

CONSERVATION AGRICULTURE NEWSLETTER



SEPTEMBER 2020 • VOLUME 6 • ISSUE 3

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Mechanization: A Key to Scaling up CA

*Neil Rowe Miller, Agriculture and Livelihoods
Technical Advisor for Eastern Africa*

In our [June, 2016 CA Newsletter](#), we presented several best-bet options for small-holder mechanization of CA. At that time ox-drawn ripping was the most popular alternative to hand-dug basins, among Canadian Foodgrains Bank (CFGB) Partners, largely due to the high cost of other equipment. We encouraged readers to consider encouraging the start-up of CA service-providers to help spread investment costs and create employment opportunities in rural communities.

Over the past four years, we have further affirmed the effectiveness of these approaches, but have learned more about how to implement and scale them up. The Food and Agriculture Organization (FAO) of the United Nations has also championed [Sustainable Agricultural Mechanization](#) as key to raising productivity of, and easing labor burdens on, small-scale farmers. The following article outlines some of the most successful technologies and lessons that we and others have learned in promoting mechanization in food security programming.

Ox-drawn Rippers continue to be the most widely adopted mechanized CA approach among our Partners. These devices use oxen to open up a planting furrow, thus saving the labor of hand-digging

planting basins. Because they do not turn the soil, rippers leave more residue on the surface, generally achieving the CA goal of a minimum of 30% soil cover. In a project of the Kulima Mbobumi Training Centre (KMTC) in Zimbabwe, supported by Mennonite Central Committee and CFGB, the number of farmers using CA on more than one hectare of land increased from just a handful to nearly 40% of participants due to the introduction of rippers.



Ox-drawn rippers cut a furrow for planting (above), but leave enough residue on the surface to protect soils (below).

Most of our Partners, including KMTTC, have promoted conversion kits which, for around \$40-70 USD, will convert a conventional moldboard plow into a CA ripper. This cost is quickly recuperated since a team of oxen can rip $\frac{1}{4}$ - $\frac{1}{2}$ hectare per day which is twice what is possible for moldboard plowing. In addition, soils can often be ripped in the dry season, when conventional plowing is impossible, thus allowing the farmer to be ready for planting as soon as the first rains fall. The African Conservation Tillage Network has developed [farmer training materials](#) for promoting ripping technology as well as a [more comprehensive resource manual](#).

An even cheaper ox-drawn ripper, which is growing in popularity among our Partners, is an adaptation of the traditional Ethiopian *maresha* plow. The cutting point of this ripper can be made by local blacksmiths for less than \$10 USD, and the wooden frame can be made by farmers themselves. The *maresha* works best in open land, whereas in fields with numerous tree stumps or large rocks, the steel-framed rippers are more appropriate. Let [us](#) know if you are interested in learning more.

Ox-drawn planters are much less widely used by the farmers we work with, largely due to their high purchase price (\$500-1000 USD). However, our Partners, in collaboration with the [ECHO East Africa Impact Center](#), have developed a CA planter which combines the *maresha* frame and point with modern seed metering. This planter is now being manufactured by commercial shops in Ethiopia and Tanzania for around \$125 USD. The *maresha* planter can precisely plant both large-seeded crops like maize and beans, and small seeded crops like sorghum and millet. Contact [us](#) if you would like drawings and/or advice for manufacturing these planters.

Multi-purpose threshers have become widely popular in the past few years, easing the burden of manual threshing, especially for women. The Soybean Innovation Lab (SIL) developed a cost-effective design, and has organized workshops for manufacturers, resulting in local production of threshers in Burundi, Ethiopia, Ghana, Malawi, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe. A [recent study](#) found that thresher operators in Ghana threshed between 20-125 bags of maize, 1-10 bags of soybean, 10-100 bags of sorghum, and 10-30 bags of millet per day. Operators and laborers are

typically paid for their work with one bag for every ten bags of crop threshed. To learn more about the fabrication of multi-crop threshers in sub-Saharan Africa, or to host a fabricator training workshop in your country, contact [SIL mechanization](#) lead, [Dr. Kerry Clark](#).

Service providers continue to be a central strategy for scaling up mechanization. Small-scale farmers and business owners can repay their investments in CA mechanization by using the equipment for hire on other farms. The key to sustainable service provision is assuring that the business model is profitable. In Tanzania, for example, farmers typically pay \$30-40 USD per hectare to plant a maize field by hand. A *maresha* planter can plant a one-hectare field using one person and a team of oxen in just a day. At these prices, a service provider can easily repay their investment, cover the cost of oxen and labor, and turn a profit of nearly \$600 USD in just 30 days/year of work. Multi-purpose threshers are also highly profitable for small-scale service providers (see side bars).



Service providers in Tanzania thresh maize (photo: [Imaratech.co](#)).

In communities where CA is a new practice, existing service providers may be reluctant to invest in new equipment, fearing that they won't generate enough business to repay their investment. One strategy to address this issue, which is being used by the CFCB *Scaling-Up CA* project in East Africa, is to provide vouchers to CA farmers, which they redeem to pay for 50% of the cost of ripping their fields. In Kenya, a service provider invested \$3,000 USD in a tractor-

drawn ripper (with a 50% cost-share from the project) with the assurance that he would have at least 100 paying customers. For more resources on encouraging service providers, consult the [FAO Training Manual for Small-Scale Mechanization Service Providers](#).

Gender Implications - CA equipment, especially those drawn by oxen or tractors, is typically owned and controlled by men. Projects which integrate these technologies need to work extra hard to empower women in ownership and decision-making related to CA mechanization. Such strategies may include helping women form groups for equipment ownership, as in [this project in Ghana](#).

Estimated return on investment for a *maresha* planter service provider in Tanzania

Income	Maize	Beans	Total
Output (ha/day)	1.03	0.69	
Income/ha	\$31.30	\$46.96	
No. of days per year	12	15	
Gross Income	\$387.26	\$484.08	\$871.34
Expenses			
Planter (2 yrs)			\$60.00
Oxen	\$52.17	\$65.22	\$117.39
Labor	\$41.74	\$52.17	\$93.91
Repairs			\$15.00
Total			\$286.30
Net Profit			\$585.04

Estimated return on investment for multi-crop thresher

	No. hours	Throughput (kg/hr)	Total threshed (kg)	Grain price/ton (USD)	Operator charge	Revenue per day	Cost per day ¹	Profit per day
Maize	3.3	4,734	15,576	\$100	10%	\$156		
Soybean	3.3	281	924	\$350	10%	\$32		
Total	6.6		16,500			\$188	\$48	\$140

From [Economics and Profitability of Locally Produced Commercial Multi-Crop Threshers in Ghana](#)

¹ Includes labor, transportation to location, maintenance and spares, and depreciation on investment.

Situation Assessments for Effective Food Security Programming

Mike Salomons, CFGB Agriculture and Livelihoods Technical Advisor

A situation assessment, conducted by implementing Partner staff, is an excellent way to start food security projects off with (1) a thorough understanding of the local context, and (2) ownership by local communities. Done well, such a process can help ensure that project impacts are more effective and sustainable.

OUTCOMES OF A SITUATION ASSESSMENT

A situation assessment (SA) process should result in a clearer understanding of the local food system. This includes all the ways food is produced, processed, delivered, accessed and consumed and how these intersect with human health, the environment, economics, and society. The food system also includes food assistance when the capacity of

households to meet their own food needs falls short. An effective assessment identifies the main actors in the local food system and how they work together; how the local food system meets (or doesn't meet) the needs of individuals and households; and the political, economic, social, and environmental context these actors work in.

Developing productive, equitable, and resilient food systems cannot be done by one organization working alone. An implementing NGO needs to build strong working relationships with key local actors. This includes direct participants in the proposed programming, but may also include local entrepreneurs, market actors, government departments, other NGOs, etc. By including these actors in the situation assessment activities, they increase their understanding, support and ownership of whatever project results.

A situation assessment should challenge the participants' thinking and underlying assumptions. What, to an outsider, may appear to be an obvious solution to an agricultural or food security challenge

materials, contact any of the Agriculture and Livelihoods Technical Advisors.

In 2021 CFGB plans to hold advanced Training of Trainers workshops in SA methods. These

Partner Profile: Church of Uganda, Nebbi Diocese

Neil Rowe Miller, Agriculture and Livelihoods Technical Advisor for Eastern Africa

The Church of Uganda, Nebbi Diocese has partnered with World Renew since 1995. Programming in Kucwiny began with a Sustainable Agriculture Food Security grant in 2011 that focused on improved bee keeping practices. This led to a three-year Kucwiny Integrated Food Security Project (KIFP) which served 450 households in Vurr and Ramogi Parishes from 2012 through 2019. A second project began in 2017, serving 420 households in Olago and Acwera Parishes.

Kucwiny Sub County experiences frequent crop failures due to both flooding and drought. The short rainy season should run from March to June while the second, more reliable season, runs from August through November. The main food crops include sorghum, cassava, sweet potatoes, groundnut, sesame and cowpeas as well as green leafy vegetables. Citrus fruits and mangoes provide food during the dry seasons.

The entry point for both of the Kucwiny projects has been village savings through formation of Self Help Groups (SHGs) which have increased access to capital through funds generated from within the community. Last year 394 SHG members involved in the project (271 women and 123 men) borrowed a total of \$21,396 USD from their collective savings, and three Cluster Level Associations were formed. Those groups who are interested, also receive agricultural trainings in Conservation Agriculture (CA) and other agronomic and environmental practices including tree planting and Farmer Managed Natural Regeneration.

CA adoption in Kucwiny has proved challenging. Of the 238 farmers who have been trained in CA (152 women and 86 men), 32% are practicing reduced soil disturbance (planting basins), 28% are covering soils

individuals will be equipped to serve as resources to CFGB and non-CFGB Partners conducting situation assessments. Further details will be available in the coming months.

with mulch and/or crop residue, and 23% are practicing crop rotation or intercropping. One lesson learned early in the project was that combining CA promotion with too many other subjects overburdened training staff and led to lower adoption rates. As a result, the project chose to focus training on fewer subjects and to incorporate Community Based Facilitators to supplement the training done by staff. Other practices, including line planting and modern cassava varieties have been much more widely adopted.



KIFP staff demonstrate the importance of soil cover.

One of the greatest impacts of the projects has been improvements in gender equity in the community. In the current project, 42 Gender Champions (17 men and 25 women) facilitate gender training both in the SHGs and in the wider community. An independent evaluation in 2016 revealed many testimonies of how household roles had become more equitably distributed and family relations strengthened.

Discussions from the Network

Neil Miller: One of the keys to widespread adoption of cover crops has been finding species with benefits beyond soil improvement. Pigeon pea may be at the top of this list since it improves soils but also provides human food, livestock fodder, and firewood. In 2019, one of our Partners, Terepeza Development Association (TDA), helped farmers produce, aggregate and sell over 133 tons of pigeon pea. By storing the crop they increased their sale price by over 50%, and now the government has decided to add pigeon pea to the official commodity exchange. Congrats to all those who have worked so hard!

Mesfin Mathewos (TDA): Dear thanks. It is all our joint effort.

Eugène Masumbuko Kika: Thanks for sharing. I'm in D.R. Congo. How can I find pigeon pea seed?

Neil Miller: If you're in eastern DRC, CBCA should be able to supply you with seed.

Eugène Masumbuko Kika: Thank you. I'm in eastern D.R. Congo. I will immediately be in touch with them. God bless.

Richard Underwoods Sulu: This is wonderful, we love it

Sebastian Scott: Awesome

Peter Woolner: Congratulations to TDA

Ruth Munyao: Wonderful efforts. In our Ukambani area in Lower Eastern Kenya, farmers have embraced the planting of pigeon peas since time immemorial. They use it as a meal, a cash crop, a cover crop and fodder for animals during the dry season. After harvest the stalks are used as firewood. This year, the rains were good, so we had a good harvest. Congratulations TDA for your good promotion work!



Government extension experts and NGO staff observe pigeon pea field during CA Master Training session hosted by TDA in December, 2019.

The Agriculture and Livelihoods Technical Advisors manage a Facebook Discussion Group from which the above conversations were copied. If you'd like to join the discussion, sign up at www.facebook.com/groups/CAinAfrica