EXTENSION CIRCULAR

Ministry of Agriculture

Department of Agricultural Research Services (DARS) October 2022

Ref No.: BC22-04-SFC001

Deep bed farming technology for improved soil health and increased crop yields in cereals or legumes in Malawi

Introduction

The national goal on agriculture is to improve crop productivity both at smallholder and commercial scale farmers. This has been done releasing and promoting improved crop varieties, with associated agronomic practices to increase the yields and income. One of the important aspects on research agenda is to address the issue of soil degradation to various farming activities.

Over the past 10 years, Tiyeni Organisation based in Mzuzu has been promoting deep bed farming technology and trial farmers regarded as one of the good crop husbandry practices to be used by farmers in Malawi. The technology was validated by Department of Agricultural Research Services with support from Sustainable Agricultural Productivity Program (SAPP). The technology has the ability to increase yields by 50% and cost effective as compared to conventional farming.

Description of deep bed farming technology

Deep bed farming is a profitable and sustainable climate smart technology package in which deep beds are formed in the first year to break down the soil's hard pan. These are accompanied by contour ridges with closed end box ridges to minimise soil erosion and improve infiltration of water into the root zone. Mulches and/or green manures and intercropping are used to build soil health and fertility. The technology improves root growth and development resulting in fields with vigorous plants even during dry spell conditions.

The technology includes construction of marker ridges, box ridges, use of manure, soil mulching, regenerative agriculture and planting vetiver grass on contoured marker ridges. These provided solutions to loss of soil, low soil fertility, sub-soil hard pans, low yields and loss of soil biodiversity. It accommodates soil mulching so it regulates soil temperature and reduces soil water evapotranspiration and soil surface run-off.

Figure 1, Constructing deep beds after contour

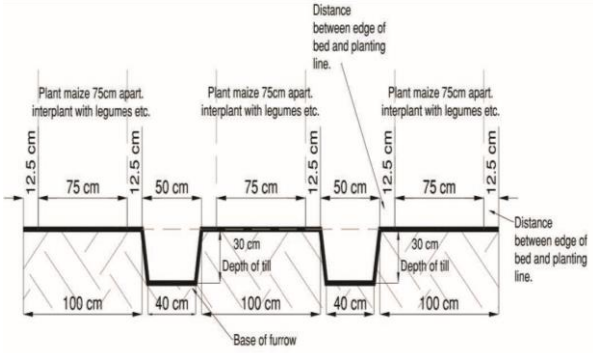

Figure 2, Dimensions for deep bed farming

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Steps to follow in implementing Deep bed farming technology

STEPS	ACTION	BENEFIT
1. Breaking the "Sub-soil's hard Pan"	Where land has been continuously cultivated for several seasons it leads to development of a hard pan. This must be broken by digging with pick-axes to a minimum depth of 30 cm. Farmers only dig once in the first year.	This improves water infiltration in the soil. It allows water to percolate into the subsoil. Plants develop deep root system that help to extract water and nutrients from the depths of the soils hence plants are able to cope water stress conditions.
2. Create marker ridges	Careful survey the land using line levels. Thereafter, create marker ridges on the contour lines at intervals down the slope.	Marker ridges help to align the deep beds along the contour lines. This promote water infiltration and minimises run-off hence reducing soil erosion
3. Reinforce the marker ridges	Plant Vetiver grass. This is a non-invasive deep-rooted grass, planted to stabilise the marker ridge.	Vetiver grass helps to stabilise the marker ridge. When trimmed, the forage can be used for mulching. Vetiver grass is widely available in Malawi.
4. Create the holding ditch	Dig a ditch 0.5 metres wide and 0.3 metres deep along the marker.	By holding the water in the ditches, it allows slow percolation of water into the subsoil where crop roots can extract from the reserved water over a period of time.
5. Making the Deep Beds, Furrows with 'Boxes and raised footpaths, Closed furrow ends	Deep Beds should be 1cm wide on top and 0.3m height from bottom of furrow. Furrows are 0.5m at top and about 0.4m at base depending on soil condition and type. Boxes should be made at 2 – 3m intervals alternately from one furrow to the other. Footpaths and Closed furrow ends should be 0.5m height and 0.5m width	Beds enhance moisture and manure retention, provides broader rooting depth. Furrows with boxes hold rain water and allows infiltration and percolation of water into soil profile to benefit crops. Footpaths minimize soil compaction in beds and reduces creation of gullies in the fields. Raised footpaths demarcate plots normally at 10 to15m. Closed furrow ends control entry of upland water in and out of fields as surface runoff.
6. Use of manure and mulching	Apply manure made from different methods. Mulch the beds with crop residuals from the previous cropping season or adjacent fields after manure application.	Manure build up organic content of the soil, reduces use of artificial fertiliser, lowers PH, builds soil organisms, and improves water holding capacity among others. Mulching improves soil health conditions and increase soil organic carbon.
7. Planting the beds with main and cover crops	The beds are wide enough for planting 2 rows of maize and inter cropping. Plant cover crops timely.	Inter-cropping brings crop diversity, provide insurance to crop failure. It also helps in control pests and diseases. Cover crops add nutrients, regulates soil temperature, suppress weeds, reduces evaporation and protect soil surface from rain drop impact and 'crusting' by sun.
8. Crop rotation and agro forestry	Farmers should practice crop rotation and plant agro-forestry tree-species such as *tephrosia*.	Control Pests and diseases, improves soil fertility, reduces weed seed bank.

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This Extension Circular was developed based on evidence presented at the Agricultural Technology Clearing Committee (ATCC) and thereafter approved by Ministry of Agriculture in Malawi. Expert contacts:

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