

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

LAND PREPARATION USING THE NO-TILLAGE METHOD

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

Land preparation before planting is done for several reasons including allowing water infiltration, allowing greater root development, weed and pest control and ensuring ease of planting. In the sorghum-based systems, farmers traditionally use hand hoes or ox-drawn ploughs which have a higher risk of leading to solid erosion in addition to being expensive to implement and/or demand intensive labour input, especially by the women. The alternative methods that have been developed and tested involve “No-tillage” and “Reduced/ minimum tillage”.

What is “no-Tillage” and “minimum tillage” Farming?

- No-tillage is generally defined as planting crops into soil that has remained untilled after the harvest of the previous crop.
- Minimum tillage refers to those tillage practices whereby minimum or no disturbance is effected on the soil for purposes of crop production.

How Does “no-tillage” and “minimum tillage” Farming Work?

In both systems the residue from the previous harvest is left on top of the field for the next planting season. The reason for this is to preserve the fertile soil, which may be completely lost if farmers continue to till the soil and use tilling practices that do not build and restore soil organic matter.

In the “no tillage” system all that has to be done is spread the harvest’s residue on the field and await the planting season. The soil will be left unharmed by the weather and useful soil microorganisms will find a place to thrive in, thereby making it possible for the soil structure to stay intact.

In the “minimum tillage” system furrows or holes where seed is planted are made and the rest of the field remains undisturbed and crop residue is left on the surface. Only the necessary operations to optimise soil conditions for seed germination and crop establishment and growth are performed, minimize human and machine traffic and thus avoid soil

compaction and destruction of soil structure, to avoid soil erosion; to conserve soil moisture, and to use less labour and mechanical energy.

What are the advantages of “no-tillage” and “minimum tillage” Farming?

- a. **It Saves Time and Money For a Farmer:** Where a farmer chooses to use no-till farming, they skip the ploughing step each year. It means they will not endure labor or fuel costs associated with ploughing.
- b. **It Improves the Soil Structure:** Tilling disrupts the natural structure of the soil, especially if it is done repeatedly. The disruption releases some carbon, which is essential for the growth and development of soil organisms;
- c. **It Reduces the Amount of Water Needed to Grow Crops:** Because all the crop residues are left on the surface of the field, they absorb or help the field absorb water more easily, reduce evaporation, and it also helps limit the amount of runoff that occurs;
- d. **Beneficial Microbes and Insects Increase:** Because the soil is not turned over the soil microbes and insects are not exposed to the harsh environmental conditions;
- e. **It Helps Prevent Soil Erosion:** Ploughing loosens the top-soil and makes it lose moisture as well as vulnerable to winds that blow it away. If floods or heavy rains fall on the land at such a time, they could erode a lot of the soil.
- f. **It Fits in the Agenda of Combating Climate Change:** No-tillage farming can play a significant role in reducing greenhouse gas emissions by minimizing soil disturbance. When soil is ploughed, it exposes the carbon components to oxygen in the atmosphere in turn reacting to form carbon dioxide that becomes part of the greenhouse gas emissions that contribute to global warming;
- g. **It reduces Soil Compaction:** No-till technology significantly reduces the amount of equipment used, and as such, reduces soil compaction or hardpan formation.

What are the disadvantages of no-tillage and minimum tillage farming?

- a. **Formation of Gullies:** Practising no-tilling for a long time may lead to pre-existing gullies to deepen;
- b. **Increased Use of Chemicals:** While no-tillage and minimum tillage farming might actually help curb fast-growing weeds, most types of weeds continue to grow and require the use of herbicides to be eliminated;
- c. **The Risk of Carrying Over Diseases:** Without tilling, there is the risk of carrying over diseases when the crop residue is not incorporated into the soil after harvest. As such, the land will act as a host for diseases and will infect subsequent crops.
- d. **Some Soil Types Might Not Support it:** No-tillage does not work well on badly drained soils or if soils suffer from water-logging;
- e. **The Fields Cannot be Used For Other Purposes:** When a farmer chooses to use the no-tilling farming method, they cannot utilize their fields for livestock benefits or creating grass crops.

FACILITATING THE PRACTICE OF NO-TILLAGE LAND PREPARATION

Facilitating farmers to practice no-tillage farming can be done on its own but it is commonly part of the package for facilitation conservation agriculture (CA). The components of the CA package are described in section 7.3 further below.

The approach to developing capacity of farmers to adopt the no-tillage practices is determined by extension methodologies employed by the extension agents. In the case of AGRA the method used is the aforementioned mother-baby demonstrations.

In general, before adoption of the “no-tillage” or “minimum tillage” system the following factors must be considered:

- i. Farmers must improve their knowledge about the system (especially weed control) before trying the technology on their farms
- ii. The change to no-tillage should be planned at least one year before implementation
- iii. Plan to acquire no-till implements (direct seeders) and obtain proper orientation on their utilization. The implements so acquired should match the available farm power.
- iv. It is advisable to start with a small portion/section and advance with time (e.g. 10% of the farm)
- v. If possible, soil tests should be done and nutrient deficiencies corrected with the aim of attaining a balanced nutrient and soil acidity status. If soils are acidic, farmers should apply small quantities of lime each year (instead of large amounts only once)
- vi. Avoid soils with bad drainage. It is known that no-tillage does not work on badly drained soils or if soils suffer from water-logging
- vii. Level the soil surface, as uneven surfaces make exact seeding impossible
- viii. Eliminate soil compaction
- ix. Use crop rotations and green manure crops, these are essential in no-tillage system
- x. Include green manure cover crops in the rotation. Crop residues and green manures must be left on the soil surface, being incorporated biologically into the soil as they decompose
- xi. Buy a no-till seeding (planter) only after having met all requirements mentioned above
- xii. Learn constantly and stay up to date with new developments