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INSIDE THIS ISSUE

Conservation Agriculture for
Root Crops

Gender Mainstreaming in
Agriculture Programming

Partner Profile: Communauté
Baptiste au Centre de l'Afrique

Discussions from the Network

CATO Schedules

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Conservation Agriculture for Root Crops

By Neil Rowe Miller, CA Technical Officer, East Africa

Growing root crops under conservation agriculture (CA) may seem like a contradiction. After all, a key principle in CA is minimal soil disturbance, and growing root crops involves disturbing soils, at least at harvest. Keep in mind, however, that “minimal soil disturbance” does not always mean “zero tillage”. The key strategy with root crops is to use the least soil disturbance possible while maintaining permanent soil cover and plant diversity. All these principles can be achieved when planting root crops.

What are the greatest challenges with CA for root crops?

Farmers often till soils before planting root crops so that root/tuber expansion is not physically restricted by compacted soils. Also, many root crops are inhibited by poor drainage. In sandy, well-drained soils, these problems are minimal and root crops should respond well to CA methods from the beginning. However, in heavier, clay soils, compaction and poor drainage may make root crop production difficult in the first few years of CA. After several years practicing CA, as soil health and drainage improves, root crop production may improve on such soils. Permanent ridges may also be necessary to grow root crops on poorly-drained soils.

Cassava: The most widely studied CA root crop

A significant amount of research has shown that CA cassava is not only possible, but can out-yield conventional cassava. Minimum tillage alone generally reduces cassava yields. However, minimum tillage with mulching almost always increases cassava yields. Last year, the Communauté Baptiste au Centre de l'Afrique, a CFGB/Canadian Baptist Ministries Partner in Bwito, DR Congo, increased cassava yields from 5.6 tons/ha to 14.7 tons/ha with Tithonia mulch and to 18.3 tons/ha with Mucuna mulch. Such results are especially common on sandy and high organic matter soils. On heavier clay and poorly-drained soils, CA cassava may need to be grown on permanent ridges. According to some scientific reports, basin planting of cassava appears to be more effective than zero-tillage planting (e.g. with planting sticks or pangas).



CA cassava in eastern DR Congo

Intercropping cassava with fast-growing legumes like cowpea, common bean, and groundnut is an essential part of an effective CA system, as it increases overall productivity and reduces soil erosion by keeping soils covered during the early, slow stages of cassava growth. Jackbean can also be intercropped as a later, understory cover crop, but late-maturing cover crops like lablab and pigeon pea should be avoided as they will compete excessively with cassava.

CA Potatoes: A growing success story

Although academic research is less common for CA potatoes, several of our Partner organizations are growing this crop successfully under minimum tillage. As with cassava, the essential component is good soil cover. In Embu, Kenya, farmers working with African Christian Churches and Schools, a CFGB/Canadian Baptist Ministries Partner, have mulched their potatoes traditionally for generations. In nearby Murang'a, CA farmers working with Anglican Development Services, Mt. Kenya, a CFGB/World Renew Partner, have found that with enough mulch, they don't need to hill their potatoes to get a good crop. They report that buyers prefer their potatoes because they are cleaner and healthier.

CA potential of other root crops

Very little research is available on CA methods for other root crops such as taro and sweet potato. Mulching and maintaining soil cover with intercropping and cover crops will likely be beneficial regardless of what crop is grown. Minimum tillage methods may or may not be effective depending on soil types and on how long fields have been under CA management. As you experiment with these crops, please let us know your experiences so that we can share them with others!

Howeler, R.H., Ezumah, H.C., Midmore, D.J., 1993. Tillage systems for root and tuber crops in the tropics. Soil Till. Res. 27, 211–240.



Theophile Uwirygyrimana, Paix et Development Durable field officer in Rwanda, supports farmers growing CA potatoes.

Gender mainstreaming in agriculture programming

By Putso Nyathi, CA Technical Officer, Southern Africa

Many a times when the word gender is mentioned, we think of women, probably because women have often been disadvantaged by society. However, the purpose of gender mainstreaming is to ensure the meaningful inclusion of both men and women in development activities. According to FAO, gender mainstreaming means making both the concerns and experiences of women and men an integral dimension of all agriculture and rural development efforts.

What is gender?

Gender refers to the socially constructed roles and responsibilities of women and men and their relationship to each other. Gender varies between cultures and changes over time.

Why is gender mainstreaming important in Agriculture?

Gender mainstreaming is important because of the imbalances in society among men and women. Gender mainstreaming is meant to ensure that the impacts of our work do not disadvantage or exclude any of the sexes.

How is gender mainstreaming achieved?

It is important that gender mainstreaming starts at the organization level. Building the capacities of project staff on gender and encouraging them to practice what they speak is important! Gender mainstreaming should help guide the entire project cycle, from *situation analysis to design, implementation and monitoring and evaluation stages.*

At the **situation analysis** stage, gender mainstreaming involves doing a gender analysis to gather information about gender issues in the community. These issues include the roles of men and women, who owns what and who makes decisions. This analysis must be incorporated into the **project design**. For example, if you intend to introduce CA to a community, you should consider the likely impact of this technology on men and women based on information gathered during the situation analysis, and use this information to minimize any negative impacts. Consider how best you can ensure that men and women both participate in your project. For example, since adoption of CA requires access to resources such as land and inputs, exclusively targeting women may negatively impact adoption if women are not the main decision makers. In such a case, it is important to ensure that both men and women are included.

Possible gender-sensitive indicators for an agriculture project

Increased access of women to X (e.g. land, agricultural inputs, credit, extension, markets)

- Number and % of women reporting increased ability to sell and buy goods at markets
- Level of satisfaction of women with access to and quality of extension services

Increased decision-making power for women

- Perception of decision-making participation of women in the household
- Number and % of women reporting changes in their control over spending of their own income and household income
- Number of community groups agreeing to gender equality statements

Increased equitable distribution of household and agricultural tasks

- Changes in women's and men's workload because of new technology or practices
- Number and % of women and men reporting satisfaction with the amount of leisure time available

Source: (MCC FSSL Sector Brief: Gender Analysis and Agriculture)

During **implementation**, the project should be structured to accommodate both men and women. If, for example, more women are attending training sessions than men, you need to find out why, and adjust your timing or training strategy to encourage more men to participate. Training programs should include gender-awareness topics, and should also allow disadvantaged groups to participate (e.g. holding training at locations and times accessible to everyone). They should also build the capacity of project staff on gender issues and encourage male gender champions to speak out on gender issues.

During **monitoring and evaluation**, indicators should include more than just the number of men and women who participate. They should also include changes in behaviour, decision making and access to resources (see side box).

The Farmer to Farmer Agroecology Project at Ekwendeni Hospital in Malawi, a partner of CFGB and Presbyterian World Service and Development, has as one of its five main objectives 'to improve women's access to and control over resources and increased decision-making power over agriculture, food security and income'.

This project has conducted gender sensitization training workshops starting with their program staff, then including traditional leaders and finally farmer training.

When the CATOs visited this project in March, the impact of these trainings was impressive. Men are helping women in household chores that were traditionally considered women's roles such as cooking. Women are empowered to speak freely even in the presence of men. We came away inspired, with a new hope in the power of gender mainstreaming!



Anita Chitaya from Ekwendeni, Malawi is a farmer promoter, and gender training has had positive effects for her in making decisions on the farm

Partner Profile: Communauté Baptiste au Centre de l'Afrique

By Jean Twilingiyumukiza, CA Technical Officer, Central/West Africa

The Communauté Baptiste au Centre de l'Afrique (CBCA) was founded through the missionary work of the Unevangelized Africa Mission, which began in 1927 in North Kivu in the Democratic Republic of Congo. The church now has about 450,000 members in the provinces of North Kivu, South Kivu, Maniema, Orientale, Katanga and Kinshasa City as well as Rwanda.

CBCA's ministries include 18 nursery schools, 386 primary schools and 201 secondary schools, 184 youth and adult education centers, and two biblical institutes. In addition, it runs four hospitals, four medical schools, 17 medical and surgical centers, and over 100 health centers. CBCA manages several community development projects with a focus on food security activities: agriculture, livestock, fish farming and bee keeping. CBCA, in partnership with CFGB members Canadian Baptist Ministries (CBM) and World Relief Canada (WRC), has been implementing food security projects in eastern DRC since 2012. CFGB currently supports three projects which involve CA components:

Muku Area Project - Geographically, this area is made up of hills and mountains on which people grow staple food crops, and a swampy area where they grow vegetables. Landslides and impoverished soils have led to a considerable reduction of food production. The CBCA project, in partnership with CBM, enhances sustainable food security for 400 households in the area through capacity building, distribution of virus-resistant cassava cuttings and training farmers in conservation farming and agroforestry to help protect the soil against erosion and reduce the consequences of inconsistent rainfall.

Malyo Area Project - This area historically had high soil fertility and was one of the main food providers in eastern DRC. With poor farming practices and the introduction of cash crops such as tea and eucalyptus trees, soils have deteriorated over the years. A lack of high yielding seed and pests and diseases such as cassava mosaic and banana wilt have further decreased production. The CBCA project, in partnership with WRC, aims to improving food security by promoting soil fertility and conservation agriculture through training 600 households.



CBCA staff and farmers participate in soil conservation training (photo credit: Ben Weisbrod).



Kambale Masareke, Chairwoman of a Malyo farmers' group enthusiastically describes the successes of the project (photo credit: Ben Weisbrod)

Bwito and South Lubero Area Project - This project, in partnership with CBM, aims to increase food production of 600 households in eight villages of Bwito, Rutshuru and Luofu areas in North Kivu. Through training, farm visits, farmers' field days, exposure visits, and demonstration plots on farmers' fields, they promote the use of high yielding varieties of maize, virus-tolerant cassava, vegetables and bananas. They have also introduced conservation agriculture, the use of green manure/cover crops and agroforestry to increase soil organic matter and enhance fertility. Lastly, they are improving food processing techniques through training and purchase of equipment.

In addition to these CFGB-supported projects, CBCA also maintains a Rural Development Centre (CEDERU), which specializes in seed multiplication and distribution. The center supports other associations by providing improved varieties of cassava, beans, soya beans, maize, rice, sweet potatoes and groundnuts. NGOs purchase seed or cuttings from CEDERU, and their impact on the population of Rutshuru has made CBCA one of the leading institutions in the promotion of good farming practices within the province of North Kivu

Discussions from the Network:

Waluzza Munthali: What are these pests? They look like grasshoppers but they are not. They eat Pigeon peas leaves. According to elders here it is the first time to see such pests. Help me with both the name and how we can deal with the pests because they look destructive... Malawi has also experienced one of the worst seasons with maize, the staple food crop due to fall army worm attack earlier this year

Ruth Munyao: I saw the same pests in Eastern Rwanda last month feeding on pigeon pea leaves. The farmers did not know their name (neither did I) but they have seen them in the past years.

Neil Miller: Here is a similar picture on lablab from a recent trip to Malawi. The pest in this case is a small, brown grasshopper. I suspect your pest may also be a grasshopper. The good news is that plants at this stage can take a lot of defoliation without having much effect on yield. No need to spray unless plants are still very small and the feeding might kill them completely.

The CA Technical Officers manage a Facebook Discussion Group from which the above conversations were copied. If you'd like to join the discussion, sign up at <https://www.facebook.com/groups/CAinAfrica/>.



Most cover crops can sustain significant foliar feeding without suffering yield losses.

CATO Travel Schedules:

JEAN TWILINGIYUMUKIZA

4-11 June

Burkina Faso

CA Project and networking visits

21-24 June

Rwanda

Exchange visit for CA farmers

10-14 July

DR Congo

CA training & Projects visits

PUTSO NYATHI

26-30 June

Mozambique

Project visit and CA workshop

10-14 July

Lesotho

Extension and Gender workshop

13-18 August

Machanga, Mozambique

Project evaluation

NEIL ROWE MILLER

3-12 June

Karamoja, Uganda

Project exchange visit and Proposal writing

13-15 June

Eldoret, Kenya

Lablab research collaboration

July-August

USA

N. American assignment/Home leave