

Webinar Questions

Is anyone looking into a combination of pigeon pea, conservation agriculture and farmer managed natural regeneration (FMNR) to also increase the density of trees on farms?

GH: CRS is working with Africa Rising in Zambia looking at the maize/pigeonpea system under what is nominally a “conservation ag” system. I say “nominally” because we are using the minimum tillage practice used in Zambia (planting basins), and we will work to keep as much mulch/ground cover on the soil as possible. But we are not using the “rotation” component of CA because we are essentially putting both crops together in the same field at the same time. That said – I think combining gm/cc systems with FMNR is likely to be both practical and beneficial...

With regard to damaged soil/land, are there estimates on costs to reverse conditions-- it can be tricky, especially with costing extra money and labor? Any strategies to achieve it?

GH: It depends on what type of rehabilitation is required, and what technologies are used. If it is flat land that just needs surface protection and the build-up of organic matter content, that can be done with green manure/cover crop systems that cost very little indeed. Protecting landscapes with trees using FMNR is also extremely inexpensive.

If it is sloping land that requires full watershed rehabilitation programs, that is somewhat more expensive because of the need to lay-out and build the water management structures (like continuous contour trenches, gully plugs, etc. But even this can be done for relatively low cost with appropriate technologies. At the higher end, the CRS-led Food for Peace project in southern Malawi (WALA) that ended in 2014 rehabilitated 32 watersheds covering 2,883 ha for the cost of about \$ 2.2 million ((US\$ 763/ha). Even at that cost, I would expect a very good return on investment over a 3 – 5 year period.

Would you touch upon small farmer buy-in and the training process as well as farmer investment, particularly with regard to poor farmers?

GH: If you talk to Roland Bunch, he will tell you that there are millions of smallholder farmers around the world using gm/cc systems. But when gm/cc systems are introduced, farmer participation in refining the systems to their own local area and tastes is essential. In regards to FMNR – the 5 million ha in west Africa that have been “re-greened” is work that was done entirely by smallholder farmers who could clearly see the benefits. There is a training process for FMNR – and I am not very experienced with that myself – but I gather that it is not very difficult or time consuming. Watershed management is more complex and can require a lot of community level discussion and planning before any work gets done (anywhere from 6 – 12 months). Community buy-in and support, as well as engagement in the planning and implementation process, is essential for success in the long-term. Farmers and communities usually contribute in-kind to the watershed rehabilitation process. But this work has very direct benefits for the poorest people as well as the “better-off”.

Lastly – farmers need to be able to continuously adapt and improve their production systems and not necessarily rely on external actors to do that for them. To encourage this process, CRS has developed a basic training curriculum on soil, water and ecosystem management for smallholder farmers, and we are now mainstreaming that training in our global programming.

Does that \$40b of food imported into Africa include subsidized Title II commodities imported duty-free?

No, I don't think so.

How does watershed rehabilitation affect carbon sequestration into the soil (vs. the above-ground plants/trees) and how much carbon is released during the degradation process?

GH: I don't have data on this. I would expect watershed rehabilitation to have significant positive effects on carbon sequestration because of the re-forestation component which is common on upper slope (and sometimes along the contour trenches), and from re-building soil carbon (organic matter). In an informal communication, Roland Bunch estimated that if you can increase soil organic carbon from 1% (which is common in African soils) to 4% or more, that is almost the equivalent of re-establishing a forest on that land... You could check with him how he calculated that, but increasing soil OM must have some quite substantial effects on carbon sequestration. In regards to landscape degradation – the reverse would also be true...

Any recommendation on influence of organic matter on root nematodes in bananas? Would green manure crops be a feasible option?

(GH: see the inputs from Roland Bunch in the chat box during the conference.)

Still have a big question on how incentives for these technologies can be part of a viable ag mkt system? e.g. brewers buying cassava from farmers offer a 'package' of inputs?

GH: An example from Zambia: There is at least one large international corporation buying cotton from smallholder farmers in eastern Zambia. They give the farmers all the inputs on loan (seed, fertilizer, herbicides) for both maize and cotton, because they want their farmers to be food secure, even while generating income from the cotton. We think they would improve both their cotton yields and their maize yields (and farmer profitability) if they encouraged their farmers to intercrop their maize with pigeonpea. To support this process they could: provide technical information on how to implement the system; provide seed of pigeonpea (on loan); and purchase the pigeonpea at the end of the season, when they buy the cotton. There is huge demand for pigeonpea from the Indian market, so the company could also sell this commodity at a profit... I am sure there are many other possibilities like this, but we really need to encourage the private sector to support the process of restoring soil health and productivity, and to move beyond just the simple provision of seed and fertilizer (and mono-cropping in smallholder farming systems).

What is the best cover crop/maize intercrop you have seen passed between farmers in Central America?

GH: You might check out Roland Bunch's new book "Restoring the Soil". He has outlined most of the options, and in what circumstances they are most effective...

The farmer did the maize intercropping for 6 yrs. How long does it take for farmers to notice changes in yields when using the green manure/cover crop intercropping practice

GH: Many intercropping systems will give a food or income benefit in the first year. The benefits of improving soil fertility usually take a little longer, but they should start to become very noticeable in either the second or third year. It is best to look for locally adapted systems that have the increased food/income benefit immediately – this will encourage adoption..

Tree legumes such as *Faidherbia albida* are an impressive farmer driven system although takes 25 years before soil improvements but then very impressive. From your experience, do farmers stick through with the process for these years? is it sustainable for smallholder farmers?

GH: I do not see a rapid adoption of *Faidherbia* by smallholder farmers in southern Africa, and I think this is related to the duration before benefits are visible, as you note above – though the figure I hear most often is that initial benefits from *Faidherbia* should start to become visible after 5 years, and fully effective after 10 years (which is still a very long time). I have recently

been persuaded that Gliricidia is a better agro-forestry option because: a) the results can be seen after 2 – 3 years and b) it does not have thorns...

Is it possible for both presenters to include specific cereal legume combinations and cereal and tree crops known to work well on the field?

GH: There are lots of cereal/legume combinations. The best will depend on local biophysical and socio-economic conditions. I would refer you to Roland Bunch's book "Restoring the Soil" for information on these. Regards cereal/tree crops combinations – the main ones I know of are cereals with either gliricidia or faidherbia – and as noted above, I am currently leaning toward gliricidia.

How much work has been done with other staple food crops (such as squash and beans a la three sisters in Mesoamerica) with cover crops? Or is it more recommended to plant a double (introduced) legume + maize and have separate household gardens for other diverse food crops?

Could you please give some examples of landscape-level soil conservation interventions?

GH --

- Watershed management, which includes things like: permanent cover on the steepest slopes (trees or grass or both); continuous contour trenches (+/- infiltration pits); grassed waterways for safe removal of excess water; gully-plug/check dams; terraces, stream-bank protection, etc.
- Farmer Managed Natural Regeneration – which involves the education of farmers and community members to allow the re-growth of useful trees from the already existing underground network of roots and seeds; and managing the trees (pruning) to create a "parkland"
- Rangeland rehabilitation – which could involve protecting certain areas from livestock to allow re-growth of soil cover (grass, trees); the use of FMNR to re-establish useful trees (which increase soil fertility and grass production); water management structures as necessary; rotational grazing schemes, etc.

What are the three most limiting micro elements in sub Saharan Africa?

GH: I think those are very location and crop specific.

Have you seen many communities with reliance on herbicides (paraquat, 2-4,D)? How do these systems impact levels of herbicide use (or are they even possible when communities rely on herbicides for weeding)?

GH: In southern Africa herbicides are more and more being promoted to address the weed issue in Conservation Agriculture systems – especially in the first couple of years after the change to CA. This is exactly what is done on large commercial farms of course... I am not convinced that it is a good idea for lots of reasons (logistics, expense, human and environmental health in places where training on safe handling is not very possible...). I think we should be able to address the issue to a large extent with green manure/cover crop systems...

Is pollination of pigeonpea and the other legumes mentioned ever an issue? Are they self-pollinating, do honeybees provide all necessary pollination services, or are other native bees significant?

GH: I have never heard of this being an issue. Maybe Sieg can provide more specific information.

Any recommendation on influence of organic matter on root nematodes in bananas? Would green manure crops be a feasible option?

GH: See inputs from Roland Bunch in the chat box during the webinar.

Would like to have more info of example of ICRAF and fert tree subsidies. Thanks

GH: If you write to Dennis Garrity at the CGIAR system, I am sure he will send you as much information on this topic as he has available.

Looking at the poverty we see in our work in Zambia and Malawi that peaks right during the beginning of the rains, we note that tons of people are doing off-farm labour (piecework) just to meet daily food needs. When you're living hand-to-mouth, how easy is it to take up a new form of soil management? Any thoughts?

GH: Good question – I believe there are many poor farmers who often fail to farm their own land because they have to perform piece work on the farms of others on an almost daily basis just to keep their family fed. However, if they could adopt gm/cc systems that produce extra food and suppress weeds at the same time (like a good maize/legume intercrop), that might help them to both meet more of their own food needs from their own fields (especially if the legume has edible leaves/green pods before the harvest season) and reduce their weeding burden. There will no doubt be trade-offs and difficulties in adopting any new system, but we need to keep looking at a wide range of options.