



Monday 6, Wednesday 8 and Friday 10 December 2021

Day 1 – Q&A

TALK 1: Comparative long-term performance of conservation agriculture and conventional tillage on soil water dynamics and maize (*Mr Mbanyele*)

Question: I wonder if I missed the details regarding the specific CA practices in Domboshava and their influence on soil water content. Would we get perhaps other different information where other CA practices are employed, crop diversification and issues of amount of residue? from the other countries?

Answer: We selected only one CA practice in which crop residue was added at 5 Mg/ha. Therefore, these reported results are from that treatment. The diversity aspect was in order with crop rotation in which cowpea was included as a legume. Prior to Cephas working on the site, the plots were under cowpea for 2 continuous seasons. We therefore used maize continuous during CEPHAS era.

Day 2 – Q&A

TALK 2: Delivery agricultural innovations to farmers in Southern Africa (*Dr Chikoye*)

Question: CA is anchored on three principles (reduced tillage, crop diversity and mulching). Is this achievable? Can only 2 principles maybe do?

Answer: All 3 principles are critical to the long-term success of CA!

TALK 3: Analysis of soil microstructure using X-ray Computed Tomography from CEPHaS Conservation Agriculture field trials (Dr Sturrock)

Question: How does the data generated from this method compare with more traditional methods?

Answer: The image analysis is still in progress so linking with the other methods used in WG1 will be done in coming months.

Question: How interconnected are the bio pores through the different soils? Is there evidence of the potential for rapid water flow through the soil?

Answer: In the cores from Zimbabwe there was not evidence for a high number of biopores at the resolution of the scans (50 um). The disturbance cracks also complicated the analysis. The cores from Malawi were in better condition and visually have evidence of biopores. The next stage of the analysis is to look at the 3d connectivity of the pores so link this with the water infiltration data will be interesting.

Question: Can you say more about the condition of soil moisture in the sampling ? and conditioning and packaging of cores sample to send it to UK?

Answer: We have soil moisture data from the sites but I would need to consult with colleagues in WG1. There were some challenges collecting the cores in Malawi as the soil was too dry and hard to use the soil corer. The team had to wait until after rains to collect the cores. Cores were packed at field moisture and wrapped in bubble wrap for shipping to the UK. Unfortunately, some of the cores were opened at customs/border and damaged. It's a challenging task shipping them across the globe with minimal disturbance.

Question: A common problem for farmers is a 'hard pan' at ~ 20-30 cms that retards root development, aeration etc... Do you observe this in the soils analysed and is there are difference between tilled and untilled soils?

Answer: We have seen this in cores from other sites. We can measure the reduction in porosity as we reach these layers. There is a suggestion that there is a lower porosity in some of the cores from Domboshava but unfortunately the disturbance due to transit to the UK meant we couldn't measure. Further work is planned to help quantify. We can also look for evidence of biopores through the hard pan which may be beneficial to plant roots accessing water in deeper layers of the soil profile.

Question: You mentioned the difference in soil structure between Zimbabwe & Malawi. Has this been linked to mineralogies at all?

Answer: Quite possibly. The soil textures are different in the two sites which is likely to influence the structure formation.

TALK 4: More yield, less field (*Mr Mbanga*)

Question: CA benefits are known to manifest over a longer period of practice. Can the success story from Zimbabwe last season attributed to Pfumvudza or generally good season?

Answer: There is no doubt that 2020 was a decent rain season but it was not the best that we have received in the last 20 years (or 37 years, to compare with the last harvest of that magnitude). We have numerous farmers in various regions of ZW that have achieved these results (+10T/Ha) since we began teaching Pfumvudza in 2012. The success of the FfF-trained Pfumvudza farmers in 2019 (serious mid-season drought) is what gained Gov attention and led to the national rollout. Thank you for the great Question!

Day 3 – Q&A

TALK 5: Education, financial incentives and awareness to reduce smallholder farmers' vulnerability to drought: A Modelling story (*Ms Wens*)

Question: Do you have estimates on how sustainable is groundwater abstraction for irrigation from shallow wells in multi-year drought conditions?

Answer: As Dr Van Loon replied live, we are currently working on linking the model to a regional-scale groundwater model to exactly evaluate this kind of trade-offs. Currently, the use of on-farm (shallow) wells is quite rare in the study area we investigated, but it might become a more popular measure and then such analysis is of high relevance.

TALK 6: Modelling, drought analysis & stakeholder forecasting information needs in the Limpopo Basin (*Dr van Loon*)

Question: Did you identify any significant transboundary impacts to groundwater and surface water in Limpopo basin?

Answer: This is what we are working on at the moment. We expect a downstream impact of the scenario of the increase in GW abstraction in South Africa. We also expect a downstream impact of the scenario of reservoir and sand dams in Botswana and Zimbabwe. We are now looking into how these water storage structures upstream could recharge the aquifers to compensate the effects of groundwater abstraction and possibly mitigate flooding downstream. This is especially important under episodic recharge.

Question: How do you think solar pumping may play out on your study areas? Did you see evidence for this already?

Answers: Answering from the modelling perspective: it would be easy to include if you know the costs and the effectivity in pumping water. It would then be interesting to see how such newer technology spreads through the farmer networks and how for example extension services or other forms of knowledge distribution can affect the adoption of this type of pumps. I have seen them implemented in Kitui, but it is quite rare (more common in the community wells; not yet used a lot for farm wells — at least not during my last, pre-covid, field visit).

(from Dr van Loon) The issue of solar pumping did not come up in the discussions with the stakeholders, but I agree it is an interesting topic. We now have higher increases in GW abstraction in South-Africa in our GW abstraction scenario, related to the development plans and resources in that country compared to the other countries of the basin. But solar pumping would change this, so that would strongly change the spatial pattern of abstractions and therefore downstream impacts. I would say that it would make other measures that increase recharge (from sand dams or by land use change) even more important.

TALK 7: Climate-smart agriculture impacts on groundwater recharge estimates (Ms Mudimbu)

Question: Is the isotope data for Zambia from Kabeleka or Liempe? If from Kabeleka, that'd explain the distinction between CA and CV as the different treatments there are quite apart.

Answer: The samples were collected that are on the chart were from Kabeleka only and the CA CV sites are not any further apart than the Malawi ones which did not show the same difference.



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