

# MAKING HARVESTING GROUPS WORK: LESSONS FROM MEGATONS

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## Abstract

The Mpumalanga cane growing region is characterised by harvesting groups using direct haul transport systems to the mills. A major drawback to infield loading and direct-haul is the resulting soil compaction and stool damage, which has been documented in sugar industries worldwide. Megatons (Pty) Ltd is a harvesting and transport group that was formed by a group of growers committed to long-term high quality cane yields with minimal infield damage. The group have opted for purpose-built, infield tractor/trailer combinations fitted with low pressure, high flotation tyres. The ability of the haulage equipment to minimise compaction and work in adverse infield conditions is an important consideration in a performance driven industry where growers are paid for delivering fresh cane in a contracted length of milling season. A comprehensive computer program manages harvesting and transport logistics. By combining an efficient logistics programme and purpose-built direct haulage equipment, Megatons is able to optimise machinery use and vehicle efficiencies, and minimise infield damage.

*Keywords:* sugarcane, harvesting groups, direct haulage, compaction, vehicle efficiency

## Introduction

The Mpumalanga sugarcane growing sector is characterised by relatively flat land that makes it suitable for infield to mill loading systems. Sugarcane is predominantly hauled from the field by rigid truck rigs. Direct haulage systems provide a significant cost saving when compared with transshipment of cane off haulage zones. Growers weigh up these savings against potential yield losses from infield traffic. Yield losses are often caused by soil compaction and/or stool damage (van Antwerpen *et al.*, 2000), especially in wet conditions. To reduce levels of soil compaction and field damage, some growers have opted for purpose-built infield tractor haulage rigs using walking beam axles that run on high flotation tyres.

Growers in Mpumalanga have also opted to form harvesting groups by pooling their daily allocations. This reduces the number of cutting fronts and improves logistics and planning (Bosch Projects, 2004). By forming harvesting groups, growers are able to take advantage of economies of scale through better utilisation of labour, capital and management. However, Bosch Projects (2004) have identified that there are no generally accepted ground rules for establishing harvesting groups. This paper aims at highlighting key areas that contribute to the establishment of a 'successful' harvesting group.

## Background to the Mpumalanga sugar industry

### *Description of the sugar growing region*

The Mpumalanga sugarcane growing sector consists of nearly 44 532 hectares of irrigated

cane situated in the sub-tropical region known as the Lowveld, nestled between the Kruger National Park and Swaziland. During the 2003/04 season, 1 483 growers delivered 3 975 480 tons of cane to the two sugar mills in the area, which are situated at Malelane and Komatipoort. Cane is harvested annually when stalks are mature. On average, a cane field is replanted every eight to ten years, with re-establishment being the most expensive year in the crop cycle. With careful nurturing, the cycle can be extended up to 15 years. Care of fields and stools is therefore critical in avoiding expensive replanting costs.

#### *Cane delivery agreement*

Growers are paid for the sugar that can potentially be extracted from their cane. Payment is based on the Recoverable Value (RV) formula, determined by quality of the cane delivered. Cane quality is a function of farm management practices, time of season and burn-to-crush delays – which is the period that elapses from the time the cane is burnt to the time it is crushed at the mill, and is usually measured in hours. Cane quality follows a rough curve that normally tails at the beginning and end of the milling season and peaks during the drier winter months in the middle of the season – known as the RV curve. Long burn-to-crush delays result in a drop in cane quality. Growers therefore need to deliver fresh cane to the mill if they are to maximise revenue. Fresh cane also maximises potential sugar extraction (personal communication<sup>1</sup>).

Due to the shape of the RV curve, growers are required to deliver their cane rateably throughout the milling season for 24 hours a day, seven days a week. The drop in cane quality at the beginning and end of season has necessitated that growers enter into a contract with the miller to define the length of milling season. The present contract restricts the length of the milling season to 38 weeks, from the first week in April to Christmas each year. The contract is managed by a time account which allocates a time budget to a defined period each season, during which the growers or the miller can temporarily stop mill throughput. If either party exceeds their allotted time account and extends the season beyond 38 weeks, they will be liable to pay a penalty based on the drop in cane quality and consequent loss in sugar production. It is therefore imperative that growers minimise the risk of creating ‘no-cane’ stops at the mill by properly co-ordinating harvesting and transport logistics, especially after rain. Reducing the number of no-cane stops has the advantage of shortening the milling season, which should result in higher average cane quality for the season. There is also less risk of delivering during wet periods in December.

#### *Harvesting groups*

Harvesting groups have existed in Mpumalanga since the Malelane mill opened in 1967. Growers opted to form harvesting groups by pooling their daily allocations. This allows for the pooling of equipment and takes advantage of economies of scale through better utilisation of labour and machinery. The resultant reduction in the number of cutting fronts improves logistics and communication throughout the cane supply chain. The groups are usually formed where farmers are more or less in the same geographic area and have similar farming practices. Harvesting groups have the same responsibilities and benefits as an individual grower, but have to deliver a greater daily allocation. Growers are nevertheless paid individually, and are therefore responsible for cane quality and production.

### **Soil compaction**

Soil compaction may be defined as a process during which soil particles move closer together as a result of external forces from heavy machinery travelling over wet soil and reducing the

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air pockets between the soil particles, and the soils then shrinking as they dry out (Torres and Rodriguez, 1995). No clear relationship has been established between compaction and yield loss. It has, however, been documented that compaction reduces soil porosity, which in turn reduces irrigation infiltration rates and hence root growth (van Antwerpen *et al.*, 2000). Research conducted by Soil Foodweb Incorporated (2003) shows that increased compaction and damage to fields in wet conditions can kill critical soil organisms, thereby reducing the overall health of the soil. Reducing the risk of compaction and infield damage should result in healthier soils and longer ratoons. Tyre pressure is a factor that cannot be ignored in soil compaction. Bailey *et al.* (1991) found that compaction and soil stress increase with tyre inflation pressure. Cane stool damage from infield traffic also needs to be considered. This factor may contribute more to short-term yield losses than compaction (van Antwerpen *et al.*, 2000).

### **Megatons cutting group**

#### *Description of the Megatons group*

Megatons (Pty) Ltd is a group of nine farmers committed to long-term, high quality cane yields with minimal infield damage. Megatons operates over a radius of nearly 25 kilometres around the Komati Mill, with an average lead distance of approximately 11 kilometres. The combined annual tonnage of the group was nearly 225 000 tons of sugarcane for the 2003/04 season. The crop is moved using six 160 kW tractor haulage rigs, and loaded infield by three grab loaders. The capacity of the machinery is approximately 250 000 tons. Current daily allocation at the mill is around 1 100 tons per day, which equates to nearly 10 hectares per day to be cut.

Growers within the Megatons harvesting group are totally committed to helping one another. In wet field conditions not suitable for infield loading, agricultural tractors with tipper trailers are sent by all cutting group members to assist in extracting cane to a spot convenient for the haulage rigs, at no additional cost to the recipient. By doing this, the group ensures that they are able to deliver their daily allocation of fresh cane, thereby reducing the risk of no-cane stops at the mill.

A further advantage is that fairly large areas of 20-30 hectares are cut at a time, improving the effectiveness of farm management operations. This allows the individual farmer to proceed with the normal practices of burning, cane cutting, loading, light cultivation or deep ripping as required, followed by a top-dressing of fertiliser, spraying of herbicides and irrigation. All of the above are made easier by cutting larger areas. This also ensures that cane age, re-growth and development is uniform within a field. An added benefit of a large group like this is that aerial spraying of chemical ripeners, which improve quality at certain times of the season, can be used cost effectively and efficiently because a larger area is sprayed at a time.

#### *How the group works*

The Megatons Group is centrally administered. A customised computer program co-ordinates the entire group's activities such as ripener application, and drying-off, burning and harvesting dates. The program is flexible by allowing for planned and unplanned mill stoppages or rain delays. The programme is updated weekly to accommodate yield variances caused by growers over or under-estimating, or any changes in mill throughput. Most importantly, it allows growers to plan important activities ahead of time. It should be noted that the parameters set within the harvesting programme determine the rules for how the group functions.

Megatons (Pty) Ltd is also the founding member of a private toll road that provides a shorter route to the Komati Mill. A further incentive for the group to develop low ground pressure rigs within the Road Traffic Act axle mass restrictions is to ensure the long-term viability of the pavement.

#### *Megatons loading and hauling system*

The Megatons group have fitted high flotation tyres inflated between 0.7 and 0.8 bar to 46 kW three-wheel mechanical grab loaders. The advantage of this configuration is two-fold; firstly, compaction is reduced because of lower tyre pressures, and secondly, the soft profile tyres reduce tractability, thereby avoiding the push-piling of cane that results in cane stool damage.

Windrowed cane is loaded into two-wheel drive 160 kW haulage tractors pulling tandem trailers parallel with the cane rows. These vehicles have a tare mass of approximately 21.6 tons. The vehicles are designed to haul 24-28 ton payloads, giving a gross combination mass of 45-48 tons. It takes approximately 20 minutes for each vehicle combination to be loaded infield. Walking beam axles are fitted to each trailer. The trailers have been designed in such a manner that in adverse infield conditions they can be detached and hauled infield as single units.

The walking beam axle design allows the trailer to 'climb' over rather than 'plough' through infield humps or ridges, with lower drawbar requirements. The walking beam is designed with a lower centre of gravity by having the axle pivotal point lower than the stub-axles. The resulting line of pull is below the stub-axles, but more or less in line with the tractor hitch. The tendency would thus be to pull the front wheel out of trouble rather than force it down, paving the way for the rear tyre. This makes the entire rig easier to handle under difficult conditions when compared with leaf-spring suspension.

The pivotal point ensures that the load mass is evenly distributed between all wheels, an advantage when traversing obstacles. The suspension thus has minimum impact on cane stools, even when fields are wet or rows need to be traversed.

Throughout the haulage configuration, the widest possible tyres have been used. This ensures the widest and longest footprint possible. The rear tractor tyres are inflated to 1.7 bar, and the front tyres are inflated to 1.65 bar. The trailer tyres are inflated to 3.5 bar.

#### *SLIP achiever awards*

During the course of 2002, the South African Cane Growers' Association commissioned the Value Chain Improvement Programme (VIP). The initiative has two legs, a cane supply logistics benchmarking database named SLIP (Sugar Logistics Improvement Programme), and a strategic study funded by the Department of Trade and Industry. The aim of SLIP is to encourage hauliers to measure their operations, highlight areas of inefficiency and facilitate change towards best practice (Perry and Wynne, 2004). As part of SLIP, hauliers were recognised for best practice in their mill areas.

At the recent SLIP Achiever Awards held in Mpumalanga, Megatons were chosen as:

- Most efficient haulier within a 30 km lead distance.
- Most improved haulier.

Recommendations from the strategic study carried out by Bosch and Associates (2004) point to the establishment of harvesting groups. The success of Megatons as a harvesting and transport group has lessons for the industry.

## **Establishing harvesting groups**

The principles described here may prove useful to growers who wish to join together to establish harvesting groups. The four key areas below require careful attention.

### *Administration*

Administration should be centralised, with one individual responsible for co-ordination of the group and cutting gang(s). This is essential to ensure that the cutting programme is continuously updated according to mill throughput. Finances should be run on principles of good governance – transparency and accountability.

### *Logistics*

Accurate estimates and a well-structured and comprehensive computerised harvesting programme are the ‘heart’ of a successful harvesting group. The harvesting programme determines the rules for the group. All members need to agree on the rules and procedures, e.g. how runaway fires will be handled, determining the cutting order, and so on. A clear dispute resolution mechanism should be established as part of the rules and procedures – possibly through a constitution. Where possible, growers in the group should be in the same geographic area and run similar farming operations, as this allows them to plan ripening and dry-off programmes for larger blocks at a time.

### *Teamwork*

Two levels of teamwork are required. Firstly, among the cutting gang(s) and the growers. Growers remain responsible for burning their fields. This should be done in co-ordination with the cutting gang to ensure that cutting is not delayed by a grower not having burnt, as this has a knock-on effect further down the line for fellow group members.

Secondly, teamwork within the group is essential to ensure that a fair harvesting programme is put in place. Growers must be committed to assisting one another when problems occur. If cane needs to be carried out of a wet field, for example, the entire group should assist, as the grower concerned is carrying the risk for the group. If this co-operation does not happen, members will be reluctant to cut during wet or other risky periods, and this will result in unnecessary tension when drawing up or amending the harvesting programme.

### *Communication*

To ensure teamwork, communication throughout the logistics chain is essential, i.e. grower, harvesting co-ordinator, haulier and mill. It is recommended that monthly meetings be held. It should be mandatory that representatives from the entire logistics chain attend these meetings.

While this paper highlights the advantages of harvesting groups, the following disadvantages have been identified by Bosch Projects (2004).

The following items are important considerations when establishing the rules.

- There may be occasional problems with control, because of up to three separate contracts held with harvester, loader and haulier. Megatons Group has taken control of these three logistics operations, thus improving efficiency.
- Some contract harvesters may not be up to the standard required by the group.
- Influential growers within a harvesting group may be able to manipulate the contractor(s) to gain an advantage over other members.
- Distrust can develop between growers within a harvesting group.

- Problems with transfers of labour and machinery can occur where the group is widely dispersed.
- In some instances, the motivational and economic drivers are not aligned between the growers (tons RV), the contract harvesters (tons or hectares) and the hauliers (tons).

### **Conclusion**

Harvesting groups are likely to feature more prominently in the future, throughout the sugar industry. Although harvesting groups have many advantages, it is important that group dynamics are managed through a central administrative system. The Megatons Group has achieved 'success' by all members having a common vision and similar farming practices. The group developed purpose-built direct haulage equipment to ensure rateable delivery in most conditions, and also developed a comprehensive computer program to manage logistics. The harvesting programme is central to the farm management planning of the group.

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