

CHIBAS

Centro Hispaniola de Investigación
en Bioenergías y Agricultura
Sostenible

Breeding Sweet Sorghum as a sustainable energy crops for Hispaniola

The goal of this proposed research is the development of an efficient multipurpose crop to provide an alternative source of energy, food and feed in Haiti and the Dominican Republic. This system would rely on Sweet Sorghum varieties with high stalk sucrose concentration and biomass, stable and significant grain yield and high value of the leaves and other residues as fodder (triple purpose crop). We propose a program aimed at the (1) evaluation, breeding, release and dissemination of such improved *Sweet Sorghum* varieties in Haiti and the Dominican Republic (2) establishment of appropriate agronomic and crop management practices for use in Haiti and the Dominican Republic.

Goals and projected outputs

- We aim at evaluating Sweet Sorghum existing varieties and deepen the scope and magnitude of our current program.
- We will systematically evaluate the germplasm and make the results readily available.
- We will be releasing Sweet Sorghum varieties, adapted to Hispaniola, that are aimed at ethanol, grain and fodder production under intensive and small scale farmers' conditions.
- We will evaluate and establish the most appropriate agronomic practices under different scenarios (low input agriculture or maximization of production/cost ratio)

Why Sweet Sorghum? Sweet Sorghum vs. Sugar cane for ethanol production

- 1) Sweet sorghum is a multipurpose crop (ethanol or sugar/ grain / fodder) while Sugar cane is single purpose (ethanol or sugar)
- 2) Sweet sorghum is a more efficient crop (requires much less water than Sugarcane)
- 3) Sweet Sorghum takes only 4-5 months from planting to harvest while Sugarcane takes 12 months between harvests.
- 4) Given present Sugarcane yields in the Dominican Republic and Haiti, Sweet Sorghum would be, with the same low agricultural input, much more productive (ethanol/ha) and cheaper to produce than Sugarcane.

Evaluating an breeding Sweet Sorghum varieties for Haiti and the Dominican Republic

Plant breeding is the most cost-effective way to achieve an increased and stable yield. Plant breeding would allow for continuous increase and release of ever more productive varieties. In industrial terms, this increase will translate to, for example, higher sugar content and juiciness that will lower the cost of making ethanol. Varieties with higher sugar content and juiciness will also provide increased revenue per working-hour for the farmers. The development of multipurpose varieties will allow farmers to have additional markets for their product (not just ethanol, it is food and fuel crop at the same time). The 'green revolution' for major cereals would not have been made possible without the release of outstanding varieties. A new green revolution will require also new outstanding energy crop varieties.

We aim at the development of sorghum genotypes producing high stalk sucrose concentrations and biomass, while producing stable grain yields of good quality. Stay-green will be introduced to increase drought resistance and insure a “juicy” stem until grain maturity in order to facilitate the extraction of the juice. Stay-green will also increase the leaves and residue values as fodder.

While we will investigate ratooning from the beginning of our program, on a longer term, we will also seek the development of fully perennial sweet sorghum varieties (with Rhizomes). This would allow growing hybrids without having to buy the seeds every year. Perennial sweet sorghum varieties would also allow the stabilization of soils on the slopes of Hispaniola contributing to the fight against erosion.

How to grow Sweet Sorghum?

Sweet Sorghum agriculture will require establishing the methodologies for managing this crop. We will establish research in areas such as intercropping, crop rotation, minimization of agricultural input, maximization of production/cost ratio (best use of agricultural input), irrigation, and mechanization of grain and cane harvesting.

Networking and international exchanges on Sweet Sorghum

CHIBAS has already established contacts and initiated collaborations with a number of international partners interested in broadening the sweet sorghum research community. These include researchers at Cornell University and Texas A&M University in the United States of America and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India; all of these institutions have an existing sweet sorghum program. We believe it is essential to promote the exchange of genetic material, information and knowledge to allow to rapidly reaching our goals.

Timetable for research (Project expected deliverables)

Results in	1 st and 2 nd year	3 years	5 years
Agronomy		Best practices	Best practices
Evaluation of existing varieties		Completed	
New CHIBAS released varieties			From year 5-7 and onwards
Technical support to sweet sorghum growers and assistance in acquiring/multiplying improved varieties	Existing cultivars ⁽¹⁾ and hybrids ⁽²⁾	Existing cultivars ⁽¹⁾ and hybrids ⁽²⁾	Existing cultivars ⁽¹⁾ and hybrids ⁽²⁾ , and CHIBAS released cultivars and hybrids ⁽³⁾

- (1) Most existing cultivars are public domain and seed can be produced free of charge
- (2) CHIBAS will provide assistance to interested parties in acquiring the right for hybrid seed
- (3) CHIBAS varieties (hybrids or cultivars) will all belong to the public domain. We will work with partner NGOs and private sector to produce low cost high quality seeds for these.