

FARMING-SYSTEM SPECIFIC EXTENSION CONTENT FOR ENHANCING CLIMATE CHANGE ADAPTATION AND RESILIENT FOOD SYSTEMS IN SORGHUM-BASED DRYLAND FARMING SYSTEMS OF TANZANIA AND BURKINA FASO

NO-TILLAGE PLANTING/ SEEDING

CLIMATE CHANGE ADAPTATION AND RESILIENT FOOD SYSTEMS ISSUE

Sorghum-based farming systems in semi-arid regions or areas are characterised by eroded and degraded soils. Traditionally, people are used to growing crops first by tilling the soil through digging, stirring and turning it over. Through tilling, the soil is turned over to a certain depth, thereby killing unwanted plants and burying mulch, leaving behind barren soil. This may lead to soil erosion and lower productivity - hence threatening the resilience of the food systems.

ESSENTIAL TECHNICAL INFORMATION

Planting refers to the precise placing of large seeds (maize and beans for example); whereas seeding usually refers to a continuous flow of seed as in the case of small cereals (sorghum and millet for example). The planting/ seeding equipment penetrates the soil cover, opens a seeding slot and places the seed into that slot. When seeding is associated with the no-tillage/ minimum tillage method of land preparation, the size of the seed slot and the associated movement of soil are kept at the absolute minimum possible. Ideally the seed slot is completely covered by mulch again after seeding and no loose soil should be visible on the surface.

In the case of vegetables, the seedling is placed in a shallow hole while covering the root section with soil.

EXTENSION ADVICE FOR PLANTING

General advice on planting

Based on their experience of the surrounding environment farmers may choose between two types of planting: (i) dry planting referring to the sowing of the seed before the rains—anticipating that the rain will fall soon, or (ii) immediately after it has rained. The key advice is that planting long after the onset of the rains—like two weeks can adversely affect productivity and production.

It is recommended to plant/ seed in rows following the recommended practice for the respective crop. This is important because it contributes to optimizing the plant population per unit area and therefore contributing to high yields and production and ease of management such as weed and pest control, and harvesting. Whereas broadcasting is less labor demanding it is potentially wasteful in terms of less than optimal plant population or too crowded plant population leading to plants competing for nutrients, water and air in a small area resulting in low yields.

Planting of vegetables in wet valley bottoms is more flexible in terms of time because there is more assurance of moisture availability.

Advice on equipment for no-tillage

When starting planting practices with no-tillage/ minimum tillage practices, a farmer needs tools such as hand hoes for making planting basins, ropes to ensure that planting lines are straight, and a tape to measure the distance from one planting station to the next and from one row to the next. But using these tools can be time-consuming. It takes a long time to complete a plot of planting basins, and the heavy work discourages some farmers from practicing conservation agriculture on a large area. In these cases, the advice to farmers is to migrate to using rippers or power tiller rippers described below.

Advice on equipment for minimum-tillage system:

1. **Dibble stick planting:** Planting stick or machete can be used to create holes to plant the seed in an un-ploughed field with stubble/crop residue. The cut hardwood stick from the bush is sharpened at one end and used to make planting holes. The holes are made in lines at evenly spaced intervals that make it easier to weed and apply fertiliser or manure.
2. **Disc-plant (stubble-harrowing):** This tool is used to loosen the soil, chop up crop residues and cut weeds. Afterwards planting is done without further soil disturbance and the crop residues are left on the surface
3. **Strip and spot tillage:** This involves scraping out shallow planting holes in un-ploughed soil, sowing the seed in the holes, then covering. The only equipment needed is the hand hoe (Jjembe) and a planting stick. You can plant in the dry or just after the rains. The following are the steps involved:
 - Dig small shallow holes at the correct distance from each other. Make the holes just deep enough to plant the seeds.
 - Put the correct number of seeds in the hole, and cover them with soil.
 - About 2 weeks after the crop emerges, use a stick to make a hole about 10 cm away from each plant. Put fertiliser into the hole.
4. **Tillage and planting using rippers:** A ripper is a chisel-shaped implement pulled by animals or a tractor. It breaks up surface crusts and opens a narrow slot or furrow in the soil, about 5 - 10 cm deep. Hence the soil between the planting rows is not disturbed. The ripper should cut regular lines to facilitate subsequent weeding with ox-drawn weeders. Planting is usually done at the same time as ripping. The distance between the furrows depends on the recommended spacing for the crop.

The ripper is faster than ploughing, as tillage is limited to only a thin opening for planting. Because of this narrow working width, pulling a ripper requires about half the draught force of that needed for pulling a conventional single-furrow plough. The ripper is smaller and lighter than a plough, and is easier to operate. The farmer can also use smaller animals, or animals that may be weaker at the end of the dry season. The ripper is also cheaper to buy and cheaper to maintain. As a result of these advantages, the farmer can work larger acreages each season, and achieve timeliness in operations, thus taking advantage of the early rains. This is important, especially in seasons of lower-than-normal rains or, generally, for marginal-rainfall zones. The weed problem can be serious in a rip tillage system. Therefore, action should be taken to lessen the problem over the longer term. The ripper (e.g. the Magoye ripper) is a useful weeding tool.

Advantages

- Ripper attachments fit on a normal plough beam hence cheaper than complete implements.
- Can be used to make planting slots in dry soil allowing early planting.
- Disturbs the soil less than ploughing hence reduces soil erosion and encourages water infiltration into the soil.

Disadvantages

- Difficult if there is a lot of residue on the surface because the residue wraps around the ripper shaft.
- Disturbs up to 30% of the soil surface.
- Quite difficult to use on fields with tree stumps.