Harvesting of green sugar cane and simultaneous spreading of the separated residues, leaving a dense mulch cover, the so called green cane trash blanket. (Hanspeter Liniger)

Green cane trash blanket (Australia)

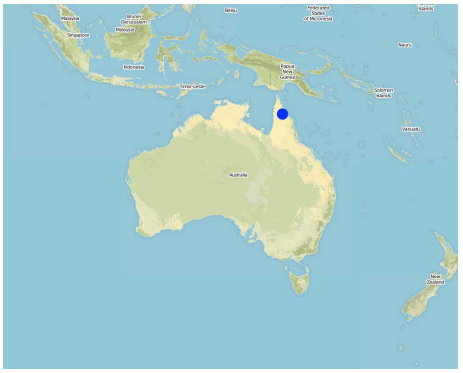
Trash blanket

DESCRIPTION

Elimination of burning as a pre-harvest treatment of sugar cane, and managing the resultant trash as a protective blanket to give multiple on and off-site benefits.

Under conventional production systems, sugar cane is burnt before being harvested. This reduces the volume of trash - comprising green leaves, dead leaves and top growth - making harvesting of the cane simpler, and subsequent cultivation of the soil easier. In the humid tropics of North Queensland, harvesting of cane used to be carried out by hand - as it still is in many parts of the developing tropics. Burning was necessary to make harvesting possible in a dense stand (and to reduce the danger of snakes). However, with the advent of mechanical harvesters in the 1960s, burning continued to be practiced through habit.
A new system then brought fundamental changes in soil management: The 'green cane trash blanket' (GCTB) technology refers to the practice of harvesting non-burnt cane, and trash blown out behind in rows by the sugar cane harvester. This trash forms a more or less complete blanket over the field. The harvested lines of cane re-grow ('ratoon') through this surface cover, and the next year the cycle is repeated: the cane is once again harvested and more trash accumulates in the inter-rows. Generally the basic cropping cycle is the same, whether cane is burnt or not. This involves planting of new cane stock (cuttings or 'billets') in the first year, harvesting this 'plant crop' in the second year, and then in years three, four, five and six taking successive 'ratoon' harvests. In year six, after harvest, it is still common, even under the GCTB system, to burn the residual trash so that the old cane stools can be more easily ploughed out, and the ground 'worked up' (cultivated) ready for replanting. A minority of planters, however, are doing away with burning altogether, and ploughing in the residual trash before replanting. A further variation is not to plough out and replant after the harvest in year six, but to spray the old cane stock with glyphosat (a broad spectrum non-selective systemic herbicide) to kill it, then to plant a legume (typically soy bean) as a green manure crop, and only replant the subsequent year after ploughing-in the legume. Under this latter system, one year of harvest is lost, but there are added benefits to the structure and nutrient content of the soil.
Whatever variation of GCTB is used, there are advantages in terms of increased organic matter, improved soil structure, more biodiversity (especially below ground) and a marked reduction in surface erosion - from over 50 t/ha to around 5 t/ha on average. Less erosion is good for the growers - but is also of crucial importance off-site, as sediment lost from the coastal sugar cane strip is washed out to sea, and damages the growing coral of the Great Barrier Reef.

LOCATION



Location: Ingham, North Queensland, Australia, Australia

No. of Technology sites analysed:

Geo-reference of selected sites
- 143.3354, -13.7444

Spread of the Technology: evenly spread over an area (800.0 km²)

In a permanently protected area?:

Date of implementation:

Type of introduction
- through land users' innovation
- as part of a traditional system (> 50 years)
- during experiments/ research
- through projects/ external interventions

A ‘ratoon’: a re-growing sugar cane sprouts through the trash blanket after harvest. (Hanspeter Liniger)

conventional sugar cane production (William Critchley)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- improve production
- [x] reduce, prevent, restore land degradation
- conserve ecosystem
- protect a watershed/ downstream areas – in combination with other Technologies
- [x] preserve/ improve biodiversity
- reduce risk of disasters
- adapt to climate change/ extremes and its impacts
- mitigate climate change and its impacts
- create beneficial economic impact
- create beneficial social impact

Land use

Land use mixed within the same land unit: No

Cropland

- Perennial (non-woody) cropping: sugar cane

Number of growing seasons per year: 1
Is intercropping practiced? No
Is crop rotation practiced? No

Water supply

- [x] rainfed
- mixed rainfed-irrigated
- full irrigation

Purpose related to land degradation

- prevent land degradation
- [x] reduce land degradation
- restore/ rehabilitate severely degraded land
- adapt to land degradation
- not applicable

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion, Wo: offsite degradation effects

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

SLM group

- improved ground/ vegetation cover

SLM measures

agronomic measures - A1: Vegetation/ soil cover, A6: Residue management (A 6.4: retained)

TECHNICAL DRAWING

Technical specifications

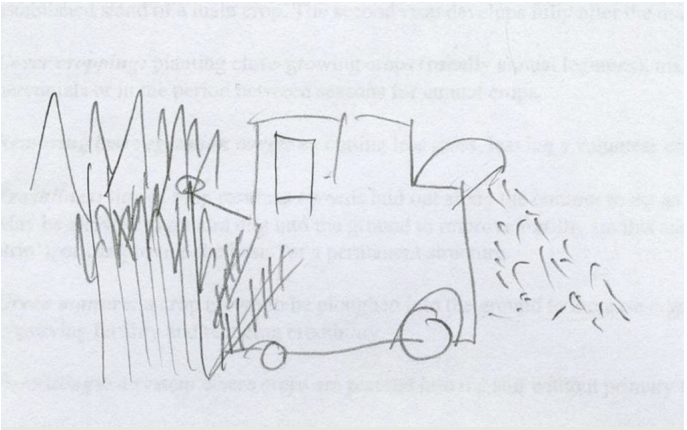
Harvester harvesting cane and depositing trash on surface

Location: Queensland

Technical knowledge required for field staff / advisors: low; Technical knowledge required for land users: low.

Main technical functions: control of raindrop splash, improvement of ground cover, improvement of soil structure, control of dispersed runoff. Secondary technical functions: increase in organic matter, increase of infiltration, increase in soil fertility, increase in surface roughness.

Mulching: "trash blanketing"



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ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **1 ha**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: 100.00

Most important factors affecting the costs

n.a.

Establishment activities

n.a.

Maintenance activities

1. Mulching of inter-rows with trash[previously: burn cane with associated trash and then harvest] (Timing/ frequency: August)
2. Fertilize cane (Timing/ frequency: October)
3. Spray with Amicide (very efficient herbicide, systemic and non-selective) (Timing/ frequency: November)
4. Spray with Amicide (Timing/ frequency: January)

Maintenance inputs and costs (per 1 ha)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Contract harvesting	ha	1.0	390.0	390.0	100.0
Fertilizers and biocides					
Fertilizer	ha	1.0	120.0	120.0	100.0
Herbicides	ha	1.0	33.0	33.0	100.0
Total costs for maintenance of the Technology				**543.0**	
Total costs for maintenance of the Technology in USD				*543.0*	

NATURAL ENVIRONMENT

Average annual rainfall

- < 250 mm
- 251-500 mm
- 501-750 mm
- 751-1,000 mm
- 1,001-1,500 mm
- 1,501-2,000 mm
- [x] 2,001-3,000 mm
- [x] 3,001-4,000 mm
- > 4,000 mm

Agro-climatic zone

- [x] humid
- sub-humid
- semi-arid
- arid

Specifications on climate

Thermal climate class: tropics

Slope

- [x] flat (0-2%)
- gentle (3-5%)
- moderate (6-10%)
- rolling (11-15%)
- hilly (16-30%)
- steep (31-60%)
- very steep (>60%)

Landforms

- [x] plateau/plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Altitude

- [x] 0-100 m a.s.l.
- 101-500 m a.s.l.
- 501-1,000 m a.s.l.
- 1,001-1,500 m a.s.l.
- 1,501-2,000 m a.s.l.
- 2,001-2,500 m a.s.l.
- 2,501-3,000 m a.s.l.
- 3,001-4,000 m a.s.l.
- > 4,000 m a.s.l.

Technology is applied in

- convex situations
- concave situations
- not relevant

Soil depth

- very shallow (0-20 cm)
- shallow (21-50 cm)
- moderately deep (51-80 cm)

Soil texture (topsoil)

- coarse/ light (sandy)
- [x] medium (loamy, silty)
- [x] fine/ heavy (clay)

Soil texture (> 20 cm below surface)

- coarse/ light (sandy)
- medium (loamy, silty)

Topsoil organic matter content

- high (>3%)
- medium (1-3%)
- [x] low (<1%)

- [x] deep (81-120 cm)
- [ ] very deep (> 120 cm)

- [ ] fine/ heavy (clay)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [ ] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [ ] for agricultural use only (irrigation)
- [ ] unusable

Is salinity a problem?
- [ ] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

Species diversity
- [ ] high
- [ ] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [x] commercial/ market

Off-farm income
- [ ] less than 10% of all income
- [x] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [ ] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [ ] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [ ] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [ ] men

Age
- [ ] children
- [ ] youth
- [ ] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [x] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [ ] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] individual, not titled
- [x] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

farm income: decreased ✓ increased

Socio-cultural impacts

SLM/ land degradation knowledge: reduced ✓ improved

Acceptance by society: decreased ✓ increased

Enhanced reputation of sugar cane growers as 'environmentally friendly'

Ecological impacts

surface runoff: increased ✓ decreased

excess water drainage: reduced ✓ improved

soil moisture: decreased ✓ increased

soil cover: reduced ✓ improved

soil loss: increased ✓ decreased

From >50 t/ha to 5 t/ha; although the location is relatively flat, soil erosion can be high due to high rainfall

nutrient cycling/ recharge: decreased ✓ increased

Loss of nutrients reduced, inproved soil structure

soil organic matter/ below ground C: decreased ✓ increased

biomass/ above ground C: decreased ✓ increased

animal diversity: decreased ✓ increased

Soil fertility: decreased ✓ increased

Off-site impacts

downstream flooding (undesired)	increased	reduced
downstream siltation	increased	decreased
groundwater/ river pollution	increased	reduced
wind transported sediments	increased	reduced

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Benefits compared with maintenance costs

Short-term returns	very negative	very positive
Long-term returns	very negative	very positive

CLIMATE CHANGE

-

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
- 1-10%
- 11-50%
- [x] > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- 0-10%
- 11-50%
- 51-90%
- [x] 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- Yes
- No

To which changing conditions?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

Strengths: compiler's or other key resource person's view

- GCTB systems offer multiple on-farm environmental benefits

  How can they be sustained / enhanced? Continue to refine the system, by encouraging (a) non burning of trash in the
- Increases overall farm income by maintaining yields of sugar cane while

  How can they be sustained / enhanced? Continue to refine the system.
- GCTB systems provide protection to the coral reef, through substantially reducing the sediment yield that reaches the lagoon and thence the Great Barrier Reef

  How can they be sustained / enhanced? Give recognition to the growers for their overall environmental contribution.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Some burning still continues through (a) the few farmers who have not yet adopted GCTB and (b) the common practice of burning trash before replanting Continue to encourage non-burning for multiple reasons.

REFERENCES

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Editors

Reviewer
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Resource persons
Anthony J. Webster - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_951/

Linked SLM data
Approaches: The 'Triple bottom line' https://qcat.wocat.net/en/wocat/approaches/view/approaches_2668/

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- CSIRO (CSIRO) - Australia

Project
- Book project: where the land is greener - Case Studies and Analysis of Soil and Water Conservation Initiatives Worldwide (where the land is greener)

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