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SRDC Grower Group Project Final Report

SRDC project number: GGP 011

Group name: Develop a Whole of Crop Load Levelling Arm

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Due date for report: 1/01/2008

Funding Statement: This project was conducted by Condong Trash Committee 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**

Condong Trash Committee 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:

This project aims to encourage involvement of representatives from all Condong harvesting groups to work together improving their skills to carry out R&D while building onto SRDC project. (HGP002 Design and build a moving wall on side tipping cane transporters.) This project run in conjunction with all Condong harvester groups, NSW Sugar and SRDC was aimed at delivering successfully the ability to level whole crop biomass in road transport containers once it had been delivered by side tipping transporters. This project if successful will level the load 100mm below the sides of road containers to achieve the 21tonne target for the successful operation of automated tarping system which secures load for safe road transportation.

The initial amount of biomass needed to reach net load target, had to be loaded well above the road container sides. Then to compact and level below the container side making way for tarp proved unattainable. Therefore the focus has been directed towards increasing bulk density, trial choppers are being supplied by harvester manufacturer during 2008 off season.

On going trials using various roller configurations were carried out, resulting in a design that rolled improving bulk density in one direction and levelled when reversed. However this needs far more development if bulk density is not increased, it would not be practical for this to be mounted on transporters.

Background

Cane transport using the multi-lift system is a very significant cost for the NSW Industry. The lower bulk densities of the whole-of-crop product will exacerbate these costs unless we can maintain our 23.5t pay loads. Whole-of-crop harvest means 20% more weight and 50% more volume; it is a real transport challenge to control costs.

Community members and state law require multi-lift cane bins to be tarped. Our Industry accepts this as essential once we commence green, whole-of-crop harvest for Co-generation in the 2007 season.

The newly developed bin-tarping system requires that all material be lower than the bin top.

Static levelling arms that have been used in burnt cane transport have been trialled and aren't successful.

A combined meeting of Condong, Broadwater and Harwood, Trash Committee's growers gave equal priority to developing an effective multi-lift bin levelling device mounted on both 48 and 33m³ haul-outs and to developing improved side-knives for the green harvest of heavy 2 year old crops. The members of the Condong trash committee have elected to focus on developing a levelling device.

Aims:

- This project aims to build and modify until effective, a haul-out mounted load levelling device to swing out and level the whole of crop product (mix of cane & trash) after it has been tipped by the haul- outs into the 90 m³ multi-lifts with a minimum net load of 21 tonne, that transport cane to the mills in NSW.

- These multi-lift bins are loaded by 48m³ haul-outs which is a two tip option or smaller 33m³ haul-outs which is a three tip option. Due to the diverse nature of the NSW industry the use of these two different size haul-outs is expected to continue for some time therefore the load levelling device needs to be trialled on both.
- This device is necessary:
 - To maintain a 23.5t pay load in the multi-lifts once co-generation commences in 2007.
 - To allow the newly developed bin tarping system to operate successfully.

The SRDC funding request was aimed at encouraging key growers representing Condong Harvesting Groups as the “Condong Trash Committee” to contribute their skills and some finances to aid these developments.

Methodology:

- Mount a levelling arm on both 48 and 33m³ haul-outs belonging to two Condong Harvesting groups.
- These levelling arms will serve as mounting point for a hydraulic drive module to be easily attached and trialled on either size haul-out.
- Various roller styles will be fitted into this hydraulic module to test their levelling effectiveness. It is proposed to start the trial with three different configurations.
- After the haul-out has emptied this module would counter rotate the roller on the levelling arm as it is moved along the loaded multi-bin, levelling mounds and filling voids.
- Trials were carried out in the 2007 season. The effectiveness of the configurations were determined by comparing times taken for levelling, weight of material in the bins and ease of tarping.

Intellectual Property and Confidentiality

None. Plans and drawing put in public domain 02 March 2006. Available on CD.

Results and Outputs

2007 season had a negative impact on this project, providing very limited trial time due to the postponed commissioning of the co-generation project; severe crop frosting and poor mill performance meaning only small amounts of whole crop biomass could be collected. Of a total of approximately 50 bins loaded in 2007 only bins with a net weight of between 16-18 tonne could be tarped without manual levelling, which is completely unacceptable due the increased transport costs.

Some members of the Condong trash committee with partial funding from SRDC attended ISSCT 2007. The conference strongly focused on the value of biomass. It was an opportunity to discuss with Case and John Deere representatives the need for harvesters to handle biomass while increasing bulk density. As a result John Deere will be trialling a 12 blade chopper system in a harvester at Condong during 2008 off season.

Results from this trial and NSC 012 (Single drum harvester chopper development) would need to be considered before any further development of a bin mounted levelling arm is pursued. If increased bulk density is not the solution, then development of a more sophisticated levelling arm mounted to a dedicated machine using the outcomes and experience from this project would need development.

Outcomes:

This project has laid a strong data base and experience for any further work on levelling sugar cane biomass.

Two levelling arms were mounted one on each of a 48cu metre tracked and 33cu metre rubber tyres side tippers. Designs needed to take into account harvester elevator clearance and haulout stability while levelling, as this was done with bin up to provide vision for operator.

A number of different roller configurations were trialled. These included plastic blades, steel spikes and steel shark fins, all in a spiral formation with and without angle mounting. Varying numbers and spacings of spikes/blades were trialled along with different rotation speeds. All of these configurations had problems in product recycling, windrowing product to the outsides or over the sides of bin.



A roller configuration consisting of three blades the roller width of each blade made of two strips flat steel 40mm apart at bottom mounting point and together at the apex was tried.



This configuration proved excellent for two applications. First when matching ground speed and rotation directing the arm worked as an effective roller compacting product improving bulk density with first pass, then on second pass the rotation is reversed and the arm moved the product out in front levelling the product, each pass was completed in less than 60 seconds.



With the amount of biomass product required to achieve above 21tonne payload target the road transport bin needed to be loaded 500-600mm above the sides.

The overall width of this arm with the minimum working clearance between roller edge and aluminium transport bin side, left a windrow of product which the tarping system was unable to pull through.



As mentioned in Results and Outputs section of report, addressing bulk density will be first priority, then if necessary more sophisticated and robust levelling arm would need to be developed possibly on a dedicated machine.

Plans, drawings and photographs (still and video on CD)

Capacity Building:

One of the aims of this project was to encourage and give ownership to capable people to work together while engaging in R&D. This caused frustration as the ownership and work fell back on the few original project organisers. Some knowledge on accountability to funded R&D was learnt by individuals.

Environmental Impact:

None

Communication and Adoption of Outputs:

During development of levelling arm 2006 / 2007 seasons a number of field demonstrations were organised for Richmond and Condong growers and milling staff. Due to the fact that loads in the target range above 21 tonne were unable to be tarped no articles went to publication. Lessons from this project are being and will continue to be applied to various trial levelling devices in NSW.

Recommendations:

None

Publications:

None