Deltas in Depth scientific sessions		
Deltas in Depth Theme 6: Rural development and food security		
DD 6.2 Strategies to increase food security		
Chair	Catharien Terwisscha van Scheltinga, Wageningen UR, the Netherlands	
Presentations	•	Dr. Ruud Bartholomeus, KWR Watercycle Research Institute, the Netherlands
	•	Johannes E. Hunink, FutureWater, the Netherlands
	•	MSc Diana Katschnig, VU University Amsterdam, the Netherlands
	•	Sylvia Szabo, University of Southampton, United Kingdom

Optimal crop production supported by climate-adaptive water management, dr. Ruud Bartholomeus, KWR Watercycle Research Institute, the Netherlands

The climate is changing and as a result of this we will be confronted with extremer precipitation, longer dry periods and higher temperatures. In order to cope with these threats KWR wanted to anticipate on these new extremes, using dynamic water management. FutureWater developed the concept of climate adaptive drainage, this drainage system is different from existing drainage systems. Conventional drainage systems have individual drain tubes within the soil and the groundwater level is at the same level as those drain tubes. The difference with this climate adaptive drainage is that all de individual drain tubes won't end in a ditch but are brought together in a collecting drain which is connected to the collecting pit.

The groundwater level for optimal crop growth also depends on the availability of water and oxygen in the root zone. Different crops need different amounts of oxygen and water for optimal growth, these amounts are determined by the transpiration- and respiration rates of the specific plant. The project focusses on an optimally working drainage system which will take the natural processes into account, because knowledge of the interaction between the type of crop, soil and atmosphere is vital information to create a modern drainage system.

For the programme TKI-Watertechnology KWR started a project with the aim to create a process-based steering algorithm for climate adaptive drainage. In which they can anticipate on a 10 day weather forecast, on the future moisture conditions and on the potential oxygen stress and drought stress in the root zone. So they can supply the farmer with an advice to lower or to raise his water level. To be able to make this happen KWR uses the soil-water-atmosphere-plant model (SWAP), that is a detailed model of the unsaturated zone which describes all the interacting processes in the soil plant and the atmosphere. SWAP has been used to simulate oxygen stress and drought stress. That method showed that both oxygen stress and drought stress impact the transpiration rate of the plant.

Future trends in crop production and food demand and supply in the Lower Mekong Basin, Johannes E. Hunink, FutureWater, the Netherlands

The Mekong Rivier Commission coordinates the trans-boundary issues in de Lower Mekong Basin. FutureWater did the research about food security. In the period from 1961 to 2011 food security has definitely improved with regards to the food supply (Kcal), protein supply and the fat supply. Also

import rates and export rates have increased. Lastly, FutureWater has predicted an increase of precipitation in the region.

The study was conducted in 15 sub-areas in the Lower Mekong Basin and with 5 crop types: paddy rice, dry rice, maize, sugarcane and cassava. To predict the future food security they came up with four periods in the future. The different crop types were all investigated for period, to see what the future would bring for the farmers. The result was that mostly all the crop yield will decrease, except for the yield of sugar cane, which will flourish in some areas.

The next step in their analysis consisted out of food balance sheets, which give a more comprehensive picture of the pattern of a country's food supply. That is a method with four categories (quantities, calories, proteins and fats) and some domains. The researchers made a food balance sheet for each subarea and different kind of scenarios. The results of the sheets were presented in graphs showing whether there will be enough food supply in the future. The predictions made with the help of the sheets were mostly rather negative about the future. Therefor the conclusion of the study is that climate change is likely to reduce crop yields for most crops in most of the areas in the Lower Mekong Basin.

Salt-tolerance mechanisms in halophytes, MSc Diana Katschnig, VU University Amsterdam, the Netherlands

Halophytes are salty plants which can take a relatively big amount of salt. Most plants can't handle an amount of salt that's more than 50 mM NaCL. Normal plants are salt sensitive because of three reasons: the water uptake inside the plant is hampered by soils limit, the salt causes deficiencies of essential nutrients in the plant an when the salts get into the plants they accumulate within the plant to toxic levels.

To make plants more salt tolerant they need to be able to accumulate and compartmentalize the ions. In a leaf cell there are several components and one of these components is a storage, where the plant can put all these ions. But there is also an osmotic problem within the leaf cell, so there needs to be something else to balance the water potential in the cell. Also the plant needs to regulate the amount of salt that gets into the plant. The last thing to make a plant salt tolerant is to still pick up all the essential nutrients.

There are a few strategies to develop salt-tolerant crops: domestication of halophytes, classical or marker-assisted breeding of conventional crops and genetic engineering. They did several experiments with different sorts of crops. The prospect is that they still need to identify the key processes and they need to confirm these possible salt tolerant genes.

Rural development and food insecurity in the Ganges Brahmaputra Delta: Challenges and prospects, Sylvia Szabo, University of Southampton, United Kingdom

This study focused on the coastal district of Bangladesh and investigated two things: the association between salinity intrusion and household food security and the association between households socio-economic characteristics and food security.

They got a lot of statistics about food security. One of them is the percentages of households who are food insecure. The percentage based on expenditure on food is 44,7%, the percentage based on calorie availability is 33,2%.
The results of the unadjusted models show that salinity intrusion has a significant effect on household food insecurity. However, this impact becomes statistically insignificant when household's wealth is taken into account. Education, household size and whether or not a household has been receiving remittances are all significant predictors of food insecurity in the study area.