EXPLORING THE USE OF A LOW-TECH TOOL FOR CONSERVATION AGRICULTURE – A FIELD EXPERIMENT IN KENYA

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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What is Conservation Agriculture?

Conservation agriculture consists of three key principles: 1) Minimal soil disturbance 2) Maintaining ground cover and 3) Undertaking crop rotation.

When we adopt these practices it helps soils to maintain structure, improves their composition and their natural biodiversity. These practices are expected to improve yields and lead to a more sustainable and healthy soil. One of things we need to avoid is disturbing the soil – for instance through ploughing.

Traditional smallholder farmers, oftentimes women, use 'jembes' (hoes) to break up the soil before planting (Fig. 4). This is a group of women from a farming association in Kenya, near Nanyuki, using traditional ploughing techniques to prepare a typical demonstration plot.

Fig. 1: Traditional ploughing using jembes

The Barney Spear Planter Agricultural Engineer Mr Barney Muckle studied at Kings College, Durham University, in the 1950s and has spent the majority of his adult life in Kenya and other parts of Africa, working with organisations and communities on agricultural techniques and technologies for improving agricultural production. Now in his eighties Barney has a lifetime of experience in designing and developed improved tools and equipment for small-scale farmers that can be made by informal sector artisans using locally available raw materials. The Barney Spear planter is a result of this experience and is designed to be used by women farmers to plant without ploughing *(see https://www.youtube.com/watch?v=3B_Xj5WpcqE).* The tool can be made using parts available locally such as car springs and steel pipes. It can be assembled by local metal workers. Initial trials appear to show using the tool increases soil health, reduces the need for fertiliser, provides a targeted delivery of fertiliser to seed and leads to an overall improved yield quality compared to alternative approaches.

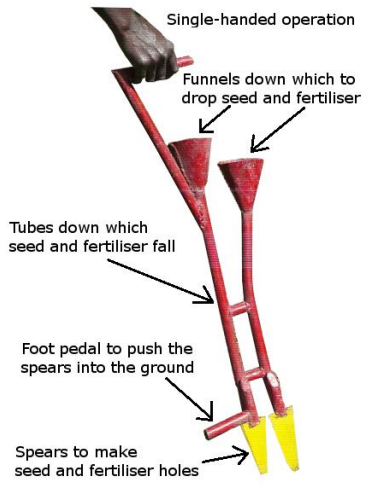

Fig. 2: Design of the Spear Planter

How does it work? The planter is pushed into the uncultivated soil at a 45 degree angle up to the top of the spear section. Then the tool is pushed forward and back incrementally until the soil forms a small hole and the planter is now upright in the soil. Then fertiliser is dropped down the longer funnel and the seed down the shorter one. The distance between seed and fertiliser is sufficient to prevent seed burn and bolting of the crop.

The planter is not used like a spade and it does not lever the soil upward. The shallow entry angle is key. Soil should be unploughed and ground cover maintained, though weeds can be pulled up. Any stones should be removed. If stones are found as the spear planter is *pushed* into the soil then it is advised to just move the planter a few centimeters away to avoid the stones, as these bend the spears. In our training session we found a tendency to try to slam the planter down into the ground like a spade, which again bends the spears.

Once the seed is dropped then the planter is lifted up and the hole is easily smoothed over with a foot. When the soil is wet care needs to be taken to make sure that the tubes attached to the funnel do not get blocked.

The Research Project. We bring together a team of management scholars and biologists to explore both the social-economic and environmental dimensions of this particular technology. We are interested in four particular research questions.

- Does the soil fertility and structure differ between plots planted using this tool or using typical smallholder ploughing techniques?
- Is the yield improved, and fertiliser and seed use decreased?
- Do we see the diffusion of this technology into the local economy through the increased production by locally trained metal workers and/or through uptake by other farmers?
- What are the implications of using this tool for conservation agriculture practices?

Fig. 3: Fundis making the tools

Fig 4: A traditional jembe (hoe)

Fig 5: Spear planters at a demonstration site

Training in the Jua Kali. In this first phase in October 2016 we trained two groups of informal economy artisans to make the planter tools. These artisans are known locally as 'fundis' (metal workers) located in the 'jua kali' (which is a Kiswahili term that represents those working in the informal economy along the roadside or in informal shacks or workspaces). We will revisit these workshops over the project to see if they are making any additional planters for the local farming community.

Training in smallholder farmers. In October 2016 we visited two women's farming associations, facilitated by the local cultural extension officer Mrs Aularia Macharia. Our training demonstrations were held at a plot in the Umende ward near Nanyuki in the Mount Kenya region. The farmers were introduced to the principles of conservation agriculture by our agricultural trainer Mr Stanley Muriuki. Each person in the two groups of men and women was trained on how to use the tool. Firstly they ploughed a small demonstration plot using traditional techniques. Then each farmer used one of the tools to practice planting maize seeds with fertiliser. In total we trained over 40 farmers over the various workshops. We gained valuable feedback on the use of the planter by this group; which will lead to improvements its design and use. We will also be providing a planter, seed and fertiliser for free for their trial plot to be planted in the next long rains.

Fig 6: Testing the Planter

In the second phase of the research, just prior to the long rains in March 2017, we will visit each farmer to see their proposed experimental plot. During this visit we will collect soil samples to develop a baseline assessment of the soil quality and microbiological communities present. We will also collect baseline samples from the main plot which will have been ploughed. In the third phase in August 2017 we will return to the pair of plots at each smallholder farm to collect soil samples just prior to harvest and interview each farmer about their experiences of using the tool. We will also collect data on seed and fertiliser use in both the trial and main plots for each farm, as well as indicative yields. We will also visit between planting and harvest to take photographic comparisons of growth between the main and trial plots at each farm. Once this pilot trial is completed we will then provide an assessment of the value of this tool for conservation agriculture in such settings.

For more details contact dholt@essex.ac.uk

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