Technology Fact Sheet for Adaptation
A.1 Technology: Conservative Agriculture (zero tillage) [i]
Sector: Agriculture
Subsector: Rain-fed Agriculture

A.1.1 Introduction

Zero tillage is a method of plowing or tilling a field in which the soil is disturbed as little as possible – the plant seed is sown directly into the seed bed which has not been tilled since harvest of the previous crop. In Sudan there are three major farming systems: the irrigated agricultural system, semi-mechanized system and traditional rain fed production system. Subjected to intensive and repeated tillage, rain-fed areas degenerate with reduced organic matter at a high rate, resulting in diminishing crop yield (non- sustainable agric production system). Production costs increase due to soil degradation whereby both farmer input and soil output capacities diminish, a low yield predicament aggravated by lack of technologies. Zero tillage aims at making better use of agricultural resources through the integrated management of soil, water and biological inputs. It contributes to environmental conservation and to sustainable agricultural production by increasing rural farmers' productivity and incomes and thereby reducing poverty.

A.1.2 Technology Characteristics

Zero Tillage improves the soil, increases production and decreases the cost of production. It consists of improved agricultural packages:

- Crop residue from previous crop and crop rotation;
- Application of herbicide for control of emerging and non emerging weeds (pre- post emergence herbicides);
- Planting in rows and application of fertilizer in one operation by a special planter; and
- Agricultural operation started after the soil has received 110 mm of rain fall.

A.1.3 Country Specific Applicability and Potential

Application of the zero tillage production system requires knowledge and skills and also necessitates that farmers be organized in groups or societies under the umbrella of agricultural service providers. All these elements are available in Sudan and accordingly the applicability of the technology is feasible beyond doubt.

A.1.4 Status of Technology in Country

Zero tillage has been introduced in limited area in Sudan (Gadarif State) since the year 2000. Training and skills development of state and federal staff, stakeholders and farmers in application of technologies of zero tillage (planting, spraying and application of fertilizer) has taken place in this Gadarif. Moreover skilled operators (in maintenance and calibration) are available and the farmers are knowledgeable about the zero tillage system.

A.1.5 Opportunities and Barriers

- Most of the existing vast areas (in different parts of the country) where zero tillage has not yet been applied though suitable for the application of zero tillage, have suffered soil degradation attributable to various climatic and non-climatic factors and are now experiencing agricultural production decline.
- Opportunities for investment in zero tillage in the rain fed areas are important for reversal of declining unit area productivity.
- Application of Zero Tillage has minimized weeds and improved soil structure over long periods, leading to a decrease in the cost of production.
- The application cost of zero tillage is high.
- In most part of Sudan there is lack of awareness and know how to apply and use zero tillage.
- Social and cultural opposition [might represent a barrier].

A.1.6 Benefits to Economic/Social and Environmental Development

The economic benefits of the intervention are represented in the creation of new job opportunities, increase of farmers' incomes, increased food production and encouragement of private sector investments in production of agricultural crops. In this connection there is need for data on approximately how many farmers are going to benefit from the technology besides information on the area which will be cultivated. The social benefits of zero tillage are improvement of living standards, upgrading the livelihood skills of farmers and enhancing their resilience to climatic and external economic shocks.

A.1.7 Climate Change Adaptation Benefits

Zero tillage can improve the productivity in rain-fed and irrigated farming areas. The targeted area for transfer and application of the zero tillage system is geographically large, covering one third of the cultivated land in Sudan. A fundamental criterion is that annual rain fall must exceed 600mm. The targeted area extends from south Gadarif, Sennar, south White Nile, Blue Nile and South Kordofan, covering the Savannah Belt Zone. The aggregate number of rain-fed farmers in these areas exceeds a million. Adoption of this intervention promises to occasion attainment of farmers' needs as well as the development priorities of the country, particularly food security and poverty alleviation.

A.1.8 Financial Requirements and Costs

Cost to implement zero tillage as adaptation technology:
Cost of establishing one unit with Zero Tillage equipment: Tractor, 90HP+planter+ sprayer = 31,600 USD.
Cost of cultivation of one hectare by Zero Tillage =154 USD
The production of one hectare by Zero Tillage= 23 sacks (1 sack of crop = 100kg)
Additional cost to implement adaptation technology compared to "business as usual" cost of cultivating one hectare [by traditional method] = 40 USD
The production of one hectare using traditional system = 7 sacks (1 sack of crop = 100kg).

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[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment for Climate Change Adaptation - Sudan. You can access the complete report from the TNA project website http://tech-action.org/**