

# Sudan experience in biosafety

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# Sudan`s natural resources

## Agriculture

- ✓ Traditional farming is the dominant form of agricultural production in Sudan.
- ✓ In the rain-fed sector no agrochemicals or organic fertilizers are used.
- ✓ Flood irrigated areas like Toker, Gash and others are strongly recommended as organic farming areas.
- ✓ The large agricultural irrigated schemes use chemical fertilizers and pesticides with crop rotation , but, they are still suboptimal, Mukhtar *et.al*,(2001).
- ✓ Continuous monoculture of sorghum, and or sesame has depleted thousands of hectares and subjected them to noxious and parasitic weeds.



## Sudan national revenue of some agricultural export products (1999-2000)

No	Products	Revenue sold as Conventional* (US\$1000)	Revenue sold as Organic 79%** (US\$ 1000)	Revenue Increase Difference (US\$ 1000)
1	Gum Arabic	16042	28715.2	12673.2
2	Talh gum	2340	4188.2	1848.6
3	Sesame	146920	262986.8	116066.8
4	Groundnuts	5421	9703.6	4282.59
5	Kerkade	17987	32196.7	14209.7
6	Watermelon seed	12608	22568.3	9960.3
7	Cassia senna	788	1410.5	622.5
8	Hinna	636	1138.4	502.4
9	Sorghum	10112	18100.5	7988.5
10	Vegetables	07	12.5	5.5
11	Fruits	3450	6175.5	2725.5
12	Loban gum	312	558.5	246.5
13	Sheep	60555	108393.5	47838.5
14	Goats	338	605	267
15	Cattle	161	288.2	127.2
16	Camels	5324	9530	4206
17	Antelopes	084	150.4	66.4
18	Red meats	17677	31642	13965
19	Fish	179	320.4	141.4
20	Gum Arabic powder	4776	8549	3773
<b>Total</b>		<b>305717</b>	<b>547233.6</b>	<b>241516.6</b>

(\*) Actually sold as conventional foods.

(\*\*) If were sold as organic foods

Source: Babiker (2003)

# Organic farming

The idea of Sudan organic projects started when some European companies (from Holland and England) suggested for the Ministry of Agriculture, the organic production of particular **crops like sesame and sunflower** in small areas to meet the demand of European market. The Sudan proposed projects based on ten principals according to IFOAM principals and in order to maintain full cooperation between the producers of Africa and the consumers of the Western World.

**Three sectors had been selected which were:**

- 1- **Traditional rain fed sector**, mainly sandy soils in Central and Western Sudan .Main products are **sesame, groundnut, Sorghum, hibiscus 'millet', senna pods, water melon seeds, guar and gum Arabic.**
- 2- **Rain fed, mechanized sector**, clay plains in central, Eastern and Southern Sudan. Main products are sesame, sunflower, cotton, sorghum, guar, natural gums, medicinal and aromatic plants and non-wood forest products.
- 3- **Irrigated sector - along rivers and near watercourses and underground aquifers.** They are small -scale private holdings or large scale private or public owned. Main products are fruits, vegetables, sorghum, sunflower, sesame, groundnuts, cotton, wheat, guar etc.

## The position of the Sudan in view of some environmental agreements and protocols

<b>NO</b>	<b>ENVIRONMENTAL AGREEMENTS AND PROTOCOLS</b>	<b>POSITION</b>
<b>1</b>	<b>Pesticides Organic Pollutants (POPs)</b>	<b>Signed</b>
<b>2</b>	<b>Convention on Biological Diversity (CBD)</b>	<b>Ratified</b>
<b>3</b>	<b>Biodiversity Convention (UNCBD)</b>	<b>Acceded</b>
<b>4</b>	<b>Climate Change Convention (UNFCCC)</b>	<b>Ratified</b>
<b>5</b>	<b>Bio-safety Protocol</b>	<b>Signature in process</b>
<b>6</b>	<b>National Capacity Self Assessment (NCSA)</b>	<b>Signed</b>

# Certification

- Certification of Sudanese products as organic started at the beginning of this millennium, and already been done for some products e.g. sesame, hibiscus sabdarrifa and gum Arabic.
- Sudan certifying amount of 5.5 thousands metric tones of both types of *Acacia Senegal* (Hashab) and *A. seyal* (Talha) as 100% organic according to European laws and American Standard for organic agriculture.
- Gum Arabic Company started since September 2005 to contact the Ecocert International donors to the organic certificate as a leading company in this area operating in 86 countries in the world.

# Certified products in Sudan



Ministry of Agriculture/  
Khartoum State



Organic Mango



Savanna  
Ltd.



Hashab Gum,  
Talah Gum,  
Hibiscus,  
Sesame



ELIE



Hibiscus

LEVEL	CONSTRAINTS	OPPORTUNITIES
<p><b>Common for all levels</b></p>	<p><b>Institutional frame for organic agriculture is lacking.</b></p>	<p><b>The government is motivated to adopt new regulations and administrative bodies for encourage future development of the agriculture sector.</b></p>
	<p><b>Specific financial and technical support is not appropriate.</b></p>	<p><b>The government is open to take appropriate measures to improve the context for organic agriculture.</b></p>
	<p><b>Incentive context is lacking.</b></p>	<p><b>International agencies are open to support the Sudanese effort to develop sustainable agriculture.</b></p>

Source: Awouda (2001)



## Agricultural technology transfer society (ATTS) attempts in enhancing organic production in Sudan

- ATTS is a member in IFOAM who seeks accreditation, through IFOAM but could not afford the budget but tried to enhance the government to finalize the draft regulation. We have some attempt in:
- Mainstreaming of **agriculture** policy, **food** and **health** policies, **environmental** policies and **poverty** eradication policies.
- Awareness raising, Try to integrate capacity building and research
- Organize stakeholders and link between government and private sector
- Data collection about organic sector
- Development of regulations for **domestic** markets based on **local** conditions.
- We need some international support

# Potential Production and Application of Biofertilizers in Sudan

## 1- Symbiotic Nitrogen Fixation

### A- Rhizobium inoculation

- a) Alfalfa: Respond positively to Rhizobium inoculation in three different locations in Khartoum state
- b) Faba bean severe increments in the fresh & dry weights of shoot, root, nodules, grain yield & N<sub>2</sub> fixation.
- c) Groundnut: Cultivation in Western Sudan is lacking nitrogen fertilizers
- d) **Guar** Bradyrhizobium inoculation to guar improved nodulation & dry matter production particularly by locally isolated bradyrhizobia.
- e) **Chickpea** Rhizobium multi strain inoculation increased the production
- f) **Phaseolus vulgaris** Rhizobium inoculation showed significant difference for the studied parameters

# 1- Symbiotic Nitrogen Fixation

## *Rhizobium Inoculation & Chicken Manure*

- ✓ Increased significantly plant density, forage fresh yield & protein content
- ✓ Decreases significantly crude fibre content

## *Rhizobium Inoculation & Phosphorus*

- ✓ Rhizobium inoculation & Phosphorus application in alfalfa significantly increased:
- ✓ Seed yield components.
- ✓ Nodulation.

## *Rhizobium Co- Inoculation*

- ✓ Inoculation of groundnut with Bradyrhizobium & Azospirillum could improve groundnut production
- ✓ Inoculation with the Rhizobium and PSB had a synergetic effect manifested in increased nodulation in fodder crops.
- ✓ Yield & seed quality were increased when Rhizobium & phosphate solubilizing bacterial strains were combined.

## *Rhizobium Inoculation & Micronutrients*

- ✓ Bradyrhizobium inoculation, molybdenum & zinc application gave positives results on growth & yield of groundnut.

# EM Technology

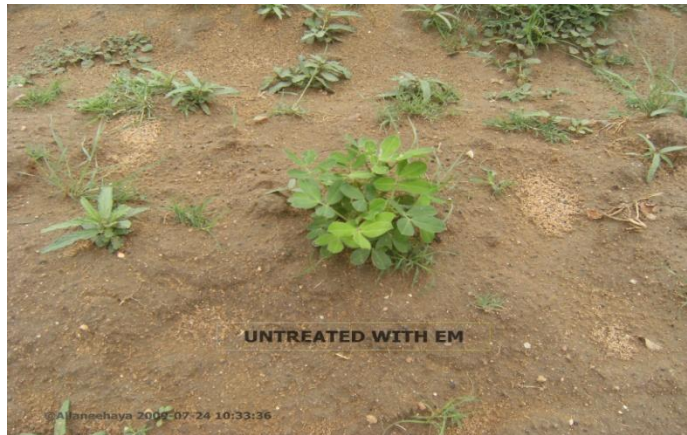
"**Effective Microorganisms**" is a Japanese technology available in more than **160 countries** all over the world including USA & Middle East.

It consists of a wide variety of effective, beneficial and non-pathogenic microorganisms produced through a natural process in acidic medium pH 3.4 and not chemically synthesized or genetically engineered.

The constituents are: Phototrophic, Lactic acid actinomysis bacteria and yeast.

These micro-organisms coexist and benefit from the material produced by each other in a phenomenon known as coexistence and prosperity

# EM Field application



untreated



untreated



Treated with EM



Treated with EM



# Field application of EM





# EM treated compost from crop residues



EM solution added to crop residues



Crop residue left to ferment

# EM treated compost from garbage







مصنع مروج للأسمدة  
مروج



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ملاة

١٠٠ كجم

# Importance of crop residues as animal feed

- Because efforts to improve crop water productivity have focused on grains and fruits that people consume, any residues and by-products that can be used by animals represent a potential feed **source that requires no additional evapotranspiration.**
- Animal production can take advantage of this feed source. **Use of crop residues can boost farm income without the use of additional water.** Theoretically, if livestock production were based solely on the use of crop residues and by-products, water for feed production would be nil.

# Agroecology / Agroforestry

- **Agroecology seeks ways to enhance agricultural systems** by mimicking natural processes, thus creating beneficial biological interactions and synergies among the components of the agroecosystem. It is now supported by an increasingly wide range of experts within the scientific community, and by international agencies and organizations (FAO, UNEP and Biodiversity International).
- A model was established in Sudan incorporating moringa and jatrofa trees, growing vegetables and cereals and raising animals at the same time. This model can also be seen as farming intensification as it reduces farmers' reliance on external inputs and state subsidies.
- This, in turn, makes vulnerable smallholders **less dependent on local retailers and moneylenders**. it promotes **on-farm fertility generation**, can be done by applying livestock manure or by growing green manures. Farmers can also establish a "fertilizer factory in the fields" by planting trees that take nitrogen out of the air and "fix" it in their leaves, which are subsequently incorporated into the soil.



## Agroforestry model

The model is growing moringa along side of canals (1800 in 3 acres) and jatrofa (570 trees in 3 acres) grown as live fence. The 3 acres is the minimum managed by a small scale rural farmer.

Two acres are divided into 8 plots where different vegetables are grown

The third acre is divided into two plots where a cereal is grown in one and moringa is grown and harvested every 35 days for tea production

Trees grown alongside the canals are allowed to reach maturity for seed collection



## Moringa added values

Women are involved in some activities stripping moringa leaves for selling it as tea

Experimentation with broiler feeding pelleted Moringa leaves.

Experimentation with sheep using moringa shoots for fattening

Experimentation with moringa leaves as supplement in meal preparation for children, elderly, pregnant and lactating women.

Different products from moringa oil as hair and body cream





# Crop breeding and agroecology

**Crop breeding** and agroecology are complementary. breeding provides new varieties with shorter growing cycles, which enable farmers to continue farming in regions where the crop season has already shrunk. Breeding can also improve the level of drought resistance in plant varieties, an asset for countries where **lack of water is a limiting factor**. **Reinvesting in agricultural research** must consequently mean continued efforts in breeding.

**In Sudan the Agricultural Research Corporation (ARC) in western Sudan established 3- 42 demo farms established to disseminate advanced agricultural packages including water harvesting techniques in rainfed areas among others :**

- Effect of inter-row spacing on the performance of three pearl millet varieties environments.
- Response of aerobic rice to seed priming and **micro-dose** fertilizer
- The influence of sowing dates, row spacing and nitrogen fertilizer on grain yield of two Sunflower varieties.
- Yield performance hybrid foxtail millet
- Collection of plant genetic resources

# Comprehensive Africa Agriculture Development Programme (CAADP)

For the past four years, the Comprehensive Africa Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD) has worked towards bringing key elements of the CAADP process Pillar 1 **Framework on Sustainable Land and Water Management**.

**The Government of Sudan**, with the support of FAO presented key milestones undertaken on **the National Agriculture Investment Plan (NAIP)** and called for development partners to engage in the process at a meeting held on February 5th, 2015. The partners present at the meeting included the United States Agency for International Development (**USAID**), Japan International Cooperation Agency (**JICA**), the Arab Organization for Agricultural Development (**AOAD**), the International Fund for Agricultural Development (**IFAD**), the International Centre for Agricultural Research in the Dry Areas (**ICARDA**), Green Vision, and Fund For Insurance Support.

**Seven Investment Programme Areas (IPAs) were identified** (1) the creation of an enabling environment for agricultural production and development, (2) **institutional** reform enhancing farming management and capacity building for producers, workers in the agricultural sector (3) **agricultural land** and natural resources issues and wildlife, (4) **better support services, information and knowledge management systems**, (5) **enhanced production and productivity** and modernization of the agriculture systems, (6) **industrialization, value chain** development and exploitation of agricultural capacities, and (7) **enhancing food security** and nutrition, quality and safety measures.

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*Thank you*