Technology Fact Sheet for Adaptation
A.5 Technology: Genetically Modified Crops [GMCs] [i]
Sector: Agriculture
Subsector: rain fed

A.5. 1 Introduction

GM crop varieties developed by biotechnology allows scientists to select specific genes from one organism and assimilate into another to confer desired traits. This technology can be used to produce new varieties of crops or animals more quickly than conventional breeding methods and to introduce traits not possible through traditional techniques. GM crops contain specific characteristics such as resistance to pests/herbicides/drought tolerance, whereby quality is improved in tandem with reduction of greenhouse gas emission.

The average productivity of traditional farming systems in Sudan has declined steadily over the past twenty years. The capacity of farmers to produce food in an efficient and sustainable manner is severely limited by technological constraints, among which the most significant is lack of capacity to offset the impact of rainfall volatility that invariably drags down productivity. Lack of modern inputs such as certified seeds and fertilizer result in farmers being menaced by poor soils, pests and diseases. Poverty and food insecurity in the traditional rain-fed farming areas aggravate the predicament. Hence, Sudan's natural resource base is degraded.

A.5.2 Technology Characteristics

The process of Genetic Modification (GM) is composed of the following:

- Define the desired traits;
- Identification of the gene controlling the trait;
- Marking the gene for detection;
- Isolation of the desired gene, multiplication of the gene and introducing this desired gene into cells of the plant to be enhanced;
- Identify the plant cells that now contain the desired gene; and
- Use tissue culture/traditional plant breeding techniques to transfer the trait into usable variety.

This process requires adequately equipped biotechnology laboratories.

A.5.3 Country Specific Applicability and Potential

- Developing GM crop varieties requires knowledge and skills in tandem with institutional organization.
- Establishing equipped biotechnology laboratories is a basic material perquisite.
- Consultancy and cooperation with international organizations and seed companies is normative.
- Technical training for researchers and technicians is essential.

A.5.4 Status of Technology in Country

Famers in Sudan rely heavily on farm saved seeds typically yielding low productivity per unit area. GM crop varieties may increase their production per unit area by 2- 3 tones /hectare; therefore, while productivity would be increased, production costs would decrease and the food security situation improved.

A.5.5. Opportunities and Barriers

Lack of financial resources supporting agricultural research leads to inadequate spending on research and development, the corollary of which is inefficiency of research output. Reform is essential to

develop more sustainable research with appropriate integration of technology adaptation, whereby strengthening would also accrue to farmers, seed companies' researchers, extension agents and policy makers.

Currently, improved crop varieties seeds meet only 10% of farmer production in Sudan. The proposition of large scale GM crop varieties production in Sudan implies substantial improvement of research and development capacity, information dissemination about GM crops and adoption as policy; all of which imply sustainable crop production intensity and dramatic food security improvement. The beneficiaries in rain-fed areas could receive hundreds of GM crop seed varieties that heighten resilience against the unpredictable rain fall variable.

A.5.6 Benefits to Economic/Social and Environmental Development

(1) Increased crop production
(2) Decreased cost of production
(3) Improved crop quality
(4) Increased farmer's income
(5) New jobs for research workers and seed production technicians, as well as increased number of service providers
(6) Improve livelihood and strengthen resilience of rural farmers to climate change

A.5.7 Climate Change Adaptation Benefits

Fits well, both for present and expected climate change

A.5.8 Financial Requirements and Costs

Cost to Implement Adaptation Technology: Cost of establishing and rehabilitating 3 research substation units in south Gadarif, south White Nile and Blue Nile to cover rain fed areas. This extended from east to central and west of Sudan.
One unit = 6 million U.S. dollars for establishing, including 3 offices /lab/rest house/training center/ toilets.
Operation cost=750,000 US dollars
Laboratory equipments = 2 million dollars
Additional cost to implement adaptation technology, compared to "business as usual":
Long term cost without adaptation: 2,000,000 US dollars
Long term cost with adaptation: 5,000,000 US dollars
GM crop varieties result in increasing the productivity per unit area/one million US dollars.

[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/**