



Netherlands Enterprise Agency

East Sudan Horticultural Study part. 2

Commissioned by the ministry of Foreign Affairs

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Annex 9:

Mission Report

East Sudan Horticulture Study



Scoping mission to identify opportunities for development of the horticultural sector in East Sudan.

February 1st -14th 2017

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Carried out for AgroFair-TASTE in assignment of RVO

Introduction

AgroFair-TASTE has been asked by the RVO to carry out a scoping mission to the Eastern regions of Sudan (Red Sea state, Kassala state and Gedaref state) to identify the opportunities for development of the horticultural sector. For this purpose a mission to the target area was fielded in order to experience the local situation first hand and meet with relevant stakeholders.

This mission report reflects the information collected during the interviews and site visits. The mission program is provided in the table below. Due to unexpected delay at Schiphol airport the mission started 1 day later than originally planned.

The mission team consisted of the following persons:

1. Mrs. Karin Bleijlevens, rural development expert of AgriNature,
2. Mr. Nico de Groot, horticultural expert of Delphy,
3. Mr. Ali Abbas, economic official of Royal Dutch Embassy in Khartoum,
4. Mr. Osman El Sheihk, regional farming expert and farmer.

General info:

- Sudan has no import levies imposed on agricultural inputs/technology.
- Since January 13th the international ban on transferring money to Sudan has been lifted.
- Exchange rate Euro (€)-Sudanese Pound (SDG): 1- 6,9 (official rate); 1-17,5 (unofficial rate).
- 1 feddan = 0.42Ha

February 1st -2nd: Departure: Flight with Turkish airlines. Delay due to technical problems at Schiphol airport. One day stay-over in Istanbul. Arrival at Sudan International Airport at 02.00 am Friday February 3rd. Stay in Kanon Hotel, Khartoum.

February 3rd: Meeting with Mr. Fadieldin El Magboul, General Manager Ph: 912 213 767, fadi@plantsco.com, Mr. Tilal A. Idris, Deputy General Manager, Ph: 913 039 800 tilal@plantsco.com, Plants Company, P.O. Box 52 11111 Khartoum, www.plantsco.com

Mr. El Magboul introduces Plants Company. Company established in 1992; main focus ornamental plants. Since 1999 they were involved in fresh flower trade and import flowers from Netherlands as well as utilities (pots). Good connection to Aalsmeer-based companies. Since 2006 company sells vegetable seeds of Enza Zaden and started with vegetable production. Since independence of South Sudan and subsequent economic crisis (2010), the company shifted completely to vegetable production and stopped ornamental production. Company is growing broccoli, iceberg lettuce (under shade net), water melon, tomato, cucumber (greenhouses) and cabbage (white & red). Some date palms are recently planted on this location; large date plantation on 2nd location. Also some citrus and mango. Have in mind to develop specific sales concept for dates on local market.



All production is sold on local market. Large demand on local market and no specific quality standards; local prices are often higher than export prices. Export makes under current conditions no sense (example mention of company Haydar exporting (water) melons; many problems with quality). Export of Galia melons can be option. In 1985 Enza Zaden sold 50 million seeds in Sudan; currently no export.

Export facilities at Khartoum International airport are lacking: no proper cold storages, no service from side of government. Much bureaucracy to overcome.

Export to Gulf States is neither ideal; Gulf Arabs claim easily. Local demand in Sudan is sufficient, prices are good, quality demands are low and own control over logistics. Company has intended to work with outgrowers/contract farming while sorting, packing and trading the produce. However, farmers do not trust this way of working.

Registration of varieties is very expensive 5000 \$ per variety for 4 years period after which registration needs to be renewed + paid visit of group of government officials to check production facilities (with high DSA!). Syngenta is very active on market through local dealer CTC. Has registered certain numbers (no variety names) which gives flexibility to introduce new varieties. Plants Company uses now seeds provided by Bejo. Other Dutch companies present on market: Hi-tech Seeds and East West Seeds (zucchini, cucumber, okra, chili and sweet pepper)

Registration of pesticides even more expensive and bureaucratic. Mostly old products are registered. CTC dominant supplier (80% in hands of local tycoon). Provide no advice or training how to apply; just sales. Lots of pesticides used on tomatoes due to white fly. People prefer to buy oval types as they require less pesticides.

Prices: tomato: 10 SDG/kg retail (farmers get 6-7 SDG/kg); cucumber 7 SDG/kg (farmer price), broccoli 65 SDG/kg; iceberg lettuce 45 SDG/kg (sell rather small heads; 6 per kg so price per head is around 7,7 SDG). Last year price iceberg lettuce was 20 SDG/kg.

Plants company sells on central local vegetable market (whole sale) 3 times a week (Monday, Thursday, Saturday). Need to be on market early morning. Also direct sales to larger retail chains/hyper markets (Turkish/Chinese links) ; 2nd quality goes to restaurants. Market/sales needs "personal touch". Company started with own brand with product information, etc.

Long discussion on payment to workers and loyalty of workers towards company. Company employs 14 workers. Currently salary ranges from 3000-5000 SDG per month (Latter for sales person; 75-150 €). A new laborer will earn 1800 SDG per month including breakfast and living for free. Last year salary increased 3 times (inflation is around 45%); in total salary increased with 40%. This year company will pay health insurance for fixed employees which is expensive and risky as it is a one-time payment in advance and if worker will leave they take insurance with them for 1 year. Hard to find reliable workers. Company pays bonuses when workers are more productive over fixed level (picking). Also loans for purchase of tv-set of

refrigerator. Each year worker of year is elected who gets 6 months bonus. Apart from picking weeding takes much hand labor; no herbicides applied.

Plants Company grows cucumbers in greenhouse with pad & fan system. Total acreage around 5000 m² (own estimate). Recently invested into new unit with higher gutter. Plants make healthy impression. Grow short type (Arab type) which is in demand on market. No demand for English type. Outdoor production of snake cucumber. Plants irrigated through drip and fertigation system. Plants show some signs of Mg/Mn/Calcium deficiency. Plants Company co-hires Egyptian advisor for 3 visits per year (paid per visit) to advice on cucumbers.

Seeds sown directly in beds in greenhouse. Some 80% germination. Extra plants for replacement are grown in corner of greenhouse. Germination looks quite regular.

Company has own well with pump and reservoir; own back-up generator to secure constant supply of electricity to run pad & fan.

Company has own cold store.

Land is rented for 20 years.

Conclusions:

- focus on local market for sales of fruits & vegetables as local demand is large and prices are attractive while quality demands are still low.
- registration of seeds and pesticides is costly and bureaucratic which will hinder modernization of sector.
- labor is difficult issue: reliability and skills.

February 3rd: Visit of open market for consumers in Khartoum

Local production from Sudan: eggplant, zucchini, carrot, red and white onions, radish (radijs en rettich), beetroot, arugula, white cabbage, potatoes, green bell pepper, various chili peppers, tomato, type of wild spinach, another leafy vegetable, green beans, gourd, garlic, dill, coriander, cucumber, melon (honey dew), water melon, banana, orange, guava, grapefruit, mango, lemon, dates, peanut, hibiscus, tamarind, roasted broad beans, sweet potato.

February 3rd: Site visit to traditional vegetable growers Nile river, Khartoum

Fields along the Nile river where traditionally vegetables have been grown have been visited. Water from Nile river is pumped up (5-6 m deep bank) with old British diesel pumps (British pumps are said to be more reliable than new Chinese ones). Farmers grow radish (rettich), potatoes, Sudan grass, arugula, okra, alfalfa.

Fields are irrigated through spate irrigation channels.

Much labor involved to open and close channels for irrigation. Fields and small channels have to be reconstructed after yearly flooding.

Hardly any fertilizers are applied: mostly urea (Nitrogen)

No application of pesticides; expensive.



Income estimated at € 500 per crop cycle. Up to 5-6 cycles per year possible. Growers sell product from field; trader organizes harvest and logistics to the market. Other scheme is that small groups harvest and transport crop to market where it is sold to middle men.

February 4th : Meeting with Mr. Mohamed Al-Bashir , Horticultural DG, Ministry of Agriculture and Food, Khartoum. Ph: 09 155 00 378.

- Discussion on potato production as most seed potatoes imported into Sudan are of Dutch origin (import since 1999). According to Al-Bashir 29 importers of seed potatoes exist (mostly from Netherlands, also Germany). Main problem in potato growing is early blight. Potatoes should be planted earlier (before November) as growing season is in winter which tends to shorten due to climate change; more difficult to plan production (planting moment). Dutch seed potatoes arrive often too late.
- Kassala is famous for tomato and onion production. Al-Bashir mentions Italian project in region. Also a lot of tomatoes are coming from Tokar (local variety), which are sown after flooding. In summer there is shortage of tomatoes (too high temperatures to grow; >45oC). Need for heat tolerant varieties. Main agronomic problem: white fly and viruses. Tokar is also known for its water melon.
- According to Al-Bashir introduction of new varieties is not a problem. Need testing at ARC for 1-2 years.
- A variety list exists. Al-Bashir promises to provide one (Esther will ask Ali). One of active Dutch companies is Poppe Vriend (trading through agent; mostly tomato). Also East West Seeds is active.
- For vegetables especially Ramadan period is interesting period to target as demand for fresh products is very high in this period.
- Production in greenhouses is gaining in popularity. Especially cucumbers are grown in greenhouses in Khartoum area. Al-Bashir estimates area of greenhouses/tunnels at 1000 ha. Al-Bashir considers investment in greenhouse technology a good idea. Greenhouse technology needs to be imported.
- No import taxation on agricultural technology exists.
- Discussion on pricing of water. Water itself is for free: any amount a farmer can take from Nile river or any other scheme. Farmers supposed to pay for maintenance of irrigation schemes however in practice this seems seldom to happen. *This is partly related to lack of ownership felt by farmers towards irrigation system/schemes which are government controlled/regulated (own remark).*
- Lack of storage facilities and post-harvest handling is another bottleneck limiting the development of the horticultural sector. No government support exists to improve this situation. Private sector concern.
- Request made for production data and pricing of fruit & vegetables in Sudan. Al-Bashir confirms that data are available. He promises to provide data at return in Khartoum. There supposed to exist also a map of Sudan with production areas of crops.

February 4th : Meeting with Dr. Adil Mohamed Elkhidir, irrigation expert, Civil Engineering Department of Faculty of Engineering, University of Khartoum (M: 0123047907, E: adil_elkhidir@yahoo.com)

Presentation on the issues related to water management/irrigation schemes in Sudan. Presentation available.

Main points:

- Sudan has 3 main rivers providing water for irrigation: Blue Nile (50 billion m³ annually), White Nile (24 Billion) and Atbara (10 billion). All three are used for irrigation and have specific schemes/dams. Largest is Gezira scheme in Blue Nile (Roseires dam). The New Halfa scheme is supplied by the Atbara river. Sudan has a share of 20 billion m³ of water of which currently 15 billion is used.
- Apart from New Halfa irrigation scheme, spate irrigation schemes in Gash Delta (Gash River) and Tokar Delta (Baraka River) are located in East Sudan. Tokar scheme needs rehabilitation which is being planned (locating of splitter) to prevent flooding of main road to Tokar in future.
- Gash scheme is used for growing sorghum by government order; 3-4 feddan per farmer. Yields are sub-optimal.
- Vegetables in Kassala are grown in rain fed agricultural part and by well irrigated plots. Problem with well irrigation is the decline of ground water level (12-70m depth). About 26,000 feddan is irrigated by wells, owned/managed by about 1800 farmers.
- Gash scheme originally had 200.000 feddan (design); currently only 80.000 feddan is used. Rehabilitation of 40.000 feddan is planned (potential is currently 120,000 feddan).
- Between Gash scheme and New Halfa scheme a new irrigation system is planned, the Upper Atbara Project on the eastbank of the Atbara River, aimed to connect both. Construction of a new dam in Atbara river for this purpose is under way (Upper Atbara-Seteit Dam?).
- Siltation, lack of maintenance and Mesquite bushes are main problems. In Tokar Delta (total area of 400,000 feddan) up to 50% is infested with Mesquite and covered by sand dunes, 16% has high salt levels, 5% is too rocky. Clean area under cultivation is about 30% or 120,000 feddan. In 2006 EU intervention project to improve situation, but main road to town of Tokar suffers from flooding. A new intervention is planned to improve the current flooding situation of the road and improve spatial water availability for a total potential area of 165,000 feddan.



- Distribution of water is not regulated within the schemes. Farmers do not pay for the water itself; only for maintenance which is problematic. Most of maintenance is done with funds from international donors.
- Prof Elkhidir has developed a water harvesting system to use a Wadi or Khor, seasonal river, for growing sorghum. Girgir Project: pilot on east bank of Gash river (East Gash Khors) was successful with a harvest of 20 sacks (1 sack is 90 kg) per feddan (approx. 4 tons/ha!). In irrigation schemes yield is 10-12 sacks; rain fed 2-4 sacks.

- Prof Elkhidir has copied his presentation for us.

Conclusions:

- Irrigation schemes mostly used for sorghum and cotton; vegetable production limited
- functioning of irrigation schemes is problematic, efficiency low.
- large potential for increase of yields exist.
- no incentives to introduce water saving technologies like drip irrigation.

February 4th :Transfer to Port Sudan

Stay in Baasher Palace Hotel, Port Sudan

February 5th : Visit to Tokar irrigation scheme.

General: Town makes run down and desolate impression. It is very windy and lay-out of streets are adapted to windy conditions. No connection to national and public electricity grid. Tokar is suffering from heavy sand storms in June-July period. Extension officer Abdelgadir Omar Ohag makes an active and knowledgeable impression.

1. Visit to regional office. Meeting with Mr. Hassin Isa Arteka, General director of Tokar irrigation scheme and Mr. Abdelgadir Omar Ohag, M: 09 128 023 65 E: abusulafa@hotmail.com, extension officer

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In recent years farmers shifted to vegetable growing. Tokar is known for tomato production.

Main problem is marketing of production. No organized system. Traders come to purchase products. In main season prices are very low. Farmers get just enough to survive. Also storage and postharvest handling in general is lacking. No export of products. Like to develop.

Tomato juice factory established with EU funds was never operational and needs renovation. Currently a training center is finalizing its construction works, funded by Italian Cooperation. The center will offer training to women with respect to food processing & nutrition.

Pilot done to introduce banana production with support of South Africa (plant material). Fields outside irrigation scheme.

Production is organic; no pesticides and fertilizers are said to be used. Investigate options for certification.

According to government regulations farmers should grow 50% cotton, 40% sorghum and can grow 10% vegetables on irrigated land. On land irrigated with water from wells more than 50% is used for growing vegetables. In practice farmers grow much more vegetables on irrigated land in scheme. Production of vegetables much more profitable than cotton and sorghum (of which prices are regulated by government). Because of different climatic conditions (clouds, windy, thus cooler and different rainy season), vegetables can be grown in Tokar during the general Sudanese off-season, fetching good prices.

Recently an informal group of interest of vegetable farmers has been organized.

2. Visit fields of small scale farmer Ahmed

Total area 5 feddan. Growing range of crops. Vegetables in square plots of approx. 15-15 m surrounded by sorghum and lentils. Production of lentils is new; good market in India. Sorghum, lentils and millet protect vegetable crops from winds.

Vegetable crops include tomato, chilli pepper, eggplant, bell pepper, okra, pumpkin, some onion. Grow mix of tomato varieties. Crops look quite healthy. Some signs of lack of nutrients (probably Mg/Ca). pH level is not known. Problems exist with controlling white fly and tuta absoluta in tomato and termites in general.

No pesticides/fertilizers are used. Seeds are bought from traders from Kassala and Khartoum. Expensive (200 SDG /box). Seedlings are raised in small nursery before planted out in field. Plants are planted in small holes. After planting irrigation is needed with water from well. Requires much work. Farmer has own well: 14 m deep, operated by hand. Construction done by hand; cost 2000 feddan.

Tomatoes are sold in wooden crates of 12 kg on local market to traders. Price per crate varies between 20-40 SDG.



3. Visit to farm of private investor: Mr. Mohamed Hasin (related to Ibrahim from Khartoum) and Mohamed Abdullah.

Farm has 120 feddan acreage. Mohamed Hasin started farming last year with mechanization. Gained first knowledge from internet. Testing teff (export to Eritrea, high price) and peanuts and grows also sorghum, vegetables and lentils (export to India). Teff looks very dense; should stretch to form stems and ears. Peanuts look healthy.

Grew water melons/ melons. Production suffered from white fly? Use of pesticides seems to be limited by local government. Organic protection against white fly is very hard. As farmers use no pesticides nothing is available locally. Growing sweet pepper/still young field. Density is rather low. Agronomical knowledge for large scale vegetable farming seems to be lacking (no expert present; use info from internet and local knowledge of farmers). Future products Mohamed Hasin intends to orient for export market.

Invested in large well with diesel pump: 30m deep (deeper will catch salt water from nearby Red Sea).



Conclusions:

- Development will require organizing farmers for joint sales to reduce dependence on traders and catch large pie of production chain.
- Own sorting, packaging and storage will be important.
- Opportunities for organic production. Certification though will be a challenge and require organization of growers in groups/farmers union. Local government seems to be supportive to this idea.
- Future market will be Port Sudan and export to Saudi Arabia. Possible Khartoum for organic product (Tokar as brand name?)
- Larger investors like Mohamed Hasin can be motor for these developments tacking along groups of smaller farmers when initiating export.

Stay in Jebel Alsit Resort, Erkowit/Arkawit

Erkowit is located about 1500m above sea level. When we arrive in the evening it is cold, humid and misty, which seems to be typical for a part of the year. Temperatures range from 10oC to 25oC during daytime in the course of the year. No connected to national and public electricity grid.

February 6th Visit to government demo farm A & B, Erkowit, Mr. Mohamed Alameen Machmud El Kait, agricultural engineer. Ph: 09151 94956

The government farm managed by mr. El Kait serves as a demo unit to show growers in the area on new crops and new growing techniques that are less common for Sudan, due to the different local climate conditions. The demo farm A has 18 feddans, located next to a wadi in the town. Water is derived from a well in the wadi river bed. The farm has rather light, sandy type of soil, most likely with low organic matter content. Plants suffer from lack of nitrogen. Most likely also potassium.

At the farm A demo plots of tomato, citrus, garlic, cabbage and other vegetables are located. Tomato and garlic demo are organized through Italian project, EU funded with main office in Kassala. The tomato varieties are grown along sticks up to 2,5 m height. Production 30-40 fruits per plant (around 5 kg). Planting distance: 0,30 m in row, 0,40 m between plant rows and 1 m between beds. Between 2 lines in bed plants are grown on side of small ditch which is used for irrigation. Far from optimal as with irrigations

plants have wet feed for a long time with increased risks of soil borne diseases esp. pythium. Plants suffer from blight (Phytophthora). Snow peas and sugar snaps don't grow well. Furthermore are grown: bell pepper, radish and carrot. The citrus is not developing well. Neem is used as natural remedial against pests.



Climate conditions are rather mild with max. of 25°C and lowest temperatures around 10°C. In October-April period many times fogs occur causing wet leaves.

On 2nd field grape trials are done and pomegranate is tested (also Italian project). Grape (white table grapes are planted in April last year. Look in bad shape. Majority is not growing or already dead. On both farm experiments with cuttings are done (oranges, jojoba). Osman purchased new variety of mint (Egypt origin).

General remarks: town makes remote impression (due to misty weather also rather depressed). Few places seems suitable for farming; very rocky, mountainous terrain in general.

Conclusions:

- soil and climate conditions favor production of crops like (seed) potatoes, carrots, cabbage,
- opportunity to grow tomatoes for off season to Khartoum (April-July) when market prices are high. Preferable under poly-ethylene cover/ simple tunnel (with side ventilation) which is possible under the indicated prevailing climate.
- in area also strawberries and fruit crops like plum, apricot and cherry could be tested/grown.

Transfer to Kassala. General: country side makes very dry impression. Harvest of sorghum in Gash in full swing.

Stay in Tulus apartments Kassala.

February 7th 2017

1. Visit to Agricultural Research Station (ARC), Kassala. Meeting with director Mr. Abdullah Al Sahid.

Mr. Al Sahid introduces himself and the station. He has studied in Norway and has a PhD in banana production. The ARC started with trials on onion for export in 1997. Since 1995 the station is dealing with research on horticultural crops. The station has 10 scientist with specializations in irrigation, pest & diseases, agricultural engineering and agronomy. The tasks of the station are:

- research (on new varieties, production technologies)

- prepare technology packages
- training extension officers

The ARC itself doesn't provide extension services. This is done under the state government at the Knowledge Transfer/Farm Extension department. Extension/farm advice is organized by donor organization and extension department through farmer field schools.

ARC is focused on adapted research for small scale farmers: sorghum, sunflower, maize, citrus, banana, onion, tomato, potato and melons.

The ARC station in Kassala has laboratory to analyze soil samples on macro-elements, pH and CEC. Micro-elements can be analyzed at the headquarter of ARC in Wad Medani (in future to be moved to Khartoum).

Kassala region has 2 types of soil: Gash and near riverbanks: silt (light clay); away from river basin heavy clay (black cotton type). pH of soil around 7,5-7,6 (director didn't know but checked with agronomist). Water analysis is done/can be done by drinking water organization; not at ARC.

Some experiments have been done with drip irrigation. Few farmers apply as it is an expensive investment.

Inputs like pesticides, fertilizer and parts for pumps are locally available. Drip irrigation has to be delivered from Khartoum; no local presence as no demand exists yet.

Discussion on banana production: station has introduced two new varieties next to dwarf Cavendish (80% of production in Sudan): Williams (Giant Cavendish) and Grand Nain (also known as Chiquita banana). The ground water table is dropping in Kassala. Banana cultivation is huge consumer of water and drip irrigation is required.

Discussion on farmer productive societies (cooperatives). Federal government has declared Farmer Union as illegal in 2016 and is now pushing farmers to form farmer productive societies or cooperatives. Such structure should have at least 7 farmers as a member. These cooperatives can apply for joint credits (to finance inputs, capital investments), organize joint sales, operate jointly equipment, arrange jointly input supply. Farmers in Kassala are reluctant to form such cooperative structures.

Discussion on problems in main crop onion. In Kassala farmer grow onions in off season with water well & pump irrigation: planting aug-sept and harvest end of winter (dec-feb) to fill market gap (most onions are grown in River Nile state and to north). The season though is short and depending on weather conditions. Onions are harvested rather pre-mature (not well dried yet) which limits possibilities for (long term) storage. Quality problems.

In Kassala no nut crops are grown. No research done on these crops. Few trees are located at University farm. In New Halfa experience with peanuts.

Prospective crops: banana, tomato, potato, onion.

A new mango variety is introduced: Tommy Atkins (growing material from South Africa). Around 100 trees are at the nursery of the university. Sudanese government is pushing the production of mango (is said to be huge market in Saudi Arabia). At government nursery near Khartoum (Zadna) a million seedlings are produced. Through Sudan Agricultural Bank farmers can get a 7 year's loan to invest in mango (2 years grace period). Also chili pepper and citrus production is said to be promoted by federal government.

Notes: ARC makes rather run down impression. Not much activity going on. Not much pro-active attitude.

2. Meeting with Yusuf Abdirahman, Yusuf.s.abdirahman@gmail.com , Dutch Somali student staying in Kassala at ARC office in frame of practical period for **NSAL potato project**. Yusuf is in Kassala since November 2016 and will stay till half of March 2017 (after potato harvest).

His main task is to collect market data on potato (in addition he collects also data on tomato and onion). Apart from that he is monitoring the demo-fields and preparing a small manual on potato production in Arab language based on the PP presentations of Dutch experts on trainings performed in March and December 2016.

Prices of potato: November 10 SDG/kg; now 20 SDG (Local market); approximately 50% is paid to farmer.

Tomato: 0,5- 3-4 SGD/kg. Big fluctuations from one to other day; there is no storage or processing in Kassala. Onion currently 550 SDG per unit of 180-200 kg. Two weeks ago: 850 SDG.

Main bottleneck in potato production is lack of suitable storage in Kassala: nothing is available. In Sudan storages exist in Khartoum area and along Nile river to north. North state is main production region of potato: high yields (up to 60 tons according to Ali). Also in Eritrea potato storages exists; production conditions there better (highlands/lower temperatures). Eritrea potatoes are available on local market in Kassala (black skinned according to Osman) when no Sudanese are present (border seems to be open and not much controlled. Lots of illegal trafficking of goods and products).

Main pest & diseases in potato cultivation: white fly and early blight (alternaria). No late blight (phytophthora) or bacterial wilt (infection pressure is too low). No problems with nematodes (virgin fields) and other soil born infections.

Project experts provide fertilizer recipe for demo fields based on soil analysis done in Netherlands. Common fertilizers are present (Ammonium sulphate, Urea , potassium nitrate, and different formulae of NPK (NPH MgO). Later are expensive: KNO₃ 750 SGD/25 kg; Urea < 300 SDG/50 kg. The potato demo fields are totally mechanized.

3. Visit to local vegetable market.

Current location is rather new: newly developed by local government. Traders rent space (shop) for 5000 SDG entrance fee and 200 SDG monthly fee. High covers on concrete platforms (2), surface around platforms not covered; will be muddy and dirty during wet season,.

Large range of fruits and vegetables available. Citrus (lime, orange), tomato, onion, okra, potatoes. Price of okra around 15 SDG/kg, tomato 140 SDG/35 kg, potato 10 SDG/kg) from North Sudan (large potato, light brown skin, part affected with damages from nematodes/grubs?). Tomato is supplied from Tokar. Red onions are harvested in Kassala.



4. Visit to local dealers of fertilizers, pesticides and seeds.

CTC Kassala. Quite well stock, employees/owner provide on spot advice. Against white fly he advises to use Chinese confidor copied product (imidachloprid) at rate of 1 cc /10 l. Rldomil type of fungicide (against blight) is present (Mancozeb). They sell tomato seeds in cans of Dutch origin (from USA): 170 SGD per 100 gr. Fertilizers: bags of different formulae of NPK: 18-5-5 300 SDG/25 kg and 10-50-10 750 SDG/25 kg bags.

Osman informs that some 5-6 similar shops exist in Kassala town where farmers can buy similar inputs.

5. Visit to potato demo-field at Agricultural University (located near banks of Gash river).

Apart from Dutch potato demo (0,5 feddan?) in same area also demo fields of Italian managed EU poverty alleviation project are located: tomato varieties on sticks, sugar snaps and French beans. Tomatoes demo makes poor impression: not well managed, not much fruits; sugar snaps seems to suffer from heat, French beans look very well. Seems suitable crop under hot local weather conditions.

Also greenhouses with pad & fan are located at this territory. Not being used. Climate conditions look quite extreme for greenhouse based production (outside temperature around 35 °C). Need much ventilation and therefore high costs of electricity.

Potato demo field looks well: clean, well looked after. Local varieties heavy infected with blight. Need to be harvested shortly. Grown for seeds and harvested March last year (not being stored under proper conditions, therefore comparison with “fresh” Dutch seeds is not really possible). Dutch seeds are quite healthy, nice dark green with blight infections but not too severe. Number of stems could be more. Taking this into account yield estimate between 25-30 tons/ha.



6. Visit to Dutch potato demo at farmer Mohamed Achmed Khali.

His main production is citrus (4000 trees, planting distance 10 x 10 rough estimate; approx. 10 feddan) under well irrigation. Also milking cattle (mixed Friesian/local breed; seem to stand local, hot weather rather well) and growing of fodder (alfalfa). Demo field looks fine (quite similar like the University field), farmer provides land, ARC takes care of crop management (inputs supplied by project?). Soil seems rather dry; irrigation should be done. Blight is present as well as some white fly. Not much. Crop will be productive till harvest which is scheduled for begin March. Similar yield estimate as at the university demo plot.

7. Visit to field of red onion where harvest is on-going.

Production is based on share cropping system: farmer operates land and carries out crop management and field works while owner provides land, sometimes seeds and fertilizers. Farmer is in charge of irrigation (from well) and crop protection. Revenues are shared: 60-40% is common. Also costs of inputs will be share in same division. Landowner can also provide labor. Sometimes land is only rented (2000-5000 SDG/feddan) from local community and farmer with investor produces the crop (sharing costs and profits as well as losses).

Commonly the harvest is organized by the trader buying the onions: ladies to harvest and collect onions; men to pack and thigh bags and load trucks. Women are paid 12 SDG per plot of 5 x 10 (1 hod); 5 plots per day are harvested while they are allowed to collect 2nd quality. Around 80-90 SDG per day can be earned. Men are paid per haddad: 2 sacks of 90 kg: 50 SDG.



Estimated yield: 240 sacks/feddan. Price per haddad is determined at end of the day by phoning to Khartoum for price. Currently around 300 SDG. Total harvest costs are estimated at around 2000 SDG/feddan.

8. Visit to fields of Mr. Idris Taha. Large scale farmer, involved in potato project as previous demo field was located on his land. He owns around 400 feddan. Main cash crop is banana: 100 feddan growing near Seteit dam in Atbara river near Shuwak. At visited location Mr. Taha is growing citrus (orange, lime, grapefruit), mango and type of local “apple”.

Citrus gives yield throughout the year. Different crop stages can be found on 1 tree. Blossoming is induced by restriction of water after which irrigation is intensified. Fields are irrigated by water from wells (with Chinese pumps, cheap but low quality, many replacements required). Ground water level is declining, leaving questions how long such production system will be possible.

Citrus are older trees and not pruned. Orchard floods up to 4 times a year: cheap system of irrigation and fertilization.

Local apple is plum type fruit (with stone); green, bit fresh taste; small local market. Not interesting for export.

Mangos are planted rather recently. Still small and not in production.

Mr Taha is interested to try out new crops. Pistachios can be an option: potential cash crop with large demand in middle east. Production is declining in Iran, main producer and exporter. Needs to be tested whether crop can grow in river flooded system like Gash. Will take 4-5 years before nuts can be picked. Only interesting for investors, large local farmers.

Partner of Mr Taha: Mr. Hassan Bashir Hassan 09 632 494 74.

9. Farmers discussion meeting

In the evening in the garden of the farm estate of relatives of Ibrahim a meeting with main farmers from Kassala area was organized. In total 4 farmers were present apart from the mission team and Yusuf:

1. Mr. Ali Abdin (and son): 170 feddan: citrus (orange., lemon), banana, onion, tomato, mango (Tommy Atkins and Kent supplied from South Africa). He started this season to grow potatoes from local seeds after participating the training of Dutch experts last year. Crops is said to grow well; Mr. Abdin is satisfied. Says to have enough information to manage crop. Harvest is expected end of month. Several more farmers seem to have started up potato production following the Dutch initiative (the number of 10 was mentioned?).
2. Mr. Osman Mohamed Karamala: 100 feddan: citrus (grapefruits, lemon), banana, onion, tomato and okra.
3. Mr. Mahayah Ebehadallah: 70 feddan at several locations: guave, oranges, lime, mandarin, banana, onion, tomato and past alfalfa in orchard with small trees.
4. Mr. Idris Taha: 400 feddan: banana (100 feddan), oranges, lemon, mango, local "apple", onion, tomato, chili pepper, eggplant and okra.

Main reason for growing wide range of crops is spreading of risks both from production and market point of view.

Discussion on needs to develop horticulture in region:

- Local food processing to add value to produce, especially during winter period: commercial companies. Business plans needs to be prepared for units to produces juices, dry fruits & vegetables. Farmers are willing to participate themselves as shareholders if business case is clear. Currently no food processing operational in the region. Dutch past initiative currently in hands of military and used to process juices on basis of imported concentrates. Whether or not it is in operation isn't clear. Other initiative is a small pilot unit to dry fruits & vegetables for Japanese project (JICA) but this is too small for commercial operations (capacity: 3ton raw material).
- Information and training of storage, packaging, quality standards, certification for export. Long discussion of requirement for banana export based on experience of Agrofair in Latin America, Senegal and Sudan. Scope requirements and seriousness became clear to participants. They realize there is a long way to go. Farmers ask if Agrofair can offer trainings to improve banana cultivation. Comment is made that mango cultivation requires less water compared to banana cultivation.
- Lack of affordable seeds, good and affordable fertilizers and sometimes quality pesticides. In Sudan nothing is regulated in this area. As most (if not all) has to be imported and exchange rate is deteriorating costs keep on increasing. Quality is not checked.
- Services for field operations: esp. spraying. Commercial soil and plant lab does not exists in Sudan; might be a good option, if includes also advice to farmers.

Discussion of set up of production societies/cooperatives to perform joint marketing, sales, storage as well as input supply and contract services. No joint opinion, strong sense to work together seems to exist.

Farmers express willingness to pay for training similar as provided in the potato project.

Comment: in past municipality of Kassala had a partnership with municipality of Amsterdam.



Farmers meeting Kassala

Conclusions:

- climate in Kassala is very warm and even higher than expected on forehand.
- greenhouse based production is therefore no option; only production under shade nets can be considered with drip irrigation as a next step to intensify production of crops like tomato, sweet pepper, melons.
- potato growing at production levels of over 30 tons per ha seems hard under the prevailing climate conditions therefore being less competitive than production from north Sudan and Eritrea.
- priority area is post-harvest handling and value addition to crops (storage, sorting, packaging, drying): packing stations for fruits & vegetables; processing units of fruits & vegetables: dried tomatoes/onions/okra/chili peppers.
- large need for water efficient irrigation technology: ground water levels are declining putting the future of well irrigated agriculture (bulk of horticultural production depends on well irrigation) at risk. Water supply through movable tubes instead of open channels, drip lines near trees, efficient, small and solar powered pumps, simple fertigation units, covered water tanks/basins (malaria risks!!). Such technology needs to be demonstrated locally and linked to commercial initiatives to secure after sales service. Introduction of pricing of water will stimulate farmers to adopt water efficient technology. Advantage of water efficient technology is that it will contribute to higher efficiency in use of fertilizers, higher yields and increase crop quality.
- there seems to be a need for spatial planning in area surrounding Kassala where most horticultural production is located.: which territory for real estate development, which territory for horticultural development and pastoral cattle grazing.
- citrus production far from optimal due to lack of pruning and fertilizer application. Though not investigated into detail general level of agronomical knowledge seems low. Much scope for improvement. Effectiveness and knowledge level of current extension system is questioned.
- several demo-field have been visited while others of international donors/regional organization have been spotted. Many seem not to be managed well to bring up the desirable results in particular in long-term. Need for more sustainable and market oriented approach.
- looking to the climate conditions the possibilities to grow nuts (pistachios, almonds) could be investigated.

February 8th

Visit to head of state horticultural department was cancelled due to other obligation on her side. Former Farmer Union representative active to mobilize farmers for cooperatives doesn't answer phone for short interview. Lack of time prevented visit to nursery of Osman.

1. Short visit to mango field Osman has established on land of relatives at skirts of Kassala

Field of approx. 2 ha planted with mango (Tommy Atkins) in intensive system (6 m x 4 m instead of 10 m x 10 m) with alfalfa as under crop. Very good lay out and good idea however implementation is less. Quite a large number of mango trees are suffering or already dead (est. 30%). other grow irregular and some very nice. Problem can be birds shitting on young branches and growing points (birds feed on caterpillars in alfalfa). Mangos planted in April last year. Irrigation is from wells; spatial irrigation for alfalfa growing.

Alfalfa is grown by other farmer who harvests crop for fodder; separated from mango cultivation. No direct control on mango apart from occasional visit of Osman (who provided plant material from his nursery). Land owner is not actively involved. Initial pruning of trees is recommended.



2. Short stop at Italian office from where **EU Poverty alleviation project/Improvement of sustainable livelihoods** is located.

Italian agronomist Alessandro Valgimigli is not present (in Port Sudan); alessandro.valgimigli@coopitsudan.org . Contact by e-mail to ask opinion on development options horticultural sector. Project period 2016-2018. Italians run also several EU funded health care projects from same office. A small nursery is at the office located with fruit trees and vegetables.

In neighborhood of office of Italian Cooperation in Kassala, a lot of offices of the international development community occur like WFP, UNDP, Plan International, Brot fur die Welt, FAO, etc.

Travel to New Halfa.

3. Short stop-over at Arab Sudanese Seed Company, meeting with Mr. Ali Hassan El Iman Ali, director El Girba Station; M: +249 11 8093108, E: asscoseed@hotmail.com.

Station used to grow vegetable seeds. Production stopped due to two reasons: farmers prefer to buy imported seeds over locally produced seeds and vegetable seed production requires isolation and much labor.

Station now focusses on production of seeds of sorghum and sun flower (varieties Sencor, Bruce1)

Sunflower production is getting popular as it has a good market. It can be grown on rain fed and irrigated plots. Two crops per year are possible with production of 0,9-1,2 tons per feddan. Production takes 100 days. Main planting done in July.

Horticultural crops with potential:

- okra (export to Saudi Arabia, variety KoraKoru, spineless, good transportability)
- tomato
- onion

4. Meeting with farmers at New Halfa Corporation

Names & background of farmers: Mr. Warrag Abdelruman (New Halfa Corporation Extension worker), Mr. Mohammed Ali Nimir (New Halfa Corporation; Ph: 0123 999 420), Saleh Ibrahim Ahmed (New Halfa Corporation), Hassan Saber, farmer and Abdel Rahman Dawood, veterinary consultant (E: a.rahmandawood@yahoo.com) .

Apart from working directly for the Corporation people have their own plots for farming. Corporation employs around 700 persons. Corporation has own extension service. Farmers pay every year fixed fee for services of corporation (SDG 800 per 5 feddan) and additional fees for specific services.

Land of the New Halfa scheme can be separate in several types:

- Land for New Halfa Sugar Cane factory (governmental company)
- Land managed by New Half corporation: 330.000 feddan. Corporation grows ground nuts, sorghum/wheat and cotton in rotation.
- Private land: 25.000 feddan mostly on south part of scheme given to Halfa settlers to compensate for their loss of land. Each family received same acreage as they were farming in Halfa before Aswan dam was built in Nile by Egyptians. Farmers are free to decide for which to use this land; many grow vegetables: okra, tomato, snake cucumber, eggplants, onion, watermelons and sweet potato. Currently very few fruit trees, but in future probably more like citrus, mango and dates.

Apart from 25.000 feddan of settlers another 15.000 feddan is privately owned by former pastoralist on whose land the New Halfa scheme has been developed. Most of this land is used by corporation to grow cotton, ground nuts and sorghum, however farmers can use this land for vegetables.

Water supply is done in stages according final irrigation unit. In past used to be water shortage, but with the construction of a new dam in Ethiopia enough water is available to irrigate whole year round. Soil in New Halfa scheme is heavy clay (black cotton) layer in upper 2m above sand. The soil is not as good as in Gash/Kassala (silt, loamy soil).

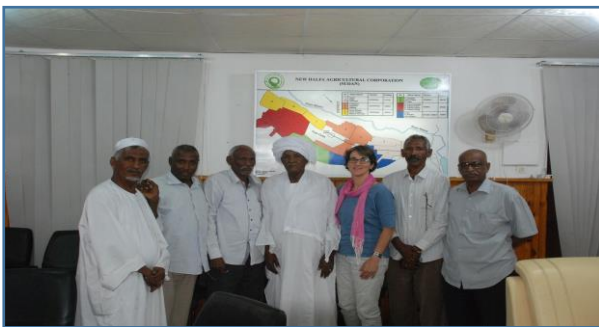
Farmers like to grow more fruits as traditionally in Halfa they used to grow fruits. Options now to plant mango and citrus with support of government (seedlings from Zadna nursery, Khartoum). Aim to grow 50% fruits and 50% vegetables (intercropping is option). Apart from growing vegetables farmers have cattle that feed on remains of sorghum crop.

Discussion on needs:

- extension service: knowledge of modern production of vegetables
- production plan for growing vegetables: currently all farmers grow same crops at same time causing oversupply. Crops need to be divided among growers and targeted to market demand.
- 5000 feddan (or more) is available for partnership with foreign investor for demo/export production.
- lack of finances.

Farmers are positive to create producer societies/cooperatives as successors of Farmer Union and started already organizing in small units that can be associated at a second level. Task of cooperatives:

- Collectively purchase and use of equipment
- Joint production planning (smallest unit is 80 feddan due to irrigation requirements)
- Joint provision of inputs: seeds, fertilizers and pesticides as well as training and technical assistance
- Joint credit applications
- joint marketing (sales, storage, sorting, packaging)



The settlers from New Halfa, originating from Halfa in Northern Sudan, close to Egypt, have a tradition of collective action: they have joint wheat mills and a joint public transportation system.

Potato production in New Halfa is not successful as the soil is very heavy (demo field with NSAL in past). Temperatures in New Halfa range from 20°C to 45°C. Sweet potato are growing well. Local varieties are grown with white inside color. No fertilizers or pesticides applied. Sales to Khartoum. Price of sweet potatoes up to 7 SDG/kg. Demand for sweet potato is growing in Western Europe: maybe a market opportunity. Option is to grow for organic niche market. (Agrofair is developing this market segment).

Note: Owner of DAL group, Osama Daoud is from New Halfa

5. Short visit to exposition room of New Halfa Corporation.

Exposition has a strong focus on eradication of mesquite tree in New Halfa and surroundings in favor of the cultivation of commercial and stable crops. Indeed, we have not seen mesquite trees in the area we passed. Along the main canals of the irrigation system forestry trees are planted like eucalyptus with the purpose as wind singles as well as shading to reduce weed growing in the canals. Pastoralists of Gash region are not anymore welcome for grazing cattle in New Halfa region, due to strong implementation of policies to manage eradication of mesquite tree, avoiding feces with mesquite seeds.

6. Short visit to New Halfa local vegetable & fruits market.

Market of fruits & vegetables and different cattle located on main road on outskirts of New Halfa town.

Prices of presented crops: okra: 5 SDG/basket of est. 750 gr, tomato 15 SDG/est. 1,5 kg, potato 10 SDG/kg (from northern Sudan), green bell pepper: 80 SDG/5-6 kg container.

Price data are difficult to collect as many different packaging sizes are on market; no uniformity. Nothing is sold per kg. Quality of crops at end of market day still quite good. Quality of sweet potato rather low with damages; no uniformity.

Conclusions:

- Intensive system of fruit production in Kassala with higher number of trees per ha and smaller trees (pruning!!) is being introduced in combination with alfalfa growing. System with high potential though implementation and dissemination needs more attention.
- Farmers at New Halfa have more collective attitude which would increase the chance of successful joint marketing and post-harvest initiatives
- Potential crop for developing export chain: sweet potato.

Transfer to Khashm El Girba. Overnight stay at house of Abdulah Hasin, relative of Ibrahim.

February 9th

Khashm El Girba is more or less centrally located among a string of 6 refugee camps. North of the town of Khashm El Girba the New and Old Girba refugee camps are located, 26 km towards New Halfa (Northwest) the Kilo 26 refugee camp and to the southeast the Shagarab I, II and III refugee camps are located of which Shagarab I camp the reception camp is. The camps exist already since the mid-80s. Initially with Ethiopian refugees because of the civil war and currently several hundreds of refugees arrive daily from mainly Eritrea.

The co-existence of refugees and the local population is said to be peaceful. Very few conflicts seem to arise. The presence of the refugees has a positive impact on the local economy (local shops/retail in town of El Girba). Refugees provide labor for local farming activities (labor costs are 50-80 SDG/day). Refugees cannot own land but hire land. A lot of refugees cultivate crops with share-cropping.

Some farmers of Khashm el Girba possess as investor land in the New Halfa irrigation scheme.

1. Meeting with local farmers/leaders.

Mr. Mustafa Hassan Mustafa: local farm leader; owner of 70 feddan on island in Atbara river of which 25% is used. Mr Mustafa is growing onion, bananas, citrus and has a fish pond.

Mr. Mohamed Ali Husein, working in logistics for Nahmash Company: Sudanese-Jordanese joint-venture growing 60 feddan of banana (Williams (giant Cavendish), Grand Naine and Chinese Cavendish? (dwarf Cavendish)), for export to Jordan for 5 years. Land is leased and company has invested in infrastructure, including irrigation. Agrochemicals are imported from Jordan. During harvest, banana clusters are cleaned with air, carried to the post-harvest facility where they are washed and packed in plastic bags vacuumed in carton boxes. The company operates its own cooled trucks from the farm to the harbor of Port Sudan. Apart from this plot the company has several other production locations in Sudan. Apart from banana the company also buys mango and water melons for export. There is no knowledge exchange. Apart from the company, Mr. Husein owns 60 feddan on which onion, water melon and fodder crops are grown. He keeps cattle (partially Friesian) for milk and meat.

Mr. Abdulah Hasin (homestay owner): sorghum, sesame seed and cattle.

Mr. Rashid Abdulah Mohamed: land owner with share cropping: eggplants, herbs and green pepper on island.

The local community has 500 feddan mostly used for animal production: sheep and cows and bananas grown by outside investor.



Visit to Atbara Island: part of land not used for several years. Look for outside investor. Total cultivable acreage is 3000 feddan of which more than 1000 is suitable for horticulture. Soil very diverse: from good quality silt and heavy clay to stony sand. Island accessible through river during dry period. During rainy season by boat.

Level of production is low: citrus not pruned, no fertilizers, limited weed control. Fish pond full with algae; no aeration of water. Level of agronomic knowledge low.

Onion is said to be the most profitable crop next to eggplants and sweet pepper. Sales to local market and Khartoum. Dried okra (weka) is also sold to Eritrea (along with product from New Halfa). Difficult to compete with New Halfa. Eggplant and sweet pepper said to have competitive advantage. Okra and tomato are sold to traders, onions are sold directly by farmers.

Produce cooperative is in process of establishment; cooperative can serve for joint marketing, collective loans and joint purchase of inputs. Local processing doesn't exist; there is a good experience in cooperation with a bakery to dehydrate onion, okra and pumpkin. The farmers are not afraid for external sanctions with respect to import and export, but they fear internal sanctions like local taxes, fees and marketing.

Remarks on export of banana:

Export is heavily taxed: Zakat (2,5% Islamic tax for poor) custom duties, fees for quality standard & measurement organization and fee for crop management. These fees and taxes can go up to 35%. In addition each state is imposing state levies mostly linked to transportation and logistics across a state towards the export harbor. This costs are carried by the transportation company and included into the transportation fees.

2. Visit to local farmer Showak, banks of Atbara river.

Farmer of Nigerian origin. Total acreage: 9 feddan of which 6 grown with banana (dwarf Cavendish); remaining acreage grown with sweet pepper, okra, some chili pepper, few lime and mango trees. Different vegetable crops are grown for spreading risk of marketing.

Products sold locally. Income from farming activities said to be low. Price for sweet pepper 5-10 SDG/kg. Most income derived from renting out land near Atbara river for preparation bricks: 10.000-20.000 SDG annually.

Irrigation is with pump from Atbara river; now during dry season fields 3-4 meters above river water table. When river is high fields can be flooded!

Farmer has many questions on banana growing. Though large share of his land is grown with bananas practical knowledge on banana growing is low: no pruning done; too many side stems, very dense crop standing. Questions on fertilization and cutting of leaves. No local expertise/extension to be available. State of other crops irregular and much to be improved.

Banana still rather young plantation; fruits are developing.

Son is running small shop in Showak for supplying spare parts of pumps and related inputs.

Visit cut short due to request of Minister of Agriculture of Gedaref state to pay him a visit as soon as possible.

3. Visit to Gedaref state Ministry of Agriculture, Meeting with Dr. Abdalla Suliman Abdalla, minister of agriculture Ph: +249 123220533/912363539; E: asasgedrf@gmail.com / agricmi@gmail.com . Meeting is joined by head of horticultural department Mr. Asheri Abdel Uhap, +249 122 461 524. Later his colleague, minister of animal production, joined meeting.

Minister studied in Wageningen for PhD.

Introduction of minister on horticulture in state of Gedaref.

Potential for development high but currently not much developed. Potential in east on banks of Atbara river and in west near Rahad river, which is a seasonal river. Production development limited by availability of water. Plans for dams in Rahad river to harvest water are in preparation.

Average size of farms is 5-50 feddan along the rivers with large farms in between mostly growing sorghum.

Potential crops: citrus, tropical fruits, all kinds of vegetables in west; banana and vegetables in east.

Gedaref state stimulates development of horticultural production.

Attention points:

- improved water usage: drip irrigation/water harvesting technologies.
- post-harvest handling/storage: nothing available.
- processing of fruits & vegetables: nothing available.
- training & consultation: improvement of agronomic knowledge, pruning.
- availability of seeds and plant material.

4. Meeting with 2 farmers from Gedaref. Mr. Omar Abdullah El Wein from Um Diblu (far south, close to Ethiopian border) and Mr. Adil Mustafa El Badouin from Asar.

Mr. El Wein is of Western Sudanese origin (people moved to Gedaref in 1984 during severe drought).

Average size of farms in area: 4 to 5 feddan. Production is seasonal depending on seasonal rivers. Ground

water level is shallow and suitable for well irrigation with pumps. Implements water harvesting techniques since last year.

Growing pumpkin, tomato, eggplant, peppers.

Casual workers come from Ethiopia (former refugees who returned after regime change) as well as refugees from Eritrea and Somali.

Bottlenecks:

- Proper post-harvest handling is lacking and products are very perishable due to more humid climate conditions
- Specific horticultural equipment (tractors for large scale farming are not suited) as manual work is very heavy
- Traders dominate sales market: price gap of 25%

High potential crops: potato and banana.

Mr. El Badouin is from Asar, 62 km west of Gedaref town. In his area the average farm size is 9-10 feddan. Production is rain fed with additional water from wells (12-20 m depth are drying otherwise 55-100m). Using electrical pumps of Danish/German origin. For deep well submerged pumps are required. Available electricity is however only for human consumption, thus solar power might be option for water pumps. Due to electricity problem, currently only rainfed agriculture. Soil is black cotton soil: heavy clay.

Water wells are originally only for drinking water, but as new public drinking water infrastructure is ready, water wells can be used in future for vegetable production. Also Rawad irrigation scheme will become permanent irrigation. If area under vegetable production increases, there exist the fear of oversupply of market.

Main crops: tomato, eggplant, citrus (lime, orange) and guave and mango in Rahad region.

Bottlenecks:

- Over supply of market; need for local food processing and storage and packaging.
- Lack of information and research on varieties and pest & diseases
- Currently no horticultural specialist in Gedaref state and no extension services
- Quality of plant material: citrus seedlings from Khartoum are virus infected.
- Lack of information on local market situation
- Inputs are available, but of low quality like Chinese pumps, due to sanctions.

Past farmer unions. Currently farmers are forming cooperatives.

Potential crops: citrus (lime, orange, grapefruit) and bee keeping (honey).

Osman suggests to look into possibilities for simple and cheap processing like dehydration of hibiscus, peppers, onion, okra, chickpeas, etc.

Conclusions:

- in order not to disturb the existing co-existence and integration, development of future economic activities should involve both original local communities as well as refugees.
- level of crop knowledge/agronomic knowledge is very limited.
- Gedaref state ministry shows positive and actively supportive attitude towards development of the horticultural sector, which is quite a new sector in this state.
- though not seen much or mentioned particularly the local climate conditions provide good opportunities for growing chili pepper. Dried chili pepper can has export potential.
- hibiscus production and processing should be investigated.

Stay in El Motwakil Hotel, Gedaref town.

February 10th Visit to farmers in El Faw/Rahad river basin.

Mr. Abdullah Rhamtilah Mohamed Ahmed. Large scale farmer and deputy chairman of Gedaref Parliament.

Size of farm: last year growing 8000 feddan of sorghum. Apart from seeds also selling fodder as well as keeping animals. Land location in south part of Gedaref state. Yield of rain fed land: 5 sacks per feddan (100 kg/sack); irrigated land: 10 sacks/feddan. Price per sack (government) 250 SDG. Price was stable last 4 years. Price of fodder per feddan: 50 SDG (some years up to 500 SDG).

Harvest is done mostly manually (harvest machines are present but have substantial losses). Per person 2 sacks per day can be harvested @ 40 SDG per sack.

They have own sowing machines (TT15 and TT75; said to be of Dutch origin). Harvesters can be rented.

Sunflower production is not supported by banks to provide credit to purchase expensive seeds.

Mr. Abdullah likes to organize study trip to Netherlands to see modern technology to grow vegetables.

Water supply in El Faw from side channels of Blue Nile. Along channels cotton and vegetables are grown. Fields visited with tomato (just started to be harvested): good crop, nice fruits. Tuta absoluta infections in leaves as well as some white flies. Quite few empty bottles of insecticides and fungicides on side of field.

Land from seed company based in Khartoum. Some smaller parcels given to employees to grow vegetables. Apart from tomato also okra is grown.

Soil is rather heavy clay. Suitability for fruit grown will be limited (need to add compost to soil to get proper aerated soil).

Visit of field with flexible hose used for irrigation. Good replacement for open channel.



Transfer to Khartoum. **Stay in Kanon hotel.**

February 11th

Reporting and information analysis.

In evening a boat trip over the Nile and dinner, offered by WAS Trading.

February 12th

1. Visit to Saeed Food Factory Ltd, Khartoum (www.saeedgroup.com). Meeting with Mr. Jamal Adil Achmed, Quality manager.

Mr. Achmed explains that main target of Saeed Food Factory is the processing of local agricultural products after the introduction on the purpose of the visit. The company prepares the following products:

- Jams: (trade mark Fruto): banana, figs, strawberry, apricot.
- Canned fruits & vegetable (400 gr, 70 gr, 50 gr?)
- Juices: basis is quash (50%) with addition of fruit flavors. New juice is made from mixture of hibiscus and tamarind and sold under the brand name Rosana.
- Artificial honey (Golden Syrup) made of inversed sugar.
- Tomato paste (trade mark Al-Bustan)
- Ketchup on demand orders of special clients

Apart from hibiscus and tamarind (Kordofan area) all products are imported including tomato concentrate from China and fruits from Turkey, South Africa, Egypt. Origin of squash was not mentioned.

The company has no contracts with suppliers. Price of inputs is decisive factor. Local market in Sudan is price market therefor company buys resources as cheap as possible. Saeed sells its products to local retailers and street shops throughout the country. Company exist since 1980.

Tour through processing factory. Factory is outdated and doesn't meet international hygiene standards. Access without hygiene measures. Since 3 months a new filling line for juice concentrates has been put into operation (Chinese technology). Used for filling plastic bottles of Rosana. Other operating line in the factory is an old line filling small cachets of tomato paste (75 gr). Impression arises that level of operation is rather low. Company has small quality control laboratory. Company is said to be ISO 9001 certified (SGS).

2. Visit to Sena Hypermarket, located in Afra Mall in Khartoum.

- Quite large range of jams as well as tomato paste products. Turkish, Egyptian and UK products. Also Saeed products are present. Price range of jams from 6 SDG (Fruto) to 60 SDG (UK jam). Turkish and Egyptian seem to be best price quality buy.
- Assortment of fresh vegetables makes rather poor impression from presentation and freshness point of view. Standard range of products present and their prices per kg: tomato (12,50), potato (15), watermelon (25), Gallia (14), sweet pepper (15), red onion (9), white onion (10), eggplant (8,5), zucchini (11), carrot (19), pumpkin (9,5), garlic (70), red beet (7), okra (8), cauliflower (18 piece), cabbage (33 piece), cucumber (15), snake cucumber (8), orange (26), grapefruit (8), lemon (48), lime (21), mango (21), grape (58), pomegranate (50).
Import mostly of fruits (apple, pomegranate, mango); vegetables are locally sourced.

3. Visit to WAS Trading. Mr. Mohamed Salih Abdelrahim, general manager.

WAS Trading core business is potatoes since its start in 2002. Mr. Abdelrahim, who has a Dutch passport (former refugee), has many business connections with Netherlands. WAS Trading imports potato seeds of Agrico. In 2007 together with Agrico a PSI project has been implemented resulting in the construction of a potato storage of 1600 tons capacity on the north-western side of Khartoum. Apart from the storage also a packaging line to fill sacks of 2,5, 5 and 10 kg of potato for the consumer market was part of the project as well as field equipment. The current storage capacity has been extended with 2000 tons on 1st and 2nd floor. At moment of visit seed potatoes were being shipped out.

Apart from seed potatoes, WAS Trading produces table potatoes, currently at an acreage of 300 ha. Two product fields were visited (north-west of Khartoum). The potatoes are grown on rather light soil (reddish colored sandy loam) with a pivot irrigation system. The first field (150 feddan) was planted 1 month ago; production looks healthy. Second location (110 feddan) was planted 60 days ago; while a third plot (not visited) was planted 10 days ago. All under pivot irrigation. Two more plots are located further away. Production looks well organized. All Dutch/Belgium production technology; modern.

Near the first field an equipment storage is located. Next to this building a new potato storage of 5000 tons will be constructed. Expected yield between 35-40 tons/ha. WAS Trading gets TA from Agrico (2-3 times a year visited by Agrico experts). Apart from seed potato WAS Trading also trades potato production technology. Import of 2nd hand equipment is said to be forbidden since last year; only new can enter. Seed potatoes are propagated 1 time locally and then sold to Chad and Eritrea (export is taxed with estimated 25% levies; see previous remarks on banana export to Jordan).

WAS Trading provides consultancy service as well as machine service to its seed potato clients.

Photo: WAS Trading production fields & potato storage



Conclusions:

- Khartoum based processing companies mainly uses cheap, low quality imported concentrates as their source to prepare processed foods (juices, jams, paste).
- Quality of fresh fruits & vegetables in high end retail quite disappointing. Price levels seems to be similar to prices on open market. From feedback it was mentioned that quality of products in Sena fluctuates throughout the week with best, fresh products on Friday (when most Khartoum people do their shopping).
- Example of WAS trading shows that modern, well organized production of agricultural products is possible under Sudanese climate and political-economic conditions.

February 13th

1. Visit to Souk Merkazi market (largest wholesale market for fruits and vegetables in Khartoum).

Market visit in early morning, just before sun rise around 6 am. Trading is on-going, but due to darkness product quality is difficult to determine. Market makes shabby impression: everywhere products are displayed on the ground; sometimes in small stacks and larger bags, many times uncovered. Market is not covered; roads are unsealed and it will be very muddy when raining. Though the market makes an unorganized impression the price levels are rather equal: the impression exists that the same price for the same product is asked throughout the market place.

Prices: carrots (35/5kg), red beet (30-40/5 kg, 75/10 kg), potato (10/kg), sweet potato (from Faw area) (7/kg), tomato (250/25 kg), onion (30 (5 kg), sweet pepper (15/kg), French beans (100/6 kg), cabbage (20/piece), cucumber (10/kg), snow peas (50/6 kg), eggplant (10/kg).

The vegetable and fruit market are separated. Next to the “wholesale” market outdoor retail sales takes place. The latter is said to be a temporary situation as the retail market is under revision.

2. Meeting with Key2Market: Khartoum based market research company hired by Dutch embassy to carry out an inventory on the vegetable seed market in Sudan. Mr. El Moiz M. El Khatim, general manager (M: +249 920000388, E: mky_elkhatim@yahoo.com) Mr. Haytham Kamal, business development manager (M: +249 920000333, E: hkamjal@yahoo.com).

Presentation of the concept plan for implementation of the vegetable seed market inventory.

Feedback from mission: weighting factor should be reconsidered and focus on small farmers. Commercial farmers mostly do not grow vegetables while in the irrigation schemes most vegetables are grown by private, smaller farms. Using distributors as source to detect farmers for the interviews has risk that large group of growers who currently use open pollinated seeds from own propagation will not be included. In general overall lack of information on the size of the vegetable sector will have impact on the research. At the same the research can be used to collect more general information on the vegetable sector and therefore be a good tool to get access to this information. As Key2 Market lacks horticultural expertise the mission is asked to review the draft questionnaire.

3. Visit to CTC nursery, Khartoum. Mr. Syed Sajid Hassan, Seeds & Fertilizer Manager (Indian background) M: +249 123990038/920001786, E: syed.sajid@ctcgroupltd.com, I: www.ctcgroupltd.com , Mr. Mamoun

Ibrahim Dawelbeit (Deputy Agrochemicals Director (former Minister of Agriculture of Gedaref state), Mr. Mazin Gamal Hassan (Engineer and responsible for seedling propagation).

CTC is a group of companies active in the agricultural sector providing inputs (agrochemicals and machinery). Main competitor is DAL group, located in neighborhood. (visit to DAL nursery could not be organized).

At CTC nursery propagation of seedlings of tomato, eggplant, sweet pepper and cucumber is done. Facility is quite modern, high greenhouse of Spanish origin, constructed 5 years ago. Total area is 4000 m².

The propagation process is explained: 3 steps: seeding of seeds in poly-ethylene trays with rather new seeding machine of Italian origin. Seeds are sown in cocopeat (imported). Max. capacity 120.000 seedlings/hr. CTC offers two systems to order plant: client brings own seeds and hires service of CTC to grow seedlings (60%) or client buys seedlings from CTC (40%) . CTC itself uses only imported hybrid seeds (CTC is representative of Syngenta in Sudan). Costs of seedling growing without seeds is 0,5 SDG/plant. According to manager this is a no-profit price (part of company policy to stimulate private sector).



After seeding, trays are put for 3-4 days in germination room (Spanish) with controlled temperature and humidity (rather basic system with 1 evaporator at side). After germination trays are put outside in main greenhouse. The part as height of about 7 m, with pad & fan, and screens. Spraying is automated. Modern set up.

Few tomato plants are present in unit. Said to be low season. (March vegetables are planted in north, in October in Khartoum area and in December in west). Around 1/3 of present plants is also rather old and according to manager needed to be taken by clients already. This is quite common problem that clients take plants too late. As fertilizer in the substrate is rather limited older plants get signs of shortages and are getting to elongated; quality is going down rapidly. Roots are quite well developed though size of root ball is still limited in this system. Promise to send pictures of seedling raising in Netherlands.

CTC has developed own box for transportation of seedlings. In 1 box around 700 seedlings can be transported. Roots are put in simple plastic bag. Said to stay good for 2-3 days.

CTC has own knowledge transfer centers (5-6 are operation, next one will be opened in March. Gedaref has such center, in Kassala such center will be opened. Around 60 people work as advisors and trainers in the centers: training on machine handling, application of crop protection products. Service is free of charge though most likely will operate to promote CTC products.

4. Debriefing meeting at Impact Hub Khartoum.

Impact Hub location is recently ready and will be opened next month: modern, open, light design. This meeting is first. Apart from Embassy staff (3), Impact Hub people (3) present are IFAD, Horticultural Sector

Administration, EU, GIZ, FAO, Key2Market and Mr. Waddah (director Morouj Commodities Ltd; processing coffee/tea/sesame; I: www.morouj.net). Names and contact details of participants are in the annex.

Presentation of main observation from side of the mission. Discussions on need and willingness to form cooperatives among farmers as a main factor to organize and influence the market as well as to initiate processing activities.

Remarks from discussions:

General impression is the willingness among growers/farmers to be actively involved themselves in marketing and/or processing as a partner and not just as a recipient. Farmers ask for partnership with respect to knowledge transfer, market and investments. Willingness to cooperate with foreign investors as local financing is difficult and expensive. In New Halfa cooperatives are already formed. In Kassala large farmers jeopardize formation of cooperatives. Farmers lack knowledge how to organize and manage cooperatives and what is its purpose/function.

Discussion on need for chain approach starting from usage/introduction of proper varieties, Good Agricultural Practices, focus on quality, standardization and linkage to specific market. (which can include local retail chain, food processing company or export). Experience that people are willing to pay a little more for better quality.

Lack of overall approach from different ministries was mentioned as bottleneck (Ministry of Agriculture, Livestock, Water and Investment). Later focusses on attracting large scale (mostly Arab) investors while land resources will be limited. Currently almost no virgin land is left to develop; joint-ventures between farmers (large and small) are necessary to exchange knowledge, training and marketing. In general lack of governmental intervention in extension services.

Issue of seasonality of production needs to be tackled: proper storage and processing need to be developed. Food processing like juices and concentrates are very competitive; it will be difficult to compete on price and variety/quality with foreign produce.

Problem with drip irrigation is squirrels/insects.

A German company has been active to collect Mesquite for making pellets for export. Apart from being a pest Mesquite can be a source for economic activity as well (charcoal, pellets, fodder, honey).

Farewell dinner at residence of Dutch ambassador.

February 14th

Return trip to Netherlands

Overall conclusions:

- production chain is fragmented with land owners who are many times not actively involved in production, farmers/producers who in many cases have uncertain rental arrangements and financial strength to invest in production and traders dealing with harvest and product handling. Improving and guaranteeing product quality throughout the chain is therefore complicated.
- the overall picture arises that agricultural/horticulture is more considered as a sector for short term exploitation rather than sustainable, long-term development.

- farmers seems to have an attitude of laissez-faire: they plant a crop and wait to see whether it will bring something to harvest and sell. Whether this is out of lack of knowledge, finances or tradition or a mixture of reasons is hard to determine however the result is low productivity and low product quality.



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