

## Smart Agriculture from a Sudanese Perspective

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### Abstract

Smart agriculture as a new term may be unknown or it is not widely in Sudan even among the academicians. This paper is an attempt to find out the constraints facing the adoption of smart agriculture in Sudan and what are the future trends for its application in the country. This paper is mainly dependent on revising the available literature and grasping the facts about the current and future status of agriculture in Sudan.

The following constraints are facing adoption of Smart agriculture: the natural and anthropogenic factors. Natural factors can be summed up in the deterioration of the natural conditions by dry spells and climatic changes. While man-made factors include: deforestation, over-cropping, mono-cropping, agricultural financing credits, poor marketing channels, instable economic policies, etc..... In conclusion From a Sudanese perspective smart agriculture is that agriculture which can remain productive in the face of stresses and shocks i.e. while maintaining the viability of the agro-ecosystems supported by vast area of agricultural lands, sufficient ground and surface water as well as rainwater in addition to presence of large number of agricultural experts and indigenous cultural practices. Its main objective is therefore to attain sustainable yield per unit area.

Smart Agriculture can be adopted in Sudan by solving the natural and man-made constraints and strengthening the institutional infrastructure of the country as well as relying on the indigenous knowledge to sustain generally the total productivity of food crops.

**Keywords:** Smart Agriculture; Impediments; Indigenous cultural practices

### Introduction

In Sudan, agriculture and livestock production are the main sources of livelihood for more than 70 percent of the

population. Agricultural production is practiced under three major production systems. These are: irrigated, rain fed semi-mechanized and rain fed traditional production systems. The total farmed area is 19.5 million hectares, or

about 7.8% of the area of the country. The arid and semi-arid zones cover the largest part of the of the rain-fed farming production systems. Most of lands in Sudan especially in the northern and western regions are threatened by desertification and it has been classified as moderately to severely affected by desertification and environmental degradation. The long term declining trend in land productivity is one of the most visible indicators of the ecological degradation. Desertification and drought were identified as the most important constraints facing dry lands farming in Sudan [1].

Research in Sudan has developed and released several technologies and management practices to improve crops productivity and to mitigate the effect of land degradation and improved productivity with great consideration of long-term environmental effects. These technologies include: zero tillage, appropriate crop varieties, intercropping, water harvesting and storage and conservation techniques ,seed priming and micro-dosing, legumes introduction and Improving soil fertility, agro-forestry systems, mulching, proper cultural practices and shelter belts. The key to development and improving the sustainability of degraded areas in Sudan is to stop any further deterioration and abuse of the natural resource base, that is, agricultural land, and the associated loss of soil productivity. In addition, scaling-up of the released technologies and appropriate policies can help facing the challenge of earning livelihood in desertification affected areas. Research is expected to continue working on the optimum use and conservation of natural resources and long-term environmental effects of farming practices, food security, recent environmental changes and adverse socioeconomic transformations [1].

### Objectives

- 1) To assess the existing situation of agriculture in Sudan and to identify the impediments of smart agriculture in the country
- 2) Explore what does smart agriculture from Sudanese perspectives

### Assessment of the existing situation and identification of the Threats to Smart Agriculture in Sudan:

Threats to smart agriculture can be summarized in the following:

**1. Deforestation, soil erosion and soil exhaustion and compaction-** have lowered agricultural productivity and

in most cases; have taken land out for the long term. This has been well documented but poorly quantified in Sudan.

**2. Deforestation-** particularly in the dry lands, has resulted in a near permanent loss of resources including seasonal forage for pastoralists and fertilizer/soil recovery services for farmers. Deforestation rates in areas studied by UNEP average 1.87 percent per annum [2].

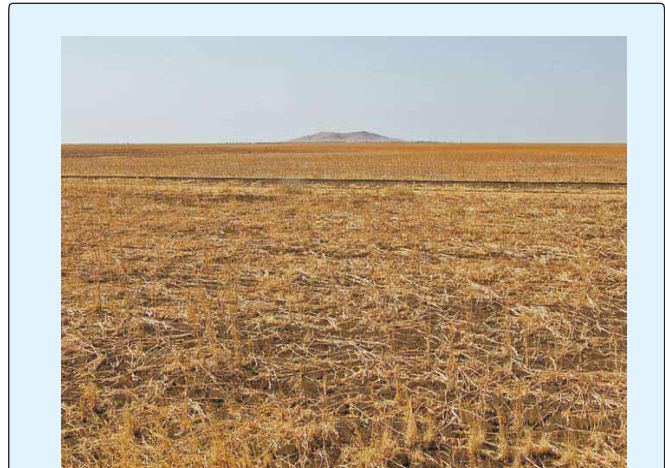


Figure 1: Expansion of Rain fed Mechanized Schemes at the expense of Natural forests in Central Sudan, source: UNEP (2007).

**3. Historical climate change-** has reduced productivity in some areas due to decline in rainfall. A major and long-term drop in precipitation (30 percent over 80 years) has been recorded in Northern Darfur, for example.

The implications of such decline on dry rangeland quality are obvious.

Forecast climate change is expected to further reduce productivity due to declining rainfall and increased variability, particularly in Sahel belt. A drop in productivity of up to 70 percent is forecast for the most vulnerable areas [2].

**4. Ever increasing demands on resources-** Human population growth is the underlying driver of the increased demand for natural resources. Sudan has an overall growth rate of over 2.6 % per annum, masking much higher localized rates. In central Darfur, for example, government statistics indicate a regional population (linear) growth rate of 12 % per annum, from 3 persons/km<sup>2</sup> in 1956 to 18 persons/km<sup>2</sup> in 2002 [3].

**5. Land use changes-** a dwindling share of resources for pastoralists. The horizontal expansion of agriculture into areas that were previously either rangeland or forest has been a well-recognized trend for the last four decades. The northwards expansion of rain fed agriculture into marginal areas historically only used for grazing has been particularly damaging [4].

**6. Blockage of the traditional migratory animal routes-** In addition to the loss of land, agricultural expansion has also blocked livestock migratory routes between many of the widely separated dry and wet season pastures, and in between the herds and daily watering points [5].



Figure 2: The tractor has enabled a massive expansion of mechanized agriculture, fundamentally altering the landscape of central Sudan, as here in Gedaref state [2].

**7. Conflict between Sedentary herders and Nomads-**A further complication is that sedentary farmers are increasingly raising their own livestock, and are hence less willing to give grazing rights to nomads in transit. In environmental terms, the reported is overgrazing and land degradation. In social terms, the reported consequences for pastoralist societies is an effectively permanent loss of livelihoods and entrenched poverty [5].

**8. Instable economic policies-** concerning agricultural development resulted in deterioration of crop production. This is because the money devoted in government's budget supporting and protecting the producers (the farmers) can be easily shifted to satisfy urgent needs other than agriculture. Moreover, farmers during harvesting time are used to put under the mercy of

market monopolies that are always enforcing poor prices [6].

The government always does not keep its promise to the farmers to buy grain crops at higher prices than those of the merchants. Only small quantities of the harvested crops were used to be bought by the government. This is because the money allotted in the budget to build a strategic stock was not available. It is more logical to anticipate that in the coming season, The farmers are seemed to be discouraged and they lack any motivation to cultivate their farms.

This is definitely led to the reduction of the total production of grains and consequently resulted in food insecurity in the coming years. It is worth mentioning that that the trade liberalization policy announced in year 1992 had encouraged farmers to cultivate more lands since the prices of their products will be high. Unfortunately this vast expansion of cultivated land was faced by shortage of seasonal labour working in manual cultivation of thousand feddans in the mechanized rain fed schemes. This shortage in labour had resulted in abandoning the harvesting of these areas due to the fact that the harvesting costs were exceed the market crop prices [7].

**9. Traditional Gold Mining-** Considerable number of young famers and pastoralists nowadays abandon their lands and left their herds in the River Nile, North Kordofan and North Darfur States. They are working now in traditional gold mining which provides them with better income compared to cultivation or herding [5].

**10. Impose of heavy Taxes on framers-** Heavy taxes imposed on farmers make cultivation unattractive occupation. This is because these taxes exceed the total cost of production [8].

**11. The Agriculture Bank of Sudan lending policy-** The Agriculture Bank of Sudan is only financing farmers who cultivate 1000 feddans. This policy prevents the farmers from adopting fallowing of their lands and this encourages the deterioration of the soil fertility. as the consequence the productivity of these schemes was drastically dropped and therefore threatens the food security of the whole country, Moreover, even the farmers who are financed by this bank always get their credit late in the season and therefore the farmers are unable to sow their crops at the optimum time and of course reflected in poor production and in many cases the farmers are used

to be sent to prisons due to their inability to pay back the loans to the bank [8].

**12. Refugees from neighbouring countries-** Influx of emigrants from neighbouring which either suffers from drought and desertification and/or tribal conflicts and civil threatens food security of the country [9].

**13. Food Smuggling-** Smuggling of food crops to neighbouring countries for example sorghum, wheat and sugar occurs at the expense of the Sudanese food security [9].

**14. Investment in Sudan-** Investment in agriculture is faced by a lot of constraints due to the conflict of interest between the central government and the states in taking decisions on agricultural land regarding their use by Sudanese citizens or by foreign investors.

**15. Foreign Investment in Sudan-** Complicated or cumbersome constraints face the foreign investors and discourage their investment in crop production sectors [10].

**16. Poor marketing channels and distorted economic structure-** They are discouraging farmers because farmers are used to be exploited by monopolistic and oligopolistic forms of trade [9].

**17. Informal credit sources-** squeeze the mechanized rain fed farmers and exploit them by return their money in terms of seeds at lower prices regardless of the fact that they are just give the farmers seeds and not money to sow their lands.

**18. Absence of food security policy-** Supporting food security policies is not one of the government's priorities and it was ranking down the list [9].

**19. Poor rural development. It enhances-** the destruction of the production systems. This can be attributed to the fact it encourages rural – urban migration and as it was mentioned before that the majority of the Sudanese population in rural areas are working in cultivation and/or herding [2].

**20. Unsecured land tenure in mechanized rain- fed agricultural schemes-** enhances land degradation. This may be due to the fact that the farmers are not willing to spend their money in conserving schemes which are not actually owned. Therefore lands of these schemes were degraded and soils deteriorated and consequently their

productivity is declining which may lead to food insecurity [7].

### Pathway to develop Smart Agriculture from Sudanese perspectives

There are two major groups of prerequisites to adopt smart agriculture: natural and human based resources. Natural resources of Sudan can be summarized as follows:

1. Vast areas of fertile soils all over the country which can be cultivated through surface or ground irrigation or by rains
2. Presence of plenty of water which is going to be increased after the building of the grand renaissance Dam in Ethiopia which will enable the country to use its share in River Nile agreements between Sudan and Egypt [10].
3. Using sprinkler irrigation in growing wheat using ground water resources in the drier or semi-arid areas of North Kordofan and Northern states by foreign investors from Gulf countries namely Saudi Arabia and Arab Emirates. These scheme has proved to be successful giving higher yields which has reached to 30 sac per feddan. It is worth to mention that these area do not lie within the belt of wheat cultivation. Nevertheless care should be followed to avoid the depletion of ground water. Therefore Environmental Impact Assessment (EIA) studies should be conducted [10].
4. Adoption of indigenous cultural practices such as no tillage, agroforestry, mixed cropping, agroforestry, etc...[5].
5. To develop a new agricultural calendar which should be adapted to extreme climatic change facing the country [10].
6. Preparation of land use map for the whole country to ensure the sustainability of agricultural activities and to avoid unneeded expansion of urban settlements on agricultural lands [10].
7. Structural and institutional changes in the national economic policy to remove the impediments imposed by irrational economic policies and regulation.
8. Improvement of the financial agricultural credits avoiding exploiting the farmers and squeeze them.
9. Development of early warning systems which is not only limited to weather forecasting but also inputs and sale price of the crops.
10. Make use of the great heritage of breeding of high yielding varieties and building of new generation of experts through training and capacity building conducted by large number of scientists and professors working for the Agricultural Research Corporation even for the retired staff.

## Conclusion

Smart Agriculture in Sudan can be attained by wise use of soil and water resources and through capacity building and develop a new economic policy which encourage farmers or the producers rather than exploiting them.

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