

## **THE LIFE CYCLE OF A SUGARCANE STICK**

### **What is sugarcane?**

Sugar is made from the juice of a tropical grass called sugarcane.

Sugarcane itself looks like bamboo stalks and it is in the stalks that the plant stores energy that it doesn't need straight away – rather like animals make fat. People like sugar for its sweetness and the energy it provides, so farmers grow these plants commercially to extract the sugar.

Sugarcane needs strong sunlight, fertile soil and lots of water to grow.

Sugar is made in the leaves of the sugarcane plant by a natural process called photosynthesis and is stored as sweet juice in its stalks.

### **How is sugarcane grown?**

Sugarcane is grown by replanting part of a mature cane stalk.

Portions of seedcane sticks (stalks), approximately 40cm long, are carefully selected and treated, and then laid in a furrow in the soil, together with fertiliser. These “setts” are then covered with soil.

Approximately 10 tons of seed are required to plant one hectare of land and up to twenty five labourers per hectare are used in this operation.

The cane germinates in about 10-21 days, dependant on soil moisture and temperature. New shoots grow from buds on the joints of the setts and break through the surface of the soil. Up to 12 stalks grow from each sett, forming what is known as the stool of sugarcane.

It is necessary to spray a herbicide (weed killer) in order to prevent weed competition.

Approximately 8-10 weeks after the herbicide application it may be necessary to follow with a hand-weeding operation using 4-10 labourers per hectare.

It is further necessary to top-dress with fertilizer at this stage.

The cane canopies (leaves shade out the inter row) after approximately 4 months on the coast and up to 6 months in the inland areas.

### **How long does it take to grow?**

The cane grows at an average rate of 5-7 tons per month; maturing at approximately 12-14 months on the coast and 20-24 months inland. Thus when harvested, one hectare of cane yields from 60-90 tons on the coast and 90-120 tons inland, dependant on rainfall, heat units and husbandry.

### **How is sugarcane harvested?**

Due to the topography of the area, only small areas lend themselves to mechanization; hence the reliance on labour intensive practices. The cane is harvested by cane cutters using cane knives. On average a

cutter can cut and stack 3 tons of trashed (un-burnt) cane and approximately 4 tons of burnt cane per day. The energy used to perform this task is estimated to be equivalent to running a standard marathon! This stack is loaded onto a tractor drawn trailer and hauled to a loading zone. The less hilly farms are able to harvest the cane and directly load into a trailer using a mechanical loader. In this case a cane cutter can harvest approximately 8 tons per day as he is not required to create a stack or bundle.

**How often is it replanted?**

The harvested cane re-grows and the lifecycle repeats itself. This cycle is known as a “ratoon” and can be repeated 5-8 times before dwindling yields require re-planting of the crop. This gives a crop life cycle of, on average, anything between 8-12 years.

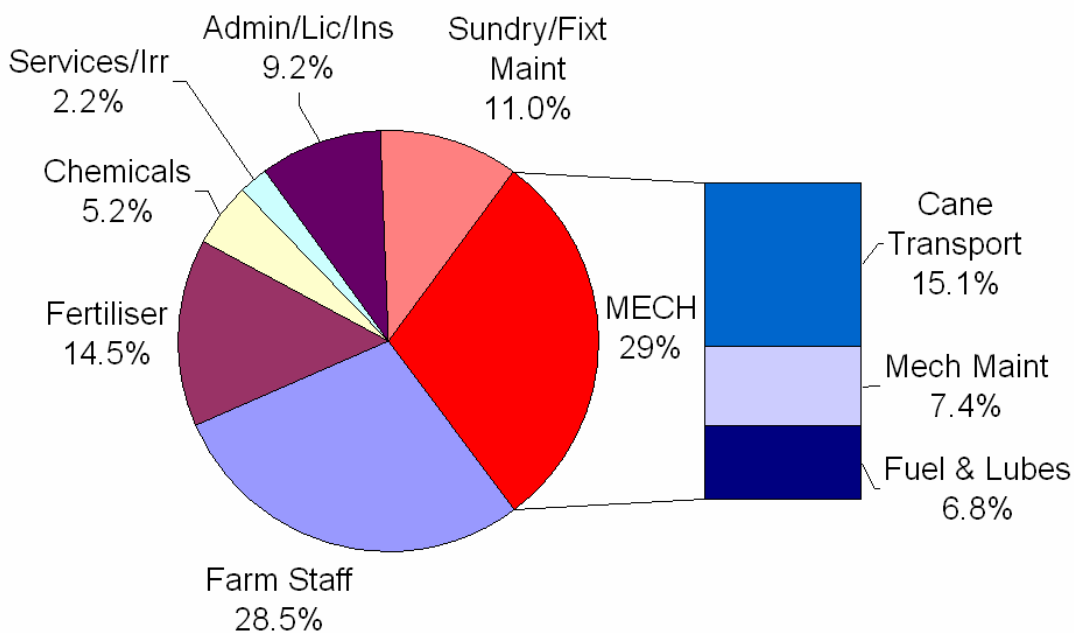
**How is sugarcane transported?**

The cane on zone is then transshipped by crane or mechanical loader into a sugarcane haulage truck. These trucks load approximately 30 tons and a roundtrip to the mill takes between 4-6 hours. The average distance from the mill is 37 km and the furthest distance approximately 120km.

**What does it cost to produce sugarcane and what are the margins?**

The current gross price received by a farmer is approximately R200 per ton of cane. After inputs such as labour, fertilizer, chemicals fuel and transport, the average farmer could be expected to make a gross profit of about R30-R40 per ton of cane or 15-20%.

**INPUT COST PIE CHART**



**What are the demographics of the local growers?**

<b>AREA STATISTICS</b>		<b>42,898 ha</b>
<b>Total</b>		
<b>Small Scale Growers</b>	<b>Black</b>	<b>4,335</b>
	<b>Indian</b>	<b>378</b>
	<b>White</b>	<b>642</b>
	<b>Total</b>	<b>5,355</b>
<b>Commercial Growers</b>	<b>Black</b>	<b>8,114</b>
	<b>Indian</b>	<b>578</b>
	<b>White</b>	<b>22,949</b>
	<b>MCP</b>	<b>5,902</b>
	<b>Total</b>	<b>37,543</b>
<b>Total area farmed by Black growers</b>		<b>13,130 ha</b> <b>30.6%</b>
<b>Total area freehold land farmed by Black growers</b>		<b>8,692 ha</b> <b>20,2%</b>

**Where is the sugarcane processed?**

The local mill is situated at Sezela. It is one of the largest of 14 cane mills in South Africa and is able to crush at a rate of approximately 10,000-12,000 tons of cane per day.

It requires a fleet of 70 trucks hauling 24 hours a day and 7 days a week, to keep the mill fed. This relates to approximately 2.1-2.3 million tons of cane per 37 week season or 70,000-75,000 truckloads!

**How is sugarcane processed?**

The cane is processed at the mill through a series of knives and shredders which chops and shred the cane into fibrous material and ruptures the juice cells. The prepared cane is fed into a diffuser which is a long "washing machine" with 12 washing stages. The temperature of the diffuser is maintained around 95 degree Celsius to sterilise the juice and aid the extraction process. About 98% of the sugar (sucrose) in the cane is extracted at this stage. The fibrous material leaving the diffuser contains about 70% moisture and is fed into large dewatering mills to decrease the moisture to about 48%. The dewatered fibrous material is called bagasse and is burnt as fuel to produce steam and electricity. At Sezela furfural is extracted from the bagasse before it is burnt in the boilers.

The juice from the diffuser is pumped away for processing into raw sugar. The juice is first clarified to removed any sand and fibrous material by adding lime and flocculants and settled in large tanks called clarifiers. The settled material is filtered and returned to the fields as filtercake. The clarified juice is thickened into syrup by evaporation and seeded with microscopic sugar crystals and grown to the required size in vacuum pans. The crystals and the remaining syrup (now called molasses) are separated by high speed centrifugals. The crystals are dried in special dryers and the sugar is transported to the Sugar

Terminal in Durban harbour. The purity of Sezela brown sugar is 99.45. Sezela does not make white (refined) sugar.

### **How is sugar refined?**

Brown sugar, sometimes referred to as raw sugar is further processed into white sugar in a sugar refinery. At the refinery, the raw sugar crystals are washed and dissolved in hot water. Carbon dioxide and lime are added to the melted sugar to remove remaining impurities. The melt is filtered through cloth, then the remaining colour and impurities are removed and the clear melt is boiled in vacuum pans and seeded with fine sugar crystals. The crystals are centrifugalled, dried and packed for the market in bulk containers, bags and packets.

### **What is the sugar to sugarcane ratio?**

Ten tons of sugarcane produce approximately 1.25 tons brown sugar. Thus at Sezela approximately 285,000 tons of sugar are produced annually by processing approximately 2.28 million tons of cane..

### **What other products are produced?**

It is not economical to remove all the sugar from the molasses although it still contains sugar. Molasses has many uses. The Sezela molasses is mainly used for ethanol (cane spirit) production. Molasses is also used for cattle feed.

The bagasse also can be used for many products. Paper and ceiling board manufacture and mixed with molasses for cattle feed. Most mills use it as fuel (instead of coal) to produce electricity thus producing clean electricity from a renewable source. A sugar mill is normally self sufficient in electricity and water. The cane plant is 68% water and thus a large quantity of water is delivered to the mill in the cane. Sezela sugar mill is unique in that it extracts a large range of naturally occurring products from the bagasse before returning it to the boilers as fuel. Furfural and diacetyl are the two main products that are extracted. Furfural is used in the lubricating oil process and its derivative furfural alcohol is used in the foundry industry. Diacetyl is a natural butter flavour that makes margarine taste like butter.

It is possible to manufacture Bio-ethanol from the low purity sugar juices and the residues. The excess energy generated from the bagasse can be fed back into the national power grid. This process is known as "co-generation", a process which could soon become a reality.

### **Where is the sugar sold?**

Currently some 55% of our sugar production of 2.4 million tons is consumed locally within the SADC countries.

Both brown and refined sugar is sold into the industrial markets such as the mineral water and sweet manufacturers.

Much of the local refined (white sugar), finds its way onto the supermarket shelves.

### **Do we export sugar?**

Bulk sugar is stored at terminals at Durban's wharf-side, ready for shipping to overseas destinations. Durban's bulk sugar terminals can store more than 525,000 tons of sugar, allowing year-round deliveries to overseas customers.

### **What is the impact of the sugar industry on the economy?**

The local Sezela industry gives rise to more than 8,000 permanent jobs, and generates a gross income of approximately R750,000,000 million rand per annum from all sugarcane and sugar related products. The Sezela industry has some 4000 growers farming 43,000 hectares of sugarcane.

### **What is the nutritional value of sugar?**

Sugar plays an extremely important role in providing the energy necessary for our bodies to function properly.

Sugar, like bread, rice, cereal and potatoes is a carbohydrate. Most carbohydrate foods are broken down into glucose, which is used as fuel for energy by the body. When people talk about sugar, they are usually referring to sucrose (cane sugar), the most commonly used sweetener in South Africa

Since sugar has half the calories of fat (1 teaspoon of sugar contains only 20 calories where as 1 teaspoon of fat contains 45 calories), gram for gram sugar is less fattening.

### **What are the Greenhouse effects of the sugar industry?**

Sugarcane is "carbon neutral" (i.e. emissions are equal to energy generated) and is the product of choice in the manufacture of bio-fuels due to its high energy conversion rate. The commercial production of bio-fuels from sugarcane in South Africa is a matter of "when" and not "if". Government policy will dictate full blown bio-fuel production.

### **What does the future hold?**

The industry is increasingly being challenged by ever increasing input costs, labour shortages, new legislation, and competition from our neighbours and abroad. In all likelihood, a rationalization of the current industry could take place together with a shift from manufacturing sugar to products such as bio-fuels. This could result in a "leaner and meaner industry" that will remain locally and globally competitive.

Acknowledgement for certain information downloaded from:

<http://www.sasa.org.za/>

<http://www.illovosugar.com/worldofsugar/internationalSugarStats.htm>

<http://www.canegrowers.com.au/information-centre/about-sugarcane/index.aspx>Sugar