

## Agriculture Cluster Conference 21 - 22 February 2018 Long Report

21 February 2018 marked the official launch of the Agriculture Cluster, the latest addition to COSIMENA's issue-driven clusters covering water, energy, economy, health, urbanism and cultural heritage, a project run by the Cairo Office of the German Academic Exchange Service (DAAD). The idea behind the establishment of these knowledge hubs and platforms of cooperation between scientists and innovators is to try and improve the communication between existing projects and foster establishment of new joint project between Germany and the MENA region.

This event, which kick-started on the evening of 21 February with a panel discussion, continued the next day during which solution-oriented presentations were delivered by scientists, researchers, and innovators with rich and varied expertise. The workshop focused on mechanisms to increase the efficiency in agriculture systems and ensure its sustainability.

Discussions at the onset of the conference identified Egypt's main challenges when it comes to food security. The agricultural sector, while it employs about 26% of the working population, only makes up 13% of the Gross Domestic Product. Egypt roughly possesses 8.7 million feddans of arable land, distributed on just 4% of the territory. Most of this land is concentrated in the Nile Valley and Delta, with additional small-sized pockets of green in and around the Western Desert's oases. Overall soil quality has plummeted over decades, and yields are declining. In order to expand Egypt's agricultural surface, the government has launched a large-scale desert reclamation scheme, "the 1.5 Million Feddan Project," which has the ambition to transform vast tracts of desert into farmland.

In Egypt, it is estimated that 30% of all the food produced is lost to inadequate food processing, storage, and transportation, at a time of unbridled demographic boom. Estimates have established that Egypt's population increases at a rate of 2% per year, further straining the country's food supply. Food and agriculture research performed in labs, universities and research centers often do not reach policy-makers, and farmers are suffering from knowledge transfer deficiencies, due to dwindling numbers of extension officers.

And if these challenges were not enough, Egypt's focus on wheat self-sufficiency remains out of reach. Currently, Egypt is the world's largest wheat importer, and relies on imports to cover over half of its wheat needs. Climate change is also threatening food production in Egypt. Higher temperatures have already reduced yields and are expected to severely slash production in the coming decades. Large patches of land in the Delta are affected by salinity and turned barren by seawater infiltrating the aquifers. Precipitations, which are already minimal outside of Egypt's North Coast area, are expected to go down by 40% in the region by 2050 if commitments to reduce CO<sub>2</sub> emissions aren't respected, according to Prof. Dr. Kerstin Dorothee Wydra from Erfurt University of Applied Sciences.



Luckily, Egypt has a large pool of agriculture experts to tap into, a lot of them being Alumni of German universities and/or involved in Egyptian-German cooperation projects funded by DAAD. The ambition of the newly formed agriculture cluster of COSIMENA is to bring this expertise together and foster multidisciplinary research projects to improve Egypt's current food-related challenges and accompany the country's ambition to establish sustainable food systems.

The clusters' dozens of members hail from universities, local and international research centers, and focus on a variety of fields. Some of the participants are soil regeneration experts, others look at water for irrigation, crop pests, animal production and health, greenhouse agriculture and innovative food technologies.

During an hour-long panel moderated by the director of the International Food Production Research Institute (IFPRI) Dr. Clemens Breisinger on the first day of the conference, Prof. Dr. Kerstin Wydra pointed out the importance of life cycle management for sustainable food production. It boils down to integrating water, organic waste, energy and biogas as part of the water-food-energy nexus, while making sure to also incorporate socio-economic aspects. Indeed, agriculture encompasses much more than just food production, explained Dr. Racha Ramadan from Cairo University. "We need to develop non-farm activities in rural areas, and pay special attention to gender issues and subsidies," she said, stressing that policy makers in the sector of agriculture do not give enough attention to the economy. "How can we bridge the gap between economy and agriculture, while ending hunger, poverty and empowering women?" she asked.

Policy research, all panelists agreed, should be boosted in Egypt to define efficient policies related to agriculture production. To achieve this, many more surveys have to be conducted, more data is needed, pilot projects need to be implemented on the ground and Ministry representatives need to support and be involved as stakeholders in this work.

At the end of the two-day conference, all participants were asked to collectively decide on the organisational structure of the new Arab-German Agriculture Cluster. During this lively 30-minute discussion, it was decided to keep everyone's focus on three main pillars for this cluster stemming from Egypt's most important agriculture-related challenges. Research, Capacity Building and Innovation were put forth, as well as Water Scarcity, Extension Tools and Integrated Waste Management. Some suggested to focus on general topics like climate change to draw experts from all disciplines in, while others advocated to highlight the biggest problems facing the agricultural sector. Creating an agro-ecosystem, based on a streamlined value-chain for sustainable food production was also discussed on the sidelines. But the intensity and involvement of the experts is a guarantee of their determination to make the most out of this new DAAD-platform of collaboration.



## Proposed solutions for Egypt's food security

**Desert Farming and Agroforestry:** While this panel discussion had no specific focus on the 1.5 Million Feddan Project, participants were eager to learn more about the objectives and ramifications of this grand enterprise from Prof. Hany El Kateb from the Technical University of Munich, who advises President Sisi on agricultural matters. "This project isn't just about food production," he said. He explained that the plan is to establish sustainable communities with adequate infrastructure, which would create pockets of economic activity outside of the Nile Valley and Delta. Kateb has been developing agroforestry in Egypt for years, and he plans on using rows of trees as wind breakers for desert farming lands, to protect crops from sand coverage, and procure shade. In a presentation the next day, Kateb expanded on the 1.5 Million Feddan Project, and showed blueprints of the planned layout of these future rural communities. They will consist of concentric circles, with the residential units at the core and industrial zone at the fringes, surrounded by agricultural fields protected by hedgerows of trees. Dr. Bernd Stimm from the Technical University of Munich also believes that agroforestry has an important role to play to ensure the future of food security. He worked in collaboration with experts at Cairo University and Ain Shams University to experiment reforestation in Egypt's desert and tested 15 different species of trees to identify the ones better suited to Egypt's desert environment. For Stimm, forest plantations in Egypt can fulfill numerous ecological roles, the most evident being their CO<sub>2</sub> absorption capacity, and wood production. They can also be used as a source of renewable energy, can fixate dunes and prevent soil erosion, while protecting human settlements from wind and sand gusts. In terms of food security, agroforestry's largest contribution would be to shield crops from shifting and encroaching desert sands, particularly in the reclaimed lands.

**Biochar for soil fertility:** Egypt's ancestral agricultural feats were closely tied to the seasonal Nile floods, which carpeted the river banks with a rich layer of sediments that enriched the soil. The construction of the Aswan Dam, while it enabled year-long and controlled irrigation, deprived agricultural land of this natural fertilizer and greatly impoverished the quality of soils. They have been further impacted by farmers' excessive use of fertilizers and pesticides, and yields have been negatively affected. To boost soil fertility, agronomist and soil scientist Karlheinz Weinfurter from Fraunhofer IME exposed the potential benefits of Biochar for Egypt's depleted soils. The word 'Biochar' is a combination of 'bio' from biomass, and 'char' as in charcoal. The first people to use Biochar to enhance soil fertility were the pre-Columbian Amazonians, who produced it by smoldering agricultural waste in pits or trenches. Biochar is charcoal used as a soil amendment: it is solid, rich in carbon, and can endure in the soil for thousands of years. The basis of food production is soil fertility, explained Weinfurter, adding that it is linked to carbon and water content in the soil. "These capacities are quite low in the desert," explains the scientist who has been experimenting with this technique on German fields for the past seven years. Because Biochar is low in nutrient content, he recommends the use of Biochar substrates, which consist in a mixture of Biochar with degradable and nutrient rich organic materials like compost. In September last year, he initiated a Biochar pilot on a farm in Asyut, and the results were positive: the field water holding capacity was enhanced, microbiological activity and nutrient availability were increased, which reduced the needs for fertilizers.



**Desalination for high-tech Agriculture:** Currently, 85% of Egypt's Nile river's 55 billion cubic meters of water allocation is used for irrigated agriculture. The per capita water share of Egyptians is already below the UN landmark for water scarcity and reaches roughly 630 cubic meters per person per year. Higher temperatures come with higher rates of evaporation, straining the country's water budget further. Prof. Dr. Hani Sewilam, RWTH Aachen University and American University in Cairo, is interested to use desalinated seawater for high-tech agriculture ventures like aquaponics. Aquaponics consists of two main parts: tanks containing fish connected to a hydroponic - soilless - system where plants grow. Aquatic effluents from the tanks are distributed to rows of plants that use the nutrients contained in the water for their growth. The cleaned-up water is then returned to the tanks in a closed cycle. "Aquaponics systems need very limited water supplies, create minimal effluent discharges, have a high chemical-free fish productivity and reduce crop time," says Prof. Sewilam. Aquaponics farming uses a mere 5% of the water needed for conventional agriculture. Nada Rostom presented Agrimatic, an Egyptian company producing clean and pesticide-free food through an aquaponics system. The company has covered 3 feddans of barren land in Obour with soilless rows of vegetables and fish tanks, in a highly controlled environment, and Rostom believes that the major hurdle to developing novel agricultural techniques lies in lack of access to capital and steep upfront costs. For Prof. Sewilam, using desalinated seawater in aquaponics systems makes complete sense. However, there are some issues related to the process of desalination itself that need to be tackled. Desalinating water using reverse osmosis is energy intensive, and it produces brine, a liquid saturated with salt that needs to be disposed of. Prof. Sewilam is currently doing research to create value out the brine, especially looking into shrimp farming, algae production and energy. "We use forward osmosis, which needs much less energy to separate the salts from the water, which end-result is good enough for the fish," he explains. He calculated that the cost of desalinated seawater for traditional food production should not exceed 5 cents per cubic meter to be competitive, and the price per cubic meter is currently 10LE. However, if you add fish production to this equation, then the entire food venture makes economic sense.

**Animal production and health for food security:** Three professors from Germany, Egypt and Sudan have set-up a new triple master's degree between Göttingen, Cairo and Khartoum universities on zoonotic diseases. These are animal infectious diseases caused by viruses, bacteria, parasites, or fungi that can be transmitted to humans. Professors Abd el Wahed, Eltom and Shalaby expect to receive their first students next September, and this triple master's will entirely be an e-learning platform. Walid Azab, who teaches Veterinary sciences at the Freie Universität in Berlin presented the work he did as part of a joint-research project, tackling long-lasting challenges to animal health in Egypt such as diagnostics and vaccine production. Egypt is 64% self-sufficient in animals, which means that a bout of Foot and Mouth disease can decimate a large number of animals and put Egypt's meat resources in a state of shock. "Foot and Mouth disease is endemic in Egypt. But in German labs, this disease is stored along with SRAS and Ebola viruses!" he said. According to the expert, only 6 million animals are vaccinated against Foot and Mouth disease in Egypt, which corresponds to about a third of all animals in the country. He also indicated the importance of collaborating with Egyptian zoos and circuses, because some of these infectious diseases can be transmitted to a large pool of species. To prevent the spread of animal diseases, Shalaby recommends active



surveillance and reporting, as well as the establishment of reference and local labs. "Everything goes through Cairo at this stage, and decentralization is very important in this instance," Shalaby added. He explained that Food and Mouth disease can spread up to a radius of 10 kilometers through wind dispersion. "That is why we need an early warning system to spot the emergence of animal diseases, so we can take action fast."

**The role of subsidies and policies for agriculture and food security:** Clemens Breisinger, who directs the International Food Production Research Institute (IFPRI) in Egypt, delved into the country's double burden of malnutrition. Egypt is affected by high rates of obesity in adults, coupled with stunting in children, especially in rural areas. The system of food subsidies that was established in Egypt after the WWII as a protective net for the country's poorest families is believed to have contributed to this double burden of malnutrition by pushing calorie-intensive and nutrient poor products such as vegetable oil, pasta and sugar. Since then, the food subsidy scheme has been improved and includes 30 to 40 food items, including vegetables, fruits, and eggs. IFPRI has been working with the government to assess the impacts of Egypt's newest social protection program that started two years ago, in which poor families receive money on a monthly basis provided their children attend school and have access to health facilities. "We surveyed 8000 people," said Breisinger, "and we will disclose our results in May."

**Greenhouse agriculture:** Greenhouse agriculture is also gaining traction in Egypt, as UNIDO recently wrapped up its Hayat project in Minya. They established pilot greenhouses with a handful of influential farmers in the rural community of El Edwa, where poverty is rife and land fragmented. Laila Kenawy, DAAD-Alumna of University of Göttingen, explained that UNIDO built a greenhouse and showed farmers that it could double their income and triple their productivity while using 2/3 less water than conventional, flood irrigation. While greenhouse farming has been widely adopted by other countries in the region, it is only starting in Egypt, and for years UNIDO has worked to build the trust in this low-tech farming technique. The second phase of this greenhouse project will start in Sohag later this year.

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*(Report by Ms. Louise Sarant)*

