Project Plan

1. Title

"Participatory Piloting of Agronomic Strategies to Mitigate the Impacts of Soil Salinity in Horticultural Systems of Southern Mozambique"

2. Partner Institutions and Project Responsibles

(1) Weltweit
Weltweit – Gesellschaft zur Förderung lokaler Initiativen e.V.
Talstr. 1, 65812 Bad Soden, Germany

Appointed co-project manager: Jakob Herrmann, Freelance Collaborator

(2) CMM – DAPPE
Conselho Municipal de Maputo (Municipality of Maputo, CMM) – Departamento de Agricultura Pequaria, Pesca e Extensão (Department of Agriculture, Livestock, Fisheries and Extension, DAPPE)
Av. Ho Chi Min, N. 251, Praça da Independência, City of Maputo - Mozambique

Appointed co-project manager: Matias Siueia Júnior, Technical Coordinator of Agriculture and Extension

(3) ABIODES
Associação Para o Desenvolvimento Sustentável (Association for Sustainable Development, ABIODES)
Rua Castelo Branco N. 47, Bairro da Malhangalene, City of Maputo - Mozambique

Appointed co-project manager: Alberto Manuel Luis, Program Officer for Agriculture and Food Security

(4) UEM – FAEF
Universidade Eduardo Mondlane (University Eduardo Mondlane, UEM) – Faculdade de Agronomia e Engenharia Florestal (Faculty of Agronomy and Forestry Engineering, FAEF)
Campus Universitário, Av. Julius Nyerere N. 3453, City of Maputo – Mozambique

Appointed co-project manager: Prof. Sebastião Famba, Head of Water and Land Use Section

2. Background and Overall Objective

In the light of increasing global natural resource use, as well as noticeable climate change and variability, salinization is an ever-increasing driver of land degradation. However, while other agricultural systems are well studied in this regard, the impact of salinity on smallholder vegetable production systems in the Global South is poorly understood. Even though extensive research on soil salinity in the context of vegetable production exists, it is restricted to fundamental research, and thus is barely geared towards direct applicability in smallholder farming contexts.

Insights from controlled experiments, mainly realised in greenhouse contexts, imply promising mitigation and reclamation effects for several agronomic management strategies, such as:
a) improved irrigation management (e.g. drip irrigation systems)
b) mulching
c) organic soil amendments (e.g. specific composts and manures)
d) targeted fertilizer management (e.g. specific biofertilizer formulations, sub-surface and/or split applications of conventional nitrogen fertilizers)
e) selection of tolerant crop varieties and species
f) targeted catch and intercropping (e.g. integration of salt tolerant leguminous intercrops)

Next to strictly agronomic mitigation approaches, the application of modern mobile soil sensing technology can be considered a valuable strategy to monitor and manage soil salinity on a regional level. Decision making in the context of land use planning and agricultural extension could highly profit from respective technology.

The presented project initiative wants to draw on these scientific insights and test selected promising low-cost and low-external-input approaches under field conditions. Thus, it would be able to make a valuable contribution to global application oriented agronomic research efforts.

The project's field of operation, the coastal vegetable production zones of Maputo in Southern Mozambique, is significantly afflicted by soil salinity. An explorative case study conducted in 2018[1] confirmed a continued salinization process of previously agriculturally used areas and declining yields. It further demonstrates that farmers generally are aware of the problem and its spacio-temporal dynamics, but that they lack technical knowledge and access to relevant agricultural inputs to sustainably manage soil salinity.

[1] Herrmann, Jakob (2019): Soil salinity and its effects on the coastal peri-urban vegetable production system of Maputo, Mozambique: exploration of the status quo and management recommendations. Master Thesis, University of Bonn.

Maputo's peri-urban vegetable production areas are located within extensive coastal lowlands bordering the central built up city. They account for approximately 1.200 hectares of agricultural land and 11.700 smallholder farmers, which are predominantly organized in growers' associations. With an estimated mean annual production of 75.000 tons over the last years, they are able to meet a significant share of the city's vegetable demand. Due to its socio-economic importance, this agricultural system receives strong external support, mainly in the form of extension services. The local extension structure is based on the engagement of several institutions, including the Provincial Directorate for Agriculture and Food Security (DASACM), CMM – DAPPE, and ABIODES.

This unique context - of soil salinity being a pressing issue, the comparatively high knowledgeability and level of organisation of the farming community, and the strong extension support structure – provides an ideal framework for the projects objective of piloting innovative soil salinity management strategies under strong farmer participation.

3. Intended Outcomes

The project aims at advancement in applicable knowledge of salinity management in smallholder vegetable farming contexts. This knowledge gain is intended to embody on two levels:

(1) On a local level, farming practices and regional land-use planning will change towards a more effective and efficient management of the prevalent salinity problem; ultimately contributing to an improved and more sustainable peri-urban agricultural system in Maputo.

(2) Additionally, generalizable scientific insights will be produced, and thus will contribute to international research and extension efforts in the field of soil salinity and horticulture.

4. Target Groups

(1) The main beneficiary of the planned intervention is the local farming community of Maputo (a total of 11.700 smallholder farmers, organized in 28 farmers associations); which is expected to profit from improved soil health, increased yields and income through the identification of effective soil salinity mitigation and remediation strategies, along with better informed land use and extension decision making. Directly targeted for training activities (Farmer Field Schools, cf. 5.) within the project's scope are 40 – 60 members from salinity affected associations.

(2) Immediately impacted are also the involved project implementing institutions. They will benefit from the commissioning of improved environmental sensing equipment and an increased capacity of its extension personnel. All the presently active extension agents (ca. 15) are targeted as facilitators and/or participants of the project's training

activities (Farmer Field Schools; familiarization with environmental sensing equipment, etc., cf. 5.).

(3) The actively trained farmers and extension agents are envisioned to function as promoters of the project's insights. To ensure the project's trans-regional relevance, it emphasizes on communication of its results along the national extension structures as well as trough scientific and extension-oriented publications.

5. Measures, Timeframe and Responsibilities

In order to achieve the project's objectives, three complementary project modules shall be implemented:

(1) Farmer Field Schools. This module is intended to sensitise the local farming community for the salinization problem and to encourage their participation in the experimentation with promising agronomic management approaches. The consistent input of the farmers' knowledge will allow for the identification of locally adapted strategies. The module follows the Farmer Field School Methodology as developed and promulgated by the Food and Agriculture Organisation of the United Nations (FAO).[2] Following the establishment of the field sites at the beginning of the season, weekly field school meetings will be realized throughout the growing period, facilitated by qualified extension personnel (CMM – DAPPE/ABIODES). In total, ca. 60 farmers and 15 extension workers will participate each year. While the focus lies on participatory piloting of promising salinity management strategies, other topics as may be requested by the participants shall be integrated.

(2) Scientific Field Trials. This module is intended to produce scientifically tenable conclusions with regard to the effectiveness of selected agronomic salinity management approaches under smallholder and open field conditions. Effectiveness shall be evaluated mainly against quantitative and qualitative crop yield parameters as well as soil health aspects. The field trials will be implemented in timely and spacial juxtaposition to the farmer field school activities. Intersections and synergies are welcomed. This module is supervised by the UEM – FAEF, focussing on strong involvement of students conducting their theses' research within the frame of the project. The students will be the main responsibles for tending the experimental plots and ensuring data collection. They will be supported by appointed scientific and laboratory personnel. Relevant laboratory analyses will be ensured by UEM's soil and water laboratory.

(3) Soil Salinity Monitoring System. The introduction of portable soil sensing equipment will allow for an improved regional decision making by the relevant institutions (mainly CMM – DAPPE, but also ABIODES and UEM – FAEF). At the same time, project modules 1 and 2 will highly profit from its commissioning. Hence, all project partner

[2] FAO (2016): Farmer Field School Guidance Document: Planning for quality programmes. Rome.

institutions are meant to familiarize themselves with the technology and jointly design an adequate salinity monitoring and mapping system. During the project's inception phase, a workshop will be realized to train the relevant technical personnel in the proper handling and application of the sensing equipment.

The different modules are envisioned to run mostly parallel over the course of two consecutive calendar years. The actual field activities (Farmer Field Schools and scientific field trials) will be confined to the annual growing season lasting approximately from March to August. Including preparatory and completion phases, the complete time frame of the project totals 36 months (September 2020 – August 2023). However, depending on the amount of funding that can be secured along with other frame conditions, the project's time frame could be flexibly reduced to down to 16 months (September 2020 – December 2021). In any case, the project will have to provide for an adequate completion phase in order to allow for a thorough revision and drafting of the project's findings. While analysis and documentation of results is intended to run throughout the project's main phase, final processing will require sufficient time beyond the field activities. As a minimum aim, the publication of a detailed scientific report is envisioned. Ideally, this report will be complimented by further scientific and/or extension-oriented publications.