
27/11/2006	Wheel rake stools 3 row (MF 290) x 2 3.05m Austil Planter (2 row) G240 New Holland(12.84kg/ha)	21.714	19.74
5/12/2006		65.373	59.43
18/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs 54.62x1.5=81.93 Power H 310 units 310x0.1986=61.57 L 390 units 390x0.0703=27.42	157.21	85.91
21/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs Power H 310 units L 390 units	157.21	85.91
31/04/2007	Forage Harvest Kenaf 37.78x14.50	650.20	547.81
			150.82
<b>Sub Total cash cost</b>		1448.78	1310.59
<b>Gross return</b>	\$45.00/1m3	1870.11	1700.10
<b>Gross margin</b>		421.33	389.51

#### Sunn Hemp Treatments 1.1ha (2x0.55ha strips)

Date	Treatment	Cost	cost / ha
22/11/2006	Bio-dunder 3.3cu/ha (truck) (\$42.87 / m3) 3L/ha Glyosphate 450 19.44/ha 0.9kg/ha Baton 12.15/ha	311.23	282.94
24/12/2006	0.5L activator 5.43	38.235	34.76
24/12/2006	7.625m Flat Boom (5row) Fiat 600 Lo	34.00	30.91
27/11/2006	Wheel rake stools 3 row (MF 290) x 2	21.714	19.74
30/12/2007	3.05m Austil Planter (2 row) G240 New Holland (33kg/ha)	65.373	59.43
18/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs Power H 310 units L 390 units	157.21	85.91
21/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs Power H 310 units L 390 units	157.21	85.91
14/07/2007	Forage Harvest Sunn Hemp 27.12x14.50	432.56	393.24
			150.82
<b>Sub Total cash cost</b>		906.31	823.92
<b>Gross return</b>	\$45.00/1m3	1401.51	1220.40
<b>Gross margin</b>		495.20	396.48

#### Industrial Hemp 1.1ha's (2x 0.55 ha Strips)

Date		Cost	Cost/ha
22/11/2006	Dunder Mid N 3.6cu / ha (truck) (100.27/m3)	397.0692	360.97
27/11/2006	Wheel rake stools 3 row (MF 290) x 2	21.714	19.74

7/12/2006	3.05m Austil Planter (2 row) G240 New Holland 145 seeds / sq m	65.373	59.43
18/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs Power H 310 units L 390 units	157.21	85.91
21/01/2007	Irrigation Winch 13hrs (0.5 cane) Treatment A1 Water 1.5megs Power H 310 units L 390 units	157.21	85.91
15/02/2007	6L/ha PowerMax 58.20/ha 1L/ha Atril 27.05/ha 2L Activator 21.70	109.655	99.69
15/02/2007	7.625m Flat Boom (5row) Fiat 600 Lo	34.00	30.91
			150.82
total			893.37
<b>Bare Fallow Treatment 1.1ha's (2x 0.55ha strips)</b>			
Date		Cost	Cost/ha
	6L/ha PowerMax 1L/ha Atril		
15/02/2007	2L Activator	109.655	99.69
15/02/2007	7.625m Flat Boom (5row) Fiat 600 Lo	45.276	41.16
			150.82
<b>Sub Total</b>			291.67

The economics highlighted in this trial information has determined that there is a net return for both Kenaf and Sunn Hemp which are highlighted in green, Industrial Hemp which died out in the Feb rainfall event also highlights the perils of a failed crop and the impact of the financial outcome. Table 1 contributes the cost in the preparation to all trial strips and is added to the input costs.

Table 2

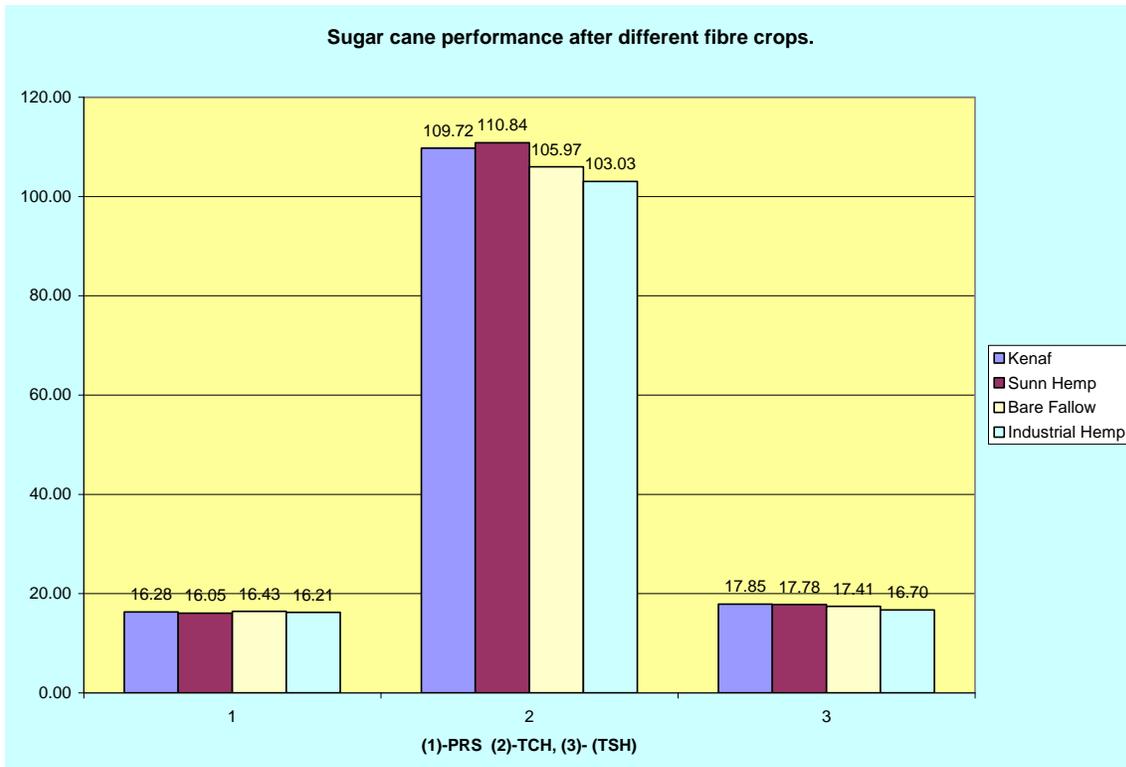


Table 2 graphs the productivity results from the Q200<sup>A</sup> plant cane crop, the table demonstrates that no significant difference in the performance of the Q200<sup>A</sup> planted after the fibre crops and the bare fallow strips.

The fibre crops were removed in this trial site which was then planted to Q200<sup>A</sup>, the results in Table 3 highlights the gross return after harvesting and industry levies were removed. In this trial site the fibre crops have had a positive impact on the following cane crop Q200<sup>A</sup> which has enhanced the returns to the grower. As can be seen in Table 3 the Industrial Hemp treatments have not performed well, these strips were sprayed out early and treated as a bare fallow.

Table 3



Table 5 demonstrates the net returns after all input cost have been removed and highlights that the Q200<sup>A</sup> has performed better planted after the Kenaf and Sunn Hemp rather than the Bare fallow treatment.

When we examine the economic return from this trial site from the time the last cane crop was taken, the results of the fibre crops and the following Q200<sup>A</sup> cane crop Table 6 demonstrates clearly that economic return has been enhanced dramatically.

Table 4

Fibre crop	Net return / ha	Increased return per ha when compared to the Bare Fallow result
Kenaf	\$1131.14	\$853.74
Sunn Hemp	\$1114.15	\$836.75
Industrial Hemp	\$207.98	

Table 4 demonstrates that increase return when compared to a bare fallow situation and when compared to the legume trial has increased returns by more than \$651 dollars per hectare.

Table 5



Table 6

Gross Margin	Kenaf	Sunn Hemp	Industrial Hemp	Bare Fallow
Fallow period	389.51	396.48	-893.37	-291.67
Plant Cane crop	741.63	717.67	685.39	569.07
Profit results	1,131.14	1,114.15	-207.98	277.40

Kenaf price matrix								
	(K) Kenaf							
	(S) Sunn Hemp							
	Cash cost / ha	Gross margin / ha	Yield (2008) Dry Tons / ha	Cash cost / ha	Gross Margin / ha	Yield (2007) Dry Tons / ha (10%)	\$ / Ton	Yield (2006) Dry Tons / ha (6%)
K	1175.42	675.92	12.5	1255.98	543.57	11.61	155	20.87
S	606.39	294.74	6.11	1374.37	400.38	11.45	155	14.54
K	1130.11	-99.8	7	1348.06	868.64	16.42	135	15.89
S	1172.52	-133.45	7.05	1539.7	367.85	14.13	135	11.17
K	1523.32	-68.82	9.87	1563.07	482.18	15.15	135	11.35
K	1120.73	-163.64	6.5	1307.67	392.68	10.97	155	18.43
				1233.88	714.47	12.57	155	16.24
				1255.98	543.57	11.61	155	16.06
								13.74
								11.07
<b>Average</b>	<b>1121.42</b>	<b>84.16</b>	<b>8.17</b>	<b>1374.68</b>	<b>538.54</b>	<b>13.19</b>	<b>146.43</b>	<b>14.94</b>

## **Summary of the Economic Assessment and Feasibility study**

Mackay Fibre Producers Pty Ltd (MFP) in its investigations has determined that producing Fibre crops (Kenaf, Sunn Hemp and Industrial Hemp) in rotation with sugar cane will enhance the economic returns of the following cane crops. In both trial 1 and 2 the results indicate an increase in the gross margin.

Producing fibre crops and marketing these crops are the challenge that we are confronted with, while understanding the agronomic implications is important, long term sustainability will depend on finding market lines that the product can be successfully utilised.

MFP is producing a number of market lines, for the Kenaf and Sunn Hemp, MFP is processing this material into garden mulch. Garden mulch is supplied in bulk and compacted bales into local markets.

Sunn Hemp has the ability to be produced as a green manure producing high levels of bio-mass as well as fixing nitrogen.

MFP has been producing Industrial Hemp for a grain market which is then processed for its oil, this is produced under contract for a supplier.

Fibre crops such as Kenaf, Sunn Hemp and Industrial Hemp are not readily available in Australia, MFP is producing seed for these crop and has exported seed.

The Kenaf price matrix highlights three years of yield achievements as well as the production cost and the gross margin. In the 2008 results we have included two Sunn Hemp results, MFP will continue to investigate the yield and production potential of Sunn Hemp. The results demonstrate different yield levels achieved as the seasonal factors play there role on productivity and cost of production of these crops.

### **Intellectual Property and Confidentiality:**

(If there is any protected Project Technology, eg information that has been kept confidential, such as equipment specifications, patentable knowledge please outline. Is there anything in this report that should be treated as confidential, and if so under what circumstances?)

There is no intellectual property which is applicable to the findings of this project.

### **Capacity Building:**

(How has the Group's capacity to conduct R&D and implement better farming systems been enhance?)

The MFP group has enhanced its capacity in a number of area's, when the group first started this project there was limited amount of rotational cropping being conducted.

Beginning of project percentage of fallow planted to rotational crops:

Anthony Cappello → no crop rotational activities

Andrew Cappello → no crop rotational activities

Lawrence Bugeja → no crop rotational activities

David Ellwood → no crop rotational activities

JJ & AF Muscat → 25% rotational cropping

End of Project:

Anthony Cappello → 35% planted to rotational crops  
Andrew Cappello → 35% planted to rotational crops  
Lawrence Bugeja → 20% planted to rotational crops  
David Ellwood → 45% planted to rotational crops  
JJ & AF Muscat → 100% planted to rotational crops

From the results outlined the MFP group members understand the impact on soil health, the benefit to the following cane crops and more importantly the enhanced economics of the farming business. As the MFP group members are not geography aligned the adoption rate in each of the grower members area's has seen an increase in rotational cropping.

### **Outcomes:**

(What benefits have been achieved or are expected from the project, and what more has to happen to get the full benefit from the project? How do the expected benefits compare with those predicted at the start of the project, as outlined in the Application?)

The outcomes of the project are outlined in the agronomic assessment and economic assessment, this project has met the objectives documented at the beginning of this project. The MFP group has developed a diversification option for growers in the Australian sugar industry with fibre cropping, there is a new legume cropping option available which will also add significant value to the following cane crop.

The ability to manage packametra in a short crop cycle with Kenaf also adds significant value to the following cane crop when we as growers have limited selection ability of cane varieties that have low resistance to packametra and smut.

### **Environmental Impact:**

(Outline any adverse or beneficial environmental impacts of conducting the Project and/or implementing its findings)

The environmental impact for fibre cropping in rotation with sugar cane is of significant value, reduced erosion in the fallow period, increased soil health, braking compacted layers in the soil profile, secquesion of carbon all contribute to a healthier environment.

### **Communication and Adoption of Outputs:**

(Outline any communication activities that have been conducted and any that are planned. How has SRDC been acknowledged or involved? Have any lessons from the project been applied by members of the Group, or others?)

The communication of the project findings has been extensive right through out the project, information has been disseminated at many conferences and community events. The Australian sugar industry has been very receptive to the work conducted by MFP with outstanding numbers of growers attending different presentations that have been delivered. One particular presentation delivered at the GIVE conference in Mackay in February 2008 had more 200 growers and industry people in attendance. Presentations that have been delivered include:

- Walkerston Rotary Club
- Marini Shire Council
- Mackay City Council
- REDEC
- Queensland LandCare Conference (Mackay)
- New Crops Conference (Gatton)
- Sugar Executive Conference (Mackay)
- Regional Advisory Group (Mackay)
- GIVE Conference 2006 (Burdekin)
- GIVE Conference 2008 (Mackay)
- GIVE Conference 2009 (Ingham)

- CRRIS (Central region Rural Innovation Support) field day (Mackay)
- SRDC Regional workshop (Mackay)
- SRDC Regional workshop (Proserpine)

A large number of other communication activities have taken place throughout the life of this project which have included field walks, information bus trips which have demonstrated planting and planting equipment, harvesting of fibre crops. Field days which have demonstrated the fibre crops and product lines that can be produced from fibre. There has been a number of TV interviews as well as radio interviews. Growers and industry people have attended the many activities conducted and has instigated large amounts of interest in fibre cropping. MFP has also established information stands at two regional shows which has generated great interest. Information has also been disseminated at two BSES Limited field days with trial information displayed as well as equipment on show.

### **Recommendations:**

(What recommendations would you make as a result of the project, including suggestions for further research and development?)

The benefits to the following cane crop has been demonstrated by this project, understanding the science behind this effect should be understood to enable the Australian Sugar Industry to capitalise on the findings of this project. MFP strongly recommends that this research be supported by SRDC. MFP also recommends that to fully utilise the findings of this project enhancing the market opportunities is a key component and requires further investigation.

MFP would like to acknowledge Eddie Gilbert from DPI & F for the support given to produce the findings of this project.

### **Publications:**

(List and attach copies (electronically if possible) of all articles, newsletters and other publications from the project.)



**news and inn**

**Hemp trials underway in Mackay**

BSES assisted with the planting of a 1 ha evaluation trial of industrial hemp and kenaf at Mackay in late October. The trial is part of an effort by the Mackay Industrial Hemp Group (made up of BSES, Queensland Department of Primary Industries and local canegrowers) to evaluate the potential of the plants as a rotational crop for sugarcane farms. BSES extension officer John Agnew will publish a detailed report about the trials in the January 2003 *Bulletin*. He makes the point that the hemp varieties used in the trials have very low THC (drug content) levels, so don't expect to see Mackay BSES officers looking any more relaxed than usual!

## ALTERNATIVE OPTIONS

# Legalisation of hemp opens doors for crop diversification

Central District cane growers looking to diversify in attempts to generate much-needed income could soon have another crop option on offer.

Although trials are still only in the preliminary stages, Ecofibre Industries Limited agriculture director Tanya Jobling said growing hemp as an alternative crop in rotation with cane could prove viable in the Central District.

"Trials for growing hemp in the Central District are still at the planning phase, with one grower set to plant hemp in October," Ms Jobling said.

"While trials haven't been done on hemp crops as a whole in this region, it shows great potential for the Central District."

Ms Jobling said hemp was a versatile crop that could grow on a wide range of latitudes, from temperate to sub-tropical and tropical areas, with the highest capacity for production in sub-tropical and tropical conditions.

"Hemp is a high biomass, short-rotation annual crop that grows over the summer period in 100 days."

### SOIL AND WATERING

Ms Jobling said hemp crops grew best in any free-draining, loamy (medium consistency) soils.

"Hemp prefers sandy and lighter soils, rather than heavy clay soils and does not grow well in areas prone to water logging."

Hemp needs a good nutrient profile, meaning it requires high levels of nitrogen, potassium and phosphorus in soils, but unlike other fibre crops, does not require any pesticide use.

Ms Jobling recommended a total of about four mega litres of irrigation per crop.

"Irrigation must be overhead, not flood, as hemp does not like wet feet."

### VARIETIES

There are many hemp varieties



**A TASMANIAN hemp grower prepares to harvest his fibre crop. Hemp trials in the Central District will start next month.**

available to grow commercially but these are all suitable only for temperate areas, so Ecofibre Industries Limited has been working on developing varieties for sub-tropical areas like the Central District.

"At this stage there are a couple of varieties that would be suitable, including INSX, CHA and CHG, currently labelled only by their breeder codes."

"In Queensland, hemp is now a licensed commercial crop, but the availability of suitable varieties will remain limited for some time."

### COSTS, RETURNS AND EQUIPMENT

Ms Jobling said because of a lack of trials for hemp in this region, it was difficult to calculate costs and returns.

Gross margin returns to the farmer would be comparable with other broadacre crops, depending on yield and input costs.

"The hemp industry is similar to the sugar industry, as it relies on a local processing factory, which in turn requires an area to have produced the capacity to produce adequate tonnage."

"It's not about whether you can

grow the crops, but about whether you can get it processed locally to market it - that is where you start to make money."

Equipment wise, Ecofibre Industries Limited suggests working on a regional model, whereby equipment can be contracted out to carry out processes like planting and harvesting.

### PRODUCTS

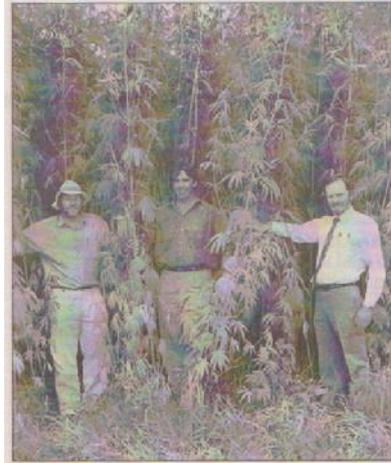
"Hemp fibre can be used for plastics, manufacturing, car panels, fibreglass replacements, absorbency industries, animal industries and the building industry, all at manufacturing fibre level."

"Hemp can also be grown as a food crop for its grain or oil, although Australia and New Zealand are the only countries in the western world that are banned from consuming hemp foods."

"However, movement is happening towards making a submission to the Australian and New Zealand Food Authority (ANZFA) to reconsider their conservative banning."

For more information on hemp, contact Tanya at Ecofibre Industries Limited by .email tanya@ecofibre.com.au .

# Industrial fibre developed into commercial viability



**ECOFIBRE Industries Limited's Phil Warner, Terry Sharp (AgForce) and Eddie Gilbert (QDPI) check the four metres of growth in a fibre trial crop of a new EIL variety in Queensland.**

Hemp is now a licensed crop in Queensland.

State Cabinet approved the commercial production of industrial hemp in May in a bid to provide growers with another crop to diversify their land.

AgForce Grains president Terry Sharp said trials had been underway in some areas for the past three-and-a-half years to progress the crop's development and commercial viability.

"AgForce Grains obviously doesn't support the growing of hemp for illegal use, but is whole-heartedly in favour of industrial hemp harvesting for legal commercial fibre production," Mr Sharp said.

Mr Sharp said industrial hemp had an almost non-existent level of THC (the mind-altering chemical found in marijuana) which renders it useless for drug users.

A steering committee is in the process of being formed and will meet on September 13 to try and work out what steps need to be taken to develop a commercial hemp industry in the Central District. -

The steering committee is expected to include several cane growers and representatives from Mackay Sugar, the Hemp Advisory Committee, the Mackay Tourism Development Bureau and government.

## First harvest of commercial hemp successful

Part of the Central District's first commercial hemp trial planted on an Oakenden cane farm last October has been harvested.

BSES senior extension officer and Hemp Steering committee member John Agnew said the first hemp variety, CHA, was well in flower before Christmas and harvested earlier than expected. "We harvested the CHA just before Christmas - which I guess was a bit disappointing, and there's a few reasons why," Mr Agnew said.

"We weren't able to plant until October 28, when we really should have by mid-September, but legislative changes regarding commercial hemp growing weren't passed until around then so we had to hold off.

"We also weren't able to irrigate as much as we would have liked to.

"The CHA variety is probably not quite as suited to this area as the second variety CHG, which was standing about three metres tall before we harvested it.

"The CHA was only about 1.8 metres tall."

About a quarter of a hectare of each hemp variety was planted on an Oakenden cane farm in late October, and Mr Agnew said the CHA produced about one and three-quarters of a round bale when it was harvested.

"The hemp was cut with a sickle mower first at ground level and then dragged together so it was in rows to dry out.

"Then it was baled with a round bailer, like any other forage."

The harvested hemp will be kept in storage until trial partner Brisbane's Ecofibre

Industries can advise when a hemp processing plant will be built and it can be processed and quality tested.

"The hemp will keep really well in storage for months and months.

"Even if Ecofibre said to us that a plant would be built at the end of the year, it would still be ok.

"Hemp is better than normal hay, this stuff has very few leaves and is mainly stalk.

"At this stage Ecofibre has said to us that there is a 80 to 90 per cent chance that a plant could be built in Queensland by the end of this year."

Mr Agnew said until the second variety was harvested and bailed he could not be sure of the trial's tonnage, but was pleased with the outcome.

"This is the first time there has been commercial on farm hemp trials and it was pretty much a learning curve.

"We didn't have a lot of pest problems - there was a few Heliothis caterpillars but they didn't cause much damage - but we've heard they've completely wiped out southern crops.

The Hemp Steering Committee and the grower are extremely keen to keep the trials running, but it's just a matter of having enough funding to continue.

"We're currently seeking funding through the State Government's 'The Way Forward' assistance package and we hope to plant again in September."

Mr Agnew said future trial plans included trialling different varieties on different soils and seeing how hemp reacts, to different types of irrigation including flood.



ABOVE: Cane grower Joe Muscat standing beside the CHG variety of hemp growing on the Oakenden cane farm as part of pilot trials. The hemp measures about three metres tall.

LEFT: A sickle mower was used in harvesting the hemp, cutting it off at ground level.

# A bumper crop for hemp farmers

A group of industrious farmers has taken advantage of rotational cropping by growing industrial hemp.

Dennis, Annette and John Werner are participating in trials of both industrial hemp and kenaf at their Septimus farm.

John Werner said he embraced hemp and kenaf over other alternative crops due to the lack of competition within Australia.

"It's no good growing heaps of pumpkin and watermelons and flooding out the existing markets," he said.

"Hemp and kenaf are emerging industries and they're environmentally friendly crops. We put no chemicals on either the hemp or the kenaf."

The uses for hemp and kenaf appear to be endless with everything from paper to building materials to biofuels on the cards.

"There's also a big push for hemp related products in Europe," he said.

"Hemp is used in animal bedding which is very popular in Europe it can also be used for lining the interior of cars. There's a brewery in Australia who use hemp fibre for filtration," he said.

It takes around 150 days from planting

for hemp to mature for harvest and slightly longer for kenaf but there's no danger of it completely overtaking the sugar industry.

"Both hemp and kenaf are meant to be more of a rotational crop to be grown with sugar cane in the fallow period, it could fit into the rotation similar to soya beans," Mr Werner said.

At present existing machinery used in the sugar industry is utilised to harvest hemp and kenaf but plans are already underway to build specialist machinery.

"There is a manufacturer in Melbourne currently building a prototype hemp harvester and processor."

There is already a bidding war underway between a number of parties for the crop once it's harvested.

"I'd say we're expecting a pretty good price for it," Mr Werner said.

Member for Dawson De-Anne Kelly recently toured the farm and praised the Werner's for their efforts.

"The Werner family have shown great initiative in growing a superb industrial hemp and kenaf crop," Mrs Kelly said.



• Showing off one of the most recent harvests are Joe Muscat, Dennis Werner, Raylene Hansen and John Werner

## GRAINS & CROPPING

[Potential export earner]

# High hopes for Qld hemp industry

A PREDICTED global shortfall of non-timber renewable fibre within the next five years will open up dynamic export marketing opportunities for Queensland-grown industrial hemp and kenaf.

That was the message delivered at the recent Mackay Fibre Producers field day that attracted 70 Mackay and Proserpine region canegrowers, agribusiness representatives and government officers.

Mackay Fibre Producers chairman Joe Muscat, a second-generation Oakenden district canegrower who help found the 14-member group 18 months ago, believes fibre crops grown in rotation with sugarcane could be quickly developed into a viable industry option for cash-strapped farmers.

With the sugarcane industry in deep recession, regional water storages at critical levels and a growing demand on the Australian dollar, all sectors of the community were reviewing their options to secure a return on investment, Mr Muscat said.

Mr Muscat, along with John and Dennis Werner, who hosted a tour of their Septimus district cane property, had outlaid about \$30,000 to conduct the investigative kenaf and licensed hemp trials on their farms for the past two years.

"Our immediate field day objective was to create an awareness of the fibre industry's potential before taking the next step to seek expressions of interest for grower involvement," Mr Muscat said.

"To succeed, we will need a long-term regional commitment from growers to work cooperatively to establish a processing mill with a continuity of supply to service export markets with value added products," he said.

"Ideally, a cooperative venture would deliver ownership and rewards back to the grower base and the broader community.

"Current advice based on hemp and kenaf crop yield indicates that 2500 hectares could produce 25,000 tonnes of dried fibre. That volume could support a \$10 million mill capable of processing 6t/hour for a 200-day plus



Inspecting the industrial hemp trial crop on the Werner family's Mackay district farm are, from left, Joe Muscat, Oakenden, Dennis Werner, Septimus, Raylene Hansen, DPI, Mackay, and John Werner, Septimus.

operation," Mr Muscat said.

Mackay Fibre Producers had applied for a Federal grant from the New Industry Development Program and would be seeking support from the State Government's Regional Partnership's Program, he said.

"Our group has a three-year work plan to move forward through venture partners with further trial plantings next year," Mr Muscat said.

"We know we have the right soil types and climate to produce high-yielding hemp and kenaf crops. Our next step is to review plant variety selections and planting, fertiliser, irrigation, herbicide and harvesting techniques.

"By January, 2005, we will be looking for regional grower interest in establishing a processing plant, and by October that year, we would hope to progress construction plans. It was envisaged the mill would process either hemp or kenaf," Mr Muscat said.

John Werner said specialised equipment had been brought in from Maryborough to plant the 2003 trials and they would purchase their own planter for next season.

The Werner's September 12-sown industrial hemp crop was planted on 10cm row spacing targeting a population of 200 plants per square metre. It was a 100-day crop that required

increasing daylight hours for optimum growth. When harvested around Christmas, it would have received 4.25 megalitres of irrigation with a dry yield estimate of around 8t/ha.

The estimated cost of growing hemp was from \$800 to \$1200/ha and current export market return was between \$150-\$220/tonne.

Mr Werner said they would probably harvest with a mower-conditioner and then windrow and dry the crop in the field over a two to three-week period using a four-wheel rake. Very little leaf material remained on the stem prior to baling.

Industrial hemp researcher Tanya Jobling, representing Brisbane-based company Ecofibre Industries Ltd, said the company had been assessing varieties imported from China, France and Canada to make selections best suited to Queensland.

Ms Jobling said the industrial hemp market, for medium retted fibre products, was unlimited. From every tonne of hemp, 20-30 percent was the external bast fibre, 60-70pc was the inner woody hurd material and 10pc was dust. Value-added bast grown in Queensland would be best suited to the production of plastic-cellulose composite, glass-fibre reinforced plastics, insulation, structural building materials, geotextiles, carpet and felt underlays.

The absorbent hurd was in demand for animal bedding, kitty and poultry litter and mulching material, while the dust was used in lightweight building materials, Ms Jobling said.

Kenaf fibre advocates Keith Gould, Kenaf Australia, Proserpine, and Dr Steve Ockerby, Nature Trust, Mareeba, said a fledgling North Queensland industry was targeting 2000ha within two years.

Mr Gould said kenaf fibre, used principally for making boards, matting and paper products, was also a spring-sown crop grown over about 140 days. Japan was seen as the major importer of non-forest fibre material for paper manufacturing.

At the 70-day period, kenaf could also be used as a highly palatable 35pc protein stock feed.

## First regional trials underway for commercial hemp industry

Central District cane growers and industry bodies are attempting to tap into the emerging and now legal commercial hemp industry in Queensland with growing trials beginning in the Mackay Sugar area earlier this month.

Bureau of Sugar Experiment Stations senior extension officer John Agnew said three varieties of hemp and one of kenas, another natural fibre crop, were planted on one hectare of land on October 28 with the view to develop a commercial hemp industry as a sideline to growing cane in the fallow.

"We originally planned to plant the week earlier, but because of the dry conditions and the fact that hemp seeds are so tiny and need to be shallow planted, we needed to further irrigate the soil before planting," Mr Agnew said.

"Hemp crops mature very quickly, in about 100 days, so we will soon start to see the plants breaking through the soil."

Laws allowing for the commercial production of industrial hemp in Queensland were passed in August, allowing the crop to move from a research development phase to commercial production, providing an alternative to cane growers wanting to grow it in rotation with cane.

Queensland Primary Industries Minister Henry Palaszczuk said the legislation now allowed for the research, production, processing, marketing and trade of processed industrial cannabis fibre and seed products, with the exception of those products that could be smoked, administered or consumed.

Traditionally industrial hemp fibre products have included paper, rope and textiles, but there are opportunities for much higher valued products such as insulation and linings for motor vehicles, building materials, oil and chemical



A MACKAY Sugar grower checks industrial hemp seed in the planter used to plant the region's first commercial hemp trial on October 28. INSET: One of the varieties of hemp seed planted in the Mackay trial.

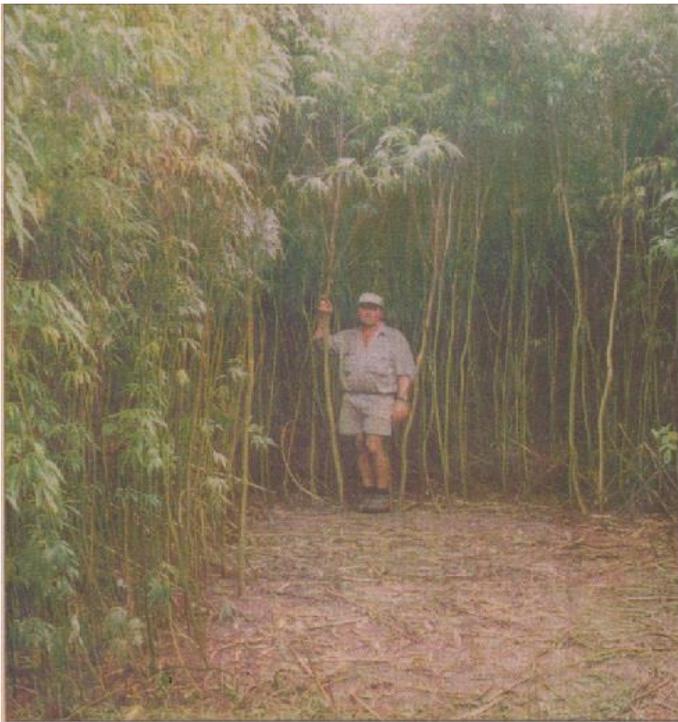
absorption materials, animal bedding, kitty litter and mulching materials.

Currently, Mr Agnew is steering a committee comprising cane growers and representatives from Mackay Sugar, the Hemp Advisory Committee, the Mackay Tourism Development Bureau, Department of Primary Industries and various government representatives to

complete the region's hemp trials.

The committee held their third meeting on September 13 and established a series of steps required to develop a local commercial hemp industry.

"The particular varieties we planted were bred for fibre production and hence have a very low - less than 0.35 per cent - THC drug content."



**TOP CROP:** Mackay Fibre Producers chairman Joe Muscat in the midst of an industrial hemp crop grown by John and Dennis Werner, of Septimus. A trial of industrial hemp and kenaf produced plants reaching heights of 4.95m. Picture: Contributed.

# Hemp hope

## Crop may save sugar industry

THERE is growing hope that industrial hemp will help save Mackay's struggling sugar industry.

A second trial just completed by two licensed growers in the Mackay district has produced a crop which appears to be the most successful in the nation.

Proponents of the value-add crop, which can be grown in rotation with sugarcane, say the Mackay district has the ideal infrastructure to support a processing plant, which could be attached to an existing sugar mill.

Lynnis Bonanno reports on Page 5.

## Hemp set to give cane growers a financial high

By LYNNIS BONANNO

INDUSTRIAL hemp is being hailed as a new hope for Mackay's struggling cane growers.

The district's second trial, believed to be the most successful in Australia, has proven Mackay has what it takes to produce world standard fibre crops.

The Mackay Fibre Producers group, led by grower Joe Muscat, is now intent on demonstrating to buyer group Ecofibre Industries in Brisbane that the city is an ideal site for development of a fibre industry.

"The indications are that our yields will be very good, so the fibre crops have real potential as a value-add for cane growers," Mr Muscat said.

Industrial hemp and similar fibre crops like kenaf have a 100-day summer growth cycle, so it can be produced in the

fallow time of sugar cane.

"To be economically viable we need the ability to process locally, and Mackay is ideally set up for that," Mr Muscat said.

He cited the refinery energy source available 12 months of the year at Racecourse mill, the established canegrower network and rail infrastructure, the compact layout of cane farms in a 120km radius, the port on our doorstep as well as agronomy support from BSES.

Crop worth could be up to \$2200 per tonne of dry matter, with the cost of production estimated at between \$600 and \$1200, depending on conditions.

Although industrial hemp is a form of cannabis it is not to be confused with marijuana. It does not contain enough THC (the chemical which produces a stoned effect) to give any desired "high". Mr Muscat hopes firm plans for a processing plant will be on the agenda by the end of this year.

### A useful product

MOST fibre crops, including industrial hemp and kenaf, can be used in the following product lines:

- The bast (outside skin of plant)
  - car interior parts (Mercedes Benz currently use about 20 kilos of kemp in every car they produce)
  - building products
  - high quality paper
  - textile industry (manufacture of clothing)
  - matting, for erosion control and carpet underlay
- The hurd (inside core, highly absorbent, able to hold up to seven times its own weight)
  - animal bedding
  - mulch
  - absorption mats for chemical and oil spills
- The seed (high in Omega 3 and 6 fatty acids, and protein)
  - use in flours and oils, for human consumption.

Sources: Mackay Fibre Producers group, HempMarket Sydney, and [www.hempcar.org/benz](http://www.hempcar.org/benz)

# Fibres find favour

By IAN MORGAN

**W**ITH the world increasingly demanding biodegradable products that will not pollute the landscape when discarded, there has been a resurgence of interest in natural plant fibres such as hemp and kenaf.

Both have the potential to be income generating fallow crops to complement the sugar industry.

During the past two summers Joe Muscat, Oakenden, and John Werner, Septimus, have between them spent \$30,000 trialing the crops, after they attended a joint DPI/BSES seminar on the crops in 2001.

They formed a group called Mackay Fibre Producers with the aim of creating an awareness of the fibres among the local canefarming community.

"But two growers can't establish a fibre industry - that will take a regional focus," chairman Joe Muscat told a recent Mackay Fibre Producers field day on the Werner property, which attracted about 100 people.

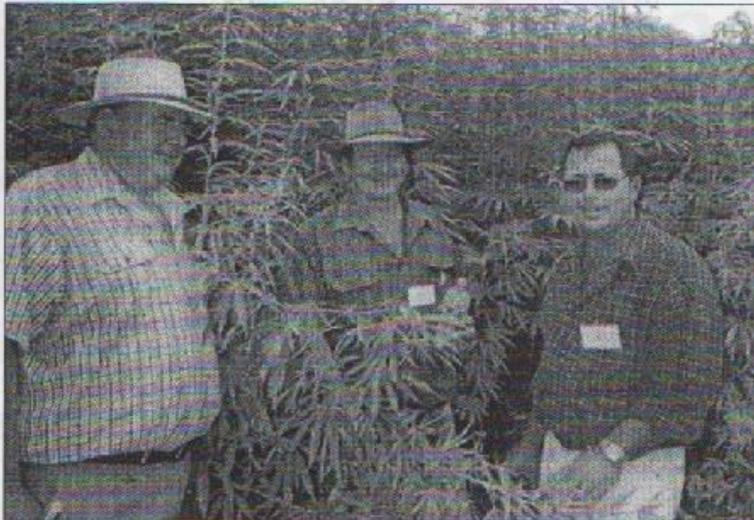
The two were so impressed with the 2002-03 trial and the progress of the current crops that they are pushing for a natural fibre industry at Mackay.

They plan to purchase a specialised seed planter and will be calling for expressions of interest from other farmers to plant about 100 hectares in three-hectare trial blocks next spring. The idea is to sort out the herbicide, pesticide, fertiliser and irrigation needs over a range of soil types.

They hope the results will attract enough venture capital to have a processing plant at the 'turnkey' stage by October, 2005.

A processing plant capable of handling 25,000 tonnes of raw stalk - the production from 2500 hectares - would cost \$5 million and produce 3600-5000 tonnes of bast fibre. Growing costs range from \$800 to \$1400 a hectare, with profits expected to be from \$600-\$800/ha, so it is not another 'get rich quick' scheme.

The impetus for a fibre industry is the increasing world demand for



Displaying their hemp crop at Septimus are licence-holder John Werner centre, his father Denis (left) and Mackay Fibre Producers chairman Joe Muscat, Oakenden, a trial hemp grower himself. The commercial hemp was planted 88 days before the photograph was taken and was estimated to already have attained a yield of 12 tonnes dry matter/ha, with another 50 days to go before harvest.

natural plant fibre material as the Europe Union, Japan and the United States legislate to compel industry to make their products from biodegradable components.

Hemp and kenaf both have long fibres that can be woven into extremely strong matting into which plastic is injected.

When pressed in a heated mould, they turn into natural fibre reinforced plastic door trims, hood linings and dashboards that are biodegrade when placed in landfill. This gives the products the name of biodegradable geotextiles.

Ecofibre Industries Ltd agricultural director Tania Jobling, Brisbane, told the field day there was a significant world natural fibre shortfall.

The EU vehicle manufacturing industry used 40,000 tonnes of geotextiles last year and hemp accounted for 12 percent of that market. However, EU demand is projected to increase to 150,000 tonnes within five years, and similar increased usage has been projected for the United States and Japan.

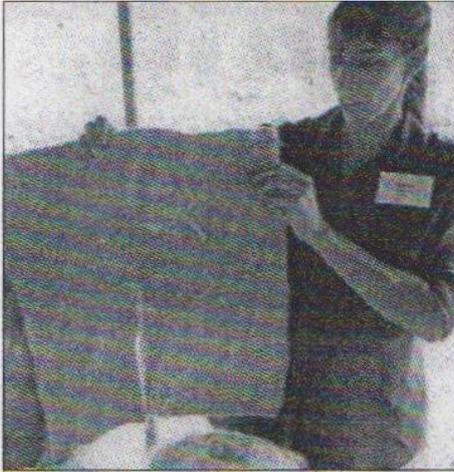
Ms Jobling said Australia had the opportunity to fill part of that increased demand, as it had the climate and a farming sector able to guarantee supply at a stable price - the two main requirements of the car industry.

However, as hemp and kenaf plant material is bulky, light and of low value, freight costs have to be contained and localised processing plants built.

That is where the sugar industry fits in. It already has a transport system that could be utilised in the off-season to transport bulky bales of hemp and kenaf to a central processing plant at a low cost, and as they are both summer growing plants they slot perfectly into the cane fallow program.

The various speakers at the field day all emphasised the establishment of a natural fibre industry would have to be a regional industry, with the stakeholders involved in the development at all levels, from growing through processing to marketing.

● To p32



Tania Jobling, agricultural director, Ecofibre Industries Ltd, with a few of the products made from hemp. The mat she is holding is used to suppress weeds around seedling trees

## Fibres in demand

● From p31

“It won’t be a government-sponsored industry,” Ms Jobling told the meeting, “Those days are gone - a natural fibre industry won’t happen unless it’s planned region by region.”

Both hemp and kenaf are interchangeable as far as growing, processing and marketing are concerned. Apart from geotextiles, they can both be made into building materials, matting, rope, carpet backing, canvas or fishing nets. They also use 40 percent less energy than woodchip when made into paper pulp - a desirable trait in an energy-conscious world trying to save forest trees and legislating for increased percentages of paper to be made from renewable natural fibres other than woodchips.

The seed of kenaf and hemp contain oils used in cooking, as a lubricant or in the manufacture of soap, cosmetics, linoleum, paint and varnish, while the cake residue makes good stock food.

Kenaf has one additional advantage - growing the plant doesn’t require the costly licences and inspection fees needed to grow hemp in Queensland.

Other advantages hemp and kenaf have as cash crops are that unlike soybeans they are always able to be harvested, and industrial fibres don’t suffer the violent price fluctuations of raw sugar.

● For further information contact the DPI call centre on 13 25 23 and ask for The Guide to Kenaf Production in North Queensland, Agdex 158/20, and the Information Paper on Industrial Hemp, published May 15, 2002.



John Werner with examples of the kenaf his family grows on its Pioneer Valley property - the plant, the dried stalks and the stems in a bale.



Mike Jubow, Nunyarra Wholesale Nursery, Kuttahul, with the first diesel tree seedlings in Australia. It's a Central American rainforest native that produces an oil in its sapwood that will run a diesel motor without any processing.



Clinton Kaddatz, Mackay Macadamias, explained to the visitors the plants behind him were 18-month-old grafted varieties, ready to plant out.

# Cane group considers alternatives

By IAN MORGAN

THE Central Region Rural Innovation Support Group (CRRIS), Mackay, was officially launched by Minister for Primary Industries Tim Mulherin at a field day at Eton recently, and was attended by more than 200 people.

CRRIS was the idea of Eton cane farmer John Ross, Heatherglenn. It aims to encourage the development of new, complementary alternative crops and industries that will be sustainable in the long term and enhance the quality of the life of the rural community.

One of the diversification industries highlighted at the field day was the fibre industry, based on kenaf and industrial hemp. It has been trialed in the Mackay area since 2002 by a small group of cane farmers calling themselves Mackay Fibre Producers (MFP). The group has ironed out a lot of the early problems of poor seedling establishment, number of plants/ha, water and fertiliser requirements, and a few weeks ago took delivery of a purpose-built

precision vacuum seeder to aid seeding establishment.

In 2005-06, kenaf yields ranged from 11-21 tonnes across the trials. The yields related to the length of time between seedling emergence and harvest. The higher figure is a world-class yield, and the group considers its aim of 25-tonne crops achievable.

Mike Jubow, Nunyarra Wholesale Nursery, aroused a lot of interest with diesel tree seedlings. A Central American rainforest cabinet timber, the diesel tree's heartwood produces an oil that can be put straight into the fuel tank of a diesel vehicle, without any processing. Although during storage it thickens and darkens when exposed to oxygen and fluctuating temperatures and would need thinning for use in a motor, it then becomes even more valuable to the alternative medicine industry which is currently selling it at US\$100/litre. When the tree has a diameter of 300mm it will produce around 200mm of oil a year in two harvests, but mature

trees produce 30 or 40 litres/year. Mr Jubow suggested it could be grown in rows four metres apart at 2.5m centres, in coastal tropical Queensland, provided the rainfall was above 1500mm and the area was frost-free.

At a stopover at Heatherglenn, John Ross discussed his plan for the 126ha Eton cane farm.

At the turn of the century, with the sugar industry in crisis with uneconomical prices, he realised he needed to diversify and have more than one income stream, so embarked on a 35-year plan.

By 2035, he aims to have the property self-sufficient, producing its own fuel for vehicles and machinery. To keep input costs down, Mr Ross aims to lift soil organic carbon levels from the current 0.6-2 percent to 5-8pc, which is higher than naturally occurs in native forest soils.

That is to be achieved by keyline principles, deep ripping and mulching along with the application of charcoal to the soil.

Currently, the property is growing sugarcane, pasture, passionfruit and cabinet timber, while a vegetable garden is grown using compost made from farm waste, chopped cane trash, straw, tree prunings and animal manure.

The field day then progressed to the Walker families cane farm, where the newest crop in the district is being established, macadamias. And to supply the planting material, which is in short supply Australia-wide, Andrew Walker and a

business partner, Clinton Kaddatz, have established a wholesale macadamia nursery and have their first 18-month-old grafted trees ready for planting. They grow and graft to order on H2 rootstock and sell the trees at \$12.50 for large orders or \$15 each in small numbers.

The CRRIS Group was formed by like-minded farmers, with Eton cane farmer David George elected as chairman.

"We've identified several areas in which we're keen to work initially," he told the *North Queensland Register*.

"First, we intend to find out what alternate crops and industries are currently in our Central Region. Then we'll compile a database that will be available to other farmers considering diversification.

"Another area we'll be investigating is the potential for equipment sharing, as much of the specialist machines - for instance a tree planter - are infrequently used by the owner, who could get a return on his capital by hiring it out."

In the longer term, the group may consider forming a marketing cooperative, a purchasing cooperative or even a community bank.

In the meantime, it is investigating the possibility of sourcing some government or industry R&D funding to employ a part-time administrator.

● Further information from David George, (07) 4959 1041.



# MACKAY **Bush** TELEGRAPH

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## Culture change



THE seeds of change are quite literally ready to be sown in the Mackay region. A growing number of cane growers are exploring alternative crops in an effort to break the sugar cane mono-culture. One of these is cane farmer and chairman of the Mackay Fibre Producers group Joe Muscat. The group has in hand kenaf seeds ready for planting in October. The group has been trialing kenaf as a rotational crop with sugar cane since 2002, and have recently gained funding to carry out a two-year agronomic and economic assessment study which will help to determine the future growth of the alternative crop in this region.

□ Story Page 3.

Picture: KIRIL RUSSELL.040806/087



**COMPLEMENTARY CROP:** Kenaf harvesting at the Muscat property at Oakenden. Picture: Contributed.

# Fibre crop works well with sugar

By **KIRILI RUSSELL**

Kirili.Russell@dailymercury.com.au

**KENAF** is proving to be a comfortable bedfellow for sugar cane.

Joe Muscat, chairman of Mackay Fibre Producers group said that he has grown kenaf on his cane property at Oakenden since 2002 and that over the past four years he has been joined by six other growers.

"It began out of an interest in growing something which would complement cane growing activities, and so the group has been exploring the viability of kenaf, industrial hemp and sun hemp as rotational crops," he said.

"The beauty of kenaf is that it adds value to the existing industry, and the product handling equipment is the same as is used for cane, from the harvester to haul out.

"Even the cane rail system could be utilised for transport, because kenaf is harvested in March and April, outside of

cane harvesting season."

With a diversity of uses for the harvested crop, from animal bedding to ethanol, the fibre crop industry in this region is still very much in its developmental stages.

Following a trial in 2002 of a half-hectare each of kenaf and industrial hemp, the trial was joined by the Werner property at Septimus the following year.

The kenaf crop has been increased each year since, with 2400 tonne wet weight at this year's harvest, bought back by Nature Trust Australia, who supply seed to the growers to generate product for a specific overseas market.

Industrial hemp and sun hemp are also being grown as fibre crops, and these too offer the benefit of complementing existing cane farm cycles.

"Sun hemp is a legume and therefore a nitrogen fixate. It also has nematode and drought resistance properties," Mr Muscat said.

"All three offer great benefits for soil health, having tap roots which break down compacted layers in soil, and because it is the hemp stems which are harvested, the leaf returns a large amount of organic matter to the soil."

In a first for sugar industry fibre diversifiers, Mackay Fibre Producers group has recently received a boost towards ongoing development to the industry, acquiring some funding through the Sugar Industry Resource Development corporation under the Grower Group Innovation program.

"We'll be embarking on a two-year project when we sow in October this year which will allow for both economic and agronomic assessment of producing fibre crops in rotation with sugar cane," Mr Muscat said.

"By analysing input and achieved yield, we will be able to determine the point at which the industry becomes viable."