Discover Tropical Sugar Beet



www.sesvanderhave.com



For decades sugar beet has been cultivated in temerate countries to produce sugar. It has always been considered as a highly profitable crop and an excellent head of the rotation. More recently, with the development of biofuels, the very high ethanol yield of sugar beet combined with the 2007 rise in cereals and crude oil prices has also renewed interest in growing sugar beet for ethanol (France & Germany).

In people's mind, sugar beet is a temperate crop that is not adapted to sugarandethanolproductionintropical regions. The recent development of sugar beet varieties able to grow in the tropics is about to change this belief...

THE TROPICAL SUGAR BEET FROM SESVANDERHAVE

DISCOVER

Tropical sugar beet hybrids are an evolution of sugar beets traditionally grown in extreme American and European locations (Southern California, Southern Spain, and Southern Italy). Within this genetic pool, hybrids were selected for their tolerance to heat and to diseases occurring in the tropics.

SESVanderHave's tropical sugar beets have been tested for several years in thefields,mainlybyIndianAgricultural Research Institutes. In parallel we have set a breeding program both in India and in other tropical areas. Today our results are very promising: performances close to the best european yields can be achieved!



3 KEY BENEFITS

- Sugar beet has a short growing cycle (4-5 months). The farmer can therefore grow 2 different crops a year. This in turn has many positive consequences, such as a doubling of the productivity of his land or the benefits of a crop rotation.
- Sugar beet has a low water requirement: about 1/3 of the water needed to grow sugar cane. This is partly due to a very deep tap root that enables the crop to use water very efficiently.
- Sugar beet has a very high ethanol yield. Depending on the growing season, root yields of 25 to 30 t per acre can be achieved. This means that ethanol yields as high as 2.500 to 3.000 litres per acre can be achieved with SESVanderHave's tropical sugar beets.

CONCLUSION: 1 acre of topical sugar beet produces a greater amount of ethanol than sugar cane in 1/2 the time and with 3 times less water

MULTIPLE CO-PRODUCTS

The big advantage of sugar cane is the bagasse: the fibrous residue left when sugar cane stalks are crushed. It can be used as cattle feed or sometimes as organic manure. But in India and Brazil it is increasingly used for the cogeneration of heat and power: it some cases it can meet all of the energy needed to run a factory.

However it is worth knowing that sugar beet also produces several co-products with a high added-value:

- The pulp (what is left of the root slices after raw juice extraction) can be sold or used directly on the farm as cattlefeed. It is rich in energy and high-quality proteins. Besides it shows excellent palatability.
- The tops & leaves (what is left in the field at harvest) are valued by farmers as a green manure and animal feed.
- The vinasse can be sold to farmers as organic fertilizer as well. It is a co-product of sugar beet and sugar cane distillation.

As already demonstrated in France, all of these co-products can also successfully be used for the cogeneration of heat and power for instance through biomethanisation.

YIELDS & CULTIVATION COSTS

In INDIA		SWEET SORGHUM		SUGAR BEET	SUGAR CANE		
Growing cycle	months		3		5		12
Water requirement	m³/a	1600		3500	14400		
Crop yield	t/a	stalk	25	root	27	stalk	28
Ethanol yield	L/t	stalk	50	root	100	stalk	78
	L/a	stalk	1250	root	2700	stalk	2184
Co-products	kg/t	bagasse	150	pulp (dry)	50	bagasse	300
		grain	32	vinasse	57	vinasse	30
				tops & leaves (dry)	49		
Cultivation costs ¹	\$/a	110		237	381		
Market price ²	\$/t	stalk	10	root	16	stalk	25

¹Vasantdada Sugar Institute (VSI), 2007

²Market prices in December 2008

The tropical sugar beet & sweet sorghum rotation: An Alternative to sugar cane in tropical areas

India's economy is one of the fastest developing in the world. The demand for energy is intensifying every day. Currently the country is importing about 70% of its petrol requirement. Therefore it is desperately looking for altenative - preferably renewable - sources of energy. Ethanol as a transport fuel is likely to play an important role in this process: in 2008 the government ordered a 5% mandatory blending with gasoline.

India halready has a small ethanol industry based on molasse, a co-product of sugar cane. However, this feedstock is only availabe in very short supply. Several feedstock alternatives exist and sugar cane is often looked as the most promising. However the tropical sugar beet & sweet sorghum rotation deserves more attention.

In India		SWEET SORGHUM (3m)		SUGAR BEET (5m)			SWEET SORGHUM + SUGAR BEET		SUGAR CANE
FARMER economics									
Cultivation cost	\$/a	110		237			347		381
Return	\$/a	stalk	258	root	445		stalk + root	702	692
		grain	*	pulp	*		pulp + grain	*	
INCOME	\$/a	148		208			356		311
FACTORY economics									
Feedstock cost	\$/m	206		165			178		317
Processing cost ¹	\$/m	9	3	179			152		60
PRODUCTION COST	\$/m	29	99	34	14		330		377
							360 ¹	India with molasse	
							314 ¹	Brazil w	ith sugar cane
O. Licht, 2008 * = Kept by the farmer									

WHY TROPICAL SUGAR BEET & SWEET SORGHUM?

- ECONOMICALY FEASIBLE-For the farmer, the association of sweet sorghum with tropical beet ensures a high income. For the industry it allows to compete with the ethanol production cost in India (molasse) and Brazil (cane).
- LESS WATER NEEDED Tropical sugar beets require 3 times less water than sugar cane whereas sweet sorghum is one of the most water efficient crop in the world.
- ABLE TO GROW ON SALINE SOILS In regions where the cultivation of sugar cane is not possible because of salinity problems, sugar beets reaches very decent yields.
- PULP, BAGASSE&GRAIN-A great combination of co-products: sugar beet provides feed for cattle (pulp) whereas sweet sorghum provides food for people (grain) and energy for the factory (bagasse).
- CROP ROTATION A crop rotation helps maintaining soil fertility while reducing the pressure of diseases and pests. In the long term, it will secure land productivity.
- DIVERSITY & STABILITY The farmer's land is no longer locked for several years with sugar cane only. He can now diversify his production and therefore stabilize his income. The same holds true for the industry who can rely on several feeds tocks and better react to the market fluctuations of feeds tocks price.

STRETCHING FACTORY OPERATIONS - 2 harvests (beet & sorghum) or even 3 (beet, cane & sorghum) will allow factories to stretch their campaign over a longer period of time.

10 KEY ISSUES FOR GROWING TROPICAL SUGAR BEETS

SEEDS

SESVanderHave delivers tropical sugar beet varieties as monogerm seeds: a single plant comes out of each seed and therefore no thinning is needed. Our tropical varieties have been extensively tested in the field for their suitability to local requirements such as high temperatures and diseases resistance.

SOIL REQUIREMENTS

Sugar beet can be grown on a wide range of soil types. But a deep soil (>1 m) is better adapted to host its long tap root. The crop grows best at a soil pH between 6.5 and 8.0 but tolerates well saline soils.

LAND PREPARATION AND SOWING

The land preparation is the same as for other crops. It shouldbethinwhilecareshouldbetakennottooverwork the seedbed (2.5 - 3 cm deep ideally). A bad seedbed preparation is often responsible for poor emergence, and can quickly reduce essential moisture in the soil.

PLANT NUTRITION

The main fertilizer needed for sugar beet is Nitrogen (N). A single application of mineral NPK should be applied before sowing. N can also be applied as manure earlier in the season.

Avoid applying N too much or too late : it will lower the sugar content and its extractability in the root.

IRRIGATION

If the soil temperature at sowing is very high (>35°C) it is crucial to irrigate immediately after sowing to cool the soil down.

Until emergence is complete it is crucial to have sufficient water in the soil. After emergence, irrigation will only be needed once every 10 days, depending on soil moisture content.



The famous blue SESVanderHave seeds



Sowing by hand



Flat bed sowing



Ridges sowing

WEED CONTROL

Weed control can be done manually or chemically until the crop canopy meets (~1 month after sowing). After this point, it becomes unnecessary as the crop will smother competitive weeds.

PESTS

Southern species of leaf-eating caterpillars (e.g. *Spodoptera exigua* or *S. littoralis*) are the most common pests in India. Aphids, bugs and leaf minors occur only occasionally. Coating seeds with insecticide offers an efficient way of controlling these early pest infestations It is best to avoid growing sugar beet on fields known to be infested with tropical root knot nematodes.



Irrigation



Leaf-eating caterpillar

DISEASES

The most common and severe disease observed on sugar beet in tropical areas is a root rot caused by a soil fungi (*Sclerotium rolfsii*). An integrated pest management programcombiningappropriateagronomicmeasures with apreventive biopesticide (*Trichoderma*) application allows an efficient control of this disease.



Sclerotium rolfsii root root

HARVEST

Sugar beet has no ripening stage. If treated well-irrigation, cropprotection, etc.-the crop will continue to growal most indefinitely. This gives a lot of flexibility to the harvesting campaign. However, once harvested, beets should be processed as fast as possible.

At harvest all green parts (tops & leaves) should be removed and care should be taken to limit the amount of soil adhering to the root.

Processing

Sugar beet has first to be washed in order to get rid of the mud. Then roots have to be sliced prior to the extraction by diffusion of the sugar from the plant cells. From this point the raw juice obtained can be further processed into sugar or ethanol.

About SESVanderHave

SESVanderHave is dedicated to the development, production and commercialization of sugar beet seeds. A world player, we work closely with growers and the sugar industry via our local branches and global research centers. This ensures we continue to lead the industry, developing the crop and exceeding our partners' expectations. Thanks to our specialization, experience and expertise in Sugar Beet research and development, SESVanderHave markets seeds through which growers and industry can increase their profit. To benefit from our knowledge please contact your local SESVanderHave branch.