
Intercropping

- Intercropping of Sugar Cane
(<https://www.echocommunity.org/resources/10321f00-680c-4533-8783-0311d2b92ad1#Inte>)
- Egusi Can Reduce Weeds in Corn
(<https://www.echocommunity.org/resources/10321f00-680c-4533-8783-0311d2b92ad1#Egus>)
- Striga Controlled in Pearl Millet by Intercropping with Cowpea
(<https://www.echocommunity.org/resources/10321f00-680c-4533-8783-0311d2b92ad1#Stri>)

INTERCROPPING OF SUGAR CANE. The following is quoted from an article "Malnutrition in the well-off farmer" in the *World Development Forum* (no longer in print), which I believe they got from Ceres. Researchers in Nairobi, surprised to find malnutrition among the families of relatively well-paid sugar-cane workers, devised an ingenious corrective." By marginal widening of the row crop spacing, they found "room for two protein-rich, non-cash crops (maize and beans) which could be harvested within three months of planting. As cane takes 22 months to mature, it proved possible to snatch two successive inter-row crops before the spreading roots of the cane feel any adverse effects from the competition." A great side benefit is that the need for cane weeding was reduced. (The reason for the malnutrition among the workers and their families was that the need for cash for buying property, consumer goods, schooling, and physical assets competed with their need for food.)

I believe this has the potential to be one of those innovations that development workers are always seeking: something that can have a large and immediate impact and limited risk. (This assumes, of course, that it is not already a local practice.) So we are dedicating considerable space to the subject of intercropping with sugar cane.

Many of you work where there is not enough good land to go around. Intercropping on land previously used solely for cane is almost the same as finding new land. It is a way to produce food for local consumption on land that was previously used primarily to earn foreign exchange. It reduces risk of total loss due to crop failure because even if something like a hurricane destroys the long season (several months) cane crop, some financial return will have been realized. Cash flow is improved. It might even slightly reduce the pressure to clear new marginal land.

The Canadian aid agency, IDRC, featured the work of Dr. Govinden on this topic in their magazine IDRC Reports and were able to put me in touch with him for more information. He graciously sent detailed reports of this work in Mauritius. The

following is based on his articles.

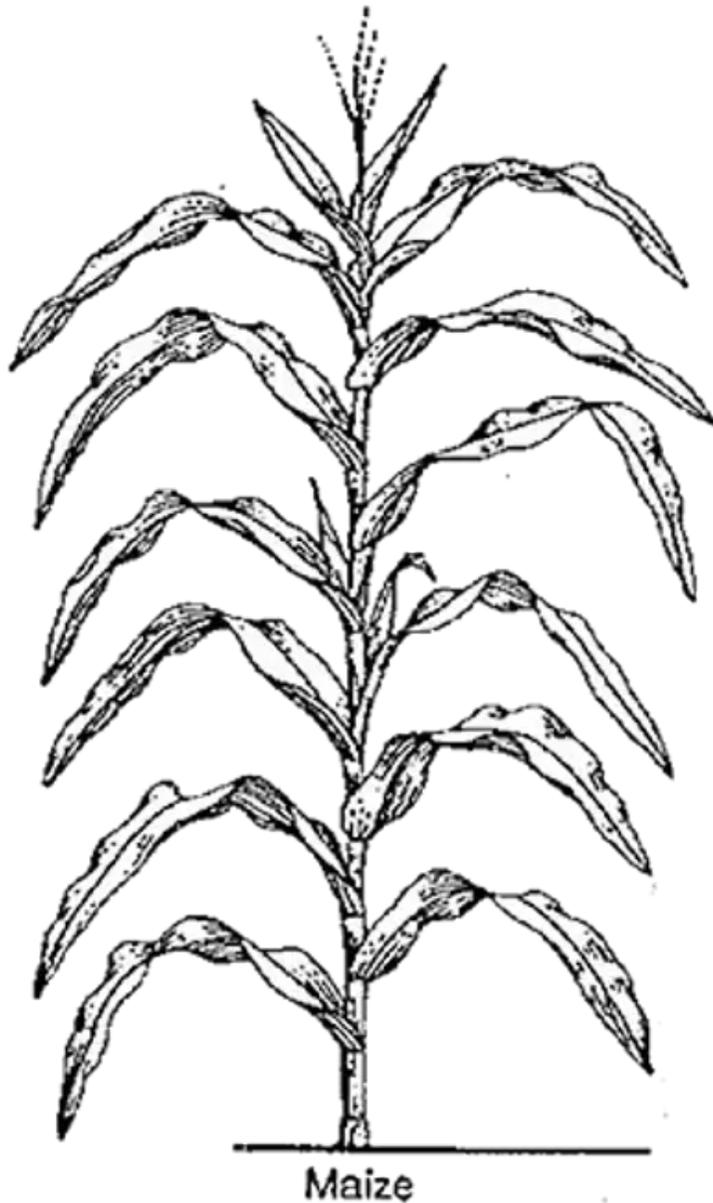
Dr. Govinden writes, "We have several teams working on intercropping of sugarcane with various food crops at the Mauritius ([/resources/fa8094dd-7369-4e2f-8fbb-](/resources/fa8094dd-7369-4e2f-8fbb-67e878093671)



[67e878093671](/resources/fa8094dd-7369-4e2f-8fbb-67e878093671))Sugar Industry Research Institute. Intercropping with sugar cane is practiced on a large scale and is responsible for 77% of the potatoes, 60% of the groundnuts and 50% of the maize (corn) produced in the country. Additionally, small planters grow a wide range of vegetables in their sugarcane fields. These include beans, peas, tomato, cabbage, pepper, and okra, to name a few."

Farmers in Mauritius have been intercropping with sugar cane on a small scale for over a century. The practice picked up during the shortages of World War II, but only "took off" during the past 10-20 years. "Intercropping with sugar cane is widespread in India, Philippines, Mauritius, Reunion, and Taiwan.... It is practiced on a limited scale in Brazil, China, Colombia, Egypt and Indonesia."

MAIZE (CORN). Unlike potato, maize reduces the sugar cane yield, due primarily to competition for light by the tall maize (</resources/beb90b77-2864-4479-ba69-2c6c8d3c1cc1>)plants. The extent of reduction depends on the height, time to maturity, and leafiness of the maize. No evidence has been found of any effect of intercropping on insect or disease damage, either positive or negative. Mechanical harvesting is a problem.



Sugarcane can be and often is grown on lands too steep for maize. Intercropping of sugarcane on such lands allows the production of some maize without leading to soil erosion. In fact the maize confers additional protection to the soil from the erosive action of rain during the establishment period of the cane. In Mauritius there are two cane planting seasons. "In the first season, maize is harvested before and, in the second season, after the cane. The peak labor demands therefore do not overlap."

"The success of intercropping depends on maximizing the complementarity and minimizing the

competition between the component crops. ...It has been suggested that maize and sugarcane are too similar for there to be benefits from the intercrop." However, there is still an important difference that can be exploited--the difference in the time at which each crop makes use of the growth resources.

"Sugarcane is planted in wide rows (1.4-1.6 m). It takes 2-3 weeks to germinate, grows slowly for the first few months and does not cover the soil until about 4-5 months after planting. In the case of ratoons, canopy closure occurs earlier, in about 3-3.5 months. [A ratoon crop is a crop that comes up from the roots after a previous crop was harvested.] During the first 3-4 months, the cane makes little demand on the available ... space, light, water and nutrients. These can therefore be used to produce compatible intercrops.

"Maize ... grows fast and achieves canopy closure in 1-1.5 months. Early maturing cultivars can be harvested within 3-3.5 months after planting, before the cane canopy closes."

Because maize is taller than the young cane, it is important to use short and early maturing varieties. "Moreover, a balance must be found between planting enough maize to give worthwhile yields and using higher densities that can lead to competition with the cane. Much of the cane yield reductions from intercropping with maize can be attributed to the use of tall and late-maturing maize cultivars planted at excessive densities."

Dr. Govinden calls the potential row between the rows of cane the "interrow." When maize is planted in each interrow it "does not compete with cane for **underground** resources. When the cane row width is 1.6 m, the maize plants are 0.8 m away from the cane. Maize roots do not extend that far and therefore do not have access to fertilizers placed in the cane row. The maize must therefore be fertilized separately."

Maize growth occurs during the first two phases of sugarcane growth: germination and tillering. [Tillering refers to the plant sending up additional stalks.] Germination is not affected by intercropping, but tiller formation is often seriously reduced. "As soon as the [maize] is removed, however, tillering resumes normally and, in time, much of the adverse effects disappear." There is even a name for the ability of sugar cane to overcome initial setbacks: "rattrapage." If rattrapage is to be complete, it is important that there be adequate water, nutrients and no weeds after the intercrop is removed. If cane farmers use herbicides, maize is an especially good intercrop because both crops react similarly to herbicides.

"Once sugarcane is planted, it is usually not replanted for several years; 8 years on the average in Mauritius." Ratoon crops grow more quickly than newly planted cane and hence are more competitive with maize. However, maize has less adverse effects on the cane when it is a ratoon cane crop. Consequently, Dr. Govinden suggests leaving the interrow between newly planted cane for other crops such as potato, beans, and groundnuts that are less competitive than maize and which themselves do better with newly planted cane than in ratoon cane. The maize would then be intercropped with the ratoon cane. "With time the ratoons encroach upon the interrow space, making [further] intercropping more difficult. Maize is indeed one of the few crops that can be successfully intercropped with 2nd or 3rd generation ratoons."

"In order to create more space for intercropping of 3rd or older ratoons, it has been proposed to plant the cane in paired rows." In Mauritius, two rows of cane were planted at only 0.95 m apart separated from the next pair of rows by 2.25 m. Success was variable. Sometimes cane yield was reduced.

Here are his suggested guidelines to developing cultural practices for maize/cane intercropping in your area.

TIME OF PLANTING. "In order to minimize the adverse effects of maize on cane, the maize should be planted as soon as possible after the cane. This ensures that the cane will have enough time after the maize harvest to offset initial setbacks. In practice, the maize may be planted up to 3 weeks after the cane."

LAND PREPARATION. "The land preparation for plant cane [i.e. not ratoon cane] is adequate for the maize as well. The cane furrows should not be too deep since it is difficult to plant maize mechanically on high ridges. In ratoon cane which is not burned at harvest, the trash must be lined up, usually in alternate interrows. The maize is then planted in the free interrows..."

VARIETIES. "Only short-statured and early-maturing varieties should be used in order to minimize competitive effects on the cane. The plant height should be less than 2 m and the crop cycle from sowing to physiological maturity should be between 85 and 95 days. Since maize yield is a direct function of the length of the crop cycle, the balance between a longer cycle for higher maize yields and a shorter cycle to minimize adverse effects on cane can only be found after experimentation under local conditions."

PLANTING PATTERNS AND PLANT DENSITY. "Various planting patterns are possible. In Mauritius, whether in plant or ratoon cane, one row of maize is planted in alternate interrows of cane [i.e. as you walk across the field you encounter cane, cane, maize, cane, cane, ...]. It is possible to grow one row of maize in every interrow of cane, but shading of cane is more pronounced when the cane rows are bordered by maize on both sides."

"Maize plant population density may be varied between 15,000 and 30,000 plants per hectare (20,000 plants per hectare is recommended in Mauritius). A lower density ensures that the maize has no effect on the cane but the yield of maize is also lower. In areas where the cane growing season is long and where the cane is more competitive, the maize plant density may be increased."

FERTILIZATION. "A good rule is to base the recommendation on the response of sole-cropped maize and to apply as much fertilizer per plant as in pure stands." [And to likewise fertilize the cane as a sole-cropped plant.]

IRRIGATION. "In areas where surface irrigation is used, the cane furrows should not be too deep, otherwise the ridge in the interrow on which the maize is grown may not be properly watered." In drip irrigation systems, a separate drip line is needed for the maize.

WEED CONTROL. [I usually assume that few readers work with farmers who have access to agrochemicals. Because this technique might be done by peasant farmers but on large commercial farms, such may not be the case. In fact, it is quite likely that the cane field has already been treated. This may present a problem with some potential intercrops that are unrelated to cane.] Grasses and broad-leaved weeds are controlled with a pre-emergence application of "Primagram" (a mixture of atrazine and metolachlor). [Imagine what that would do to a subsequently planted intercrop of beans!] If grass is not a problem, use atrazine alone. Nutsedge can be controlled with "Basagran DF" or 2,4-D amine which should be applied underneath the maize canopy after it has grown to knee height.

HARVEST. "In pure stands, maize may be left to dry in the field, but in sugarcane interrows, it should be harvested soon after physiological maturity in order to minimize shading of the cane. The grain must then be dried."

MAIN PROBLEMS. "Sugarcane is sometimes called the lazy man's crop. The management of sugarcane intercropped with maize is more difficult; careful attention must be paid to details. Timeliness of operations is important. Main

problems relate to mechanization and to pests and diseases." Mechanization of planting is easy, with one row maize planters. Harvesting is more difficult and is still done by hand in Mauritius.

"Perhaps the major objection to intercropping sugarcane with maize is the fear of increasing pests and diseases common to the two crops." Especially downy mildew, sugarcane mosaic virus and maize streak virus. "In South East Asia where downy mildews are a problem, intercropping ... is possible so long as resistant maize cultivars are used." [There appears to be little information on the subject, but no reported serious problems.]

"Sugarcane and maize have several pests in common, mainly borers. ... One report from India indicates that when sugarcane is intercropped with maize, the difference in borer infestation was negligible." "The fact that insecticides are not used in cane certainly helps to maintain the activity of biological control agents."

POTATOES. Potatoes are the most successful intercrop. Potatoes do not reduce the yield of the cane and conversely sugar cane does not affect potato yields. Each crop is fertilized separately according to its recommended needs.

GROUNDNUT (PEANUT). Groundnuts resemble potatoes in that they do not adversely affect cane yields. They differ from potatoes in that fertilizer requirements on cane lands are very low; so low that most growers do not use any fertilizers. Work is underway to determine to what extent groundnuts may provide fixed nitrogen to the cane.

BEANS. Dry beans do not reduce yields of cane. Recent results indicate they may be able to grow beans in the interrows left free when maize is intercropped with sugar cane. (Remember that cane does better if maize is not grown on both sides of the cane row.) An advantage over many crops is that beans have a relatively short life and require less water than most crops.

GENERAL COMMENTS. In contrast to what is commonly observed in other countries, intercropping of sugar cane with food crops in Mauritius is much more popular with the corporate sector (sugar estates) than with the small holders. In some cases the estates produce the maize, potato and groundnut themselves. Others rent the cane interrows to planters for a few months. The reason may be that small landholders have two jobs and lack the extra time to do intercropping. The timing of some food crops cultivation may be complementary to sugar cane in terms of labor use.

In many countries the large plantations "have the best lands and infrastructure and have access to inputs such as fertilizers and irrigation. They should therefore also share the burden of producing food. This they can do by intercropping their sugarcane with food crops.... They need not do it themselves, but could rent out the interrows or make them available freely to landless peasants for the purpose of intercropping as is commonly done in Mauritius."

Thanks to Dr. Govinden for sharing this information. ECHO is **very** interested to hear about your own experience if you try intercropping with sugar cane, or details of local practice if it is already done. (https://cdn.ymaws.com/echocommunity.site-ym.com/resource/resmgr/a_to_z/azch5int.htm#Table)