

Role of training/extension to understand soil constraints for crop selection

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Introduction

Soil is an important resource that supports agriculture and aquaculture in the Mekong River Delta (MRD), contributing approximately 20% of Vietnam's GDP. However, soil type, management practice, land use and climate change (including droughts and heat waves) can cause or accentuate soil physical constraints such as surface sealing, compaction, and waterlogging, and chemical constraints such as acidity, salinity, nutrient deficiencies, toxicities, and organic matter decline. These soil constraints significantly limit crop production and, in some cases, lead to substantial yield losses or irreversible land use change. Two examples of this are saline water intrusion impacting on rice yields, and continuous and intensive farming practices including the over application of inorganic fertilizers leading to substantial organic matter and soil fertility decline.

Diagnosing and addressing soil constraints can support crop production and reduce input and labour costs thereby improving overall farm profitability, as well having beneficial environmental outcomes. Sustainable soil management is crucial for food security in the MRD and to ensure that these farming systems adapt to future climate change challenges. This paper presents our approach to diagnose and manage soil constraints that goes beyond a simple extension model, to build capacity with groups of farmers in the MRD, and the Government staff who support and advise these farmers.

Our Approach

Development of our soil constraints training spanned three projects funded by ACIAR and the Crawford Fund (Figure 1). Key elements in this design phase are outlined below.

1. Stakeholder needs analysis – Always keep asking.

Discussion groups with local people (farmers, private sector and local Government staff) to identify the current state of knowledge of salinity in the MRD (2018 and 2019), and then a broader view of soil constraints (2022 and 2023; Figure 1). Specifically, these groups discussed:

- Experience and impact of saline water intrusion and drought on rice production in the MRD,
- Knowledge of climate, farming system and soil-related constraints of their arable land,
- Identification and management to overcome constraints following many years of cultivation, and
- Knowledge gaps related to the diagnosis of soil constraints, and need for training to improve knowledge in this area (Figure 2).

2. Reflect on what works, and what doesn't work - Lessons from our salinity training and Citizen Science approach.

The salinity training in 2019 was well received however, some key factors meant that the Citizen Science approach to collecting salinity data and monitoring saline water intrusion as part of the FOUCS Project required revision. Firstly, the course content was technical and required specific

equipment (handheld salinity meter and scales) and time (to dry samples) to get results for input to the project app. This was identified as a barrier to adoption. Secondly, the COVID-19 pandemic limited participants ability to travel to collect data and the FOCUS team’s ability to support the field collection of data. Thirdly, the need and urgency to collect salinity data varied depending on Province. Those in areas not directly impacted by saline water intrusion, were less inclined to implement the monitoring. It became apparent that other soil constraints were more limiting to production and there was a demand for practical diagnosis of soil constraints. The salinity monitoring protocols were modified to be delivered by students studying at Can Tho University who had an interest in a career in this field.

3. Be prepared to modify your approach to get a better impact - Developing the Soil Constraints training.

As per point one (above), stakeholder discussion groups identified a need for practical soil constraints training, delivered on-farm with the following key learning outcomes:

- Understand the impacts of soil constraints on plant growth and yield,
- Identify and recognise soil constraints in the field, and
- Understand the aspects of soil health that management can influence.

Underpinning this training was the development of simple field-based methods that helped participants identify soil constraints to plant growth using readily available resources.

4. Design a product that is fit for purpose.

Considerations when reviewing our training included:

- How well does the training meet participants needs and expectations?
- How could the training content, delivery method, location of event, and participant engagement be improved to be more aware and inclusive of women, and participants from minority and all socioeconomic groups?
- How well does the training fit the time allocated; what modifications should be considered?
- How are participants supported after the course?

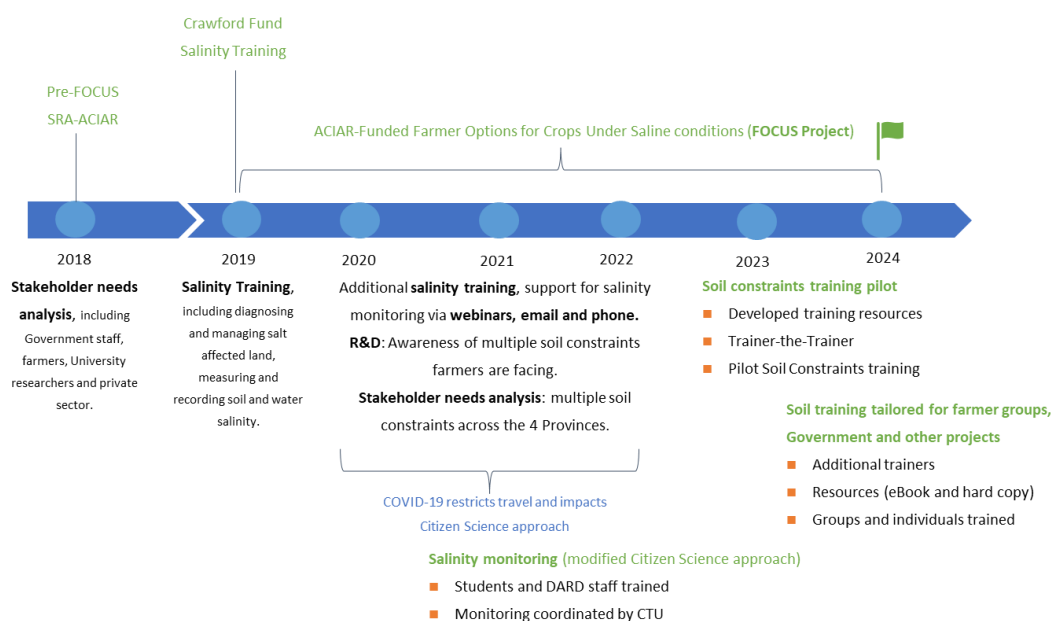


Figure 1. Project timeline and training development.

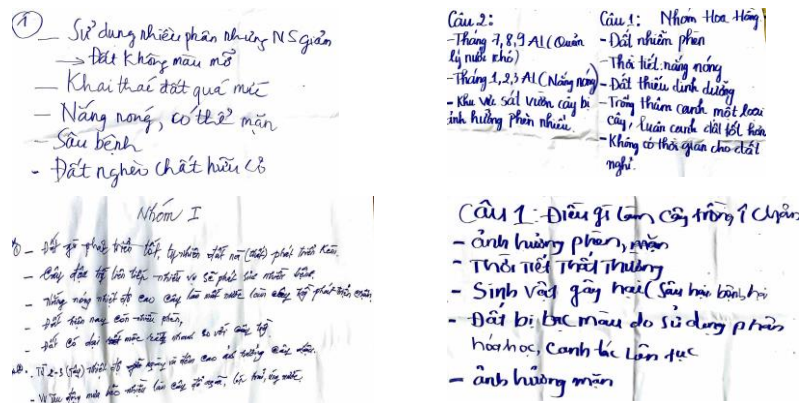


Figure 2. Examples of local people opinion about soil constraints and agricultural challenges in the MRD collected during discussion groups. Factors include: soil and water salinity, low soil carbon content due to longterm cultivation with inorganic fertilizers, rotated crop farming system better nutrient availability than monocultivation.

Results and Discussion – Soil Constraints Training

Pilot phase: Developing, delivering, and refining the training.

Following a three-day Train-the-Trainer at Can Tho University, the FOCUS team delivered two practical soil constraints training sessions for researchers and students at Can Tho University (Figure 3). The FOCUS training team then delivered the soil constraints training to three groups of 15 to 20 participants across three Provinces in the MRD. Participants of the pilot training consisted of farmers, District DARD staff and Women's Union representatives.



Figure 3. Activities of practical training for FOCUS team researchers at Can Tho University.

The FOCUS training team collected feedback from participants and observers (FOCUS project staff) and revised the course content and activities. Surveys were completed either verbally with FOCUS staff asking participants key questions to obtain feedback, or via a short paper survey. This approach enabled all participants to provide feedback. These surveys indicated that there is a demand from local people for more training to enhance their knowledge on soil management and other agricultural practices. Vietnamese team researchers and agricultural extension officers in the provinces found the techniques learned in the training very helpful and practical. Feedback

overwhelmingly indicated that they would apply these skills in their work as well as continue to guide farmers to perform these proficiently and regularly in the future.

Scaling FOCUS Project Soil Constraints Training

Following the pilot phase, the 'Guide to identify soil constraints to crop production in the Mekong River Delta' was finalised. Soil constraints training is being delivered (ongoing) to local extension staff and farmers in the FOCUS project across four Provinces (Figure 4), as well as being delivered through other projects. So far 75 participants have been trained. An important output of this work is an e-Guide that can be shared through the project network, and the soon to be filmed short videos on the field-based methods.



Figure 4. Activities of practical training for local staff and farmers in the MRD.

Maintaining engagement and momentum with participant groups through social media networks

Each province participating in the training is connected online via social networks. With these groups and connection networks, the FOCUS team continues to support local people in implementing the training and co-designing future professional activities. Specifically, the team shares training materials and information related to seminars and training courses organised by the FOCUS Project and other institutes. This has already been successful in offering postgraduate opportunities (e.g. Masters) through Can Tho University and getting local support for student excursions and provincial-based research activities.

Conclusion

Adoption of agricultural research findings requires information to be presented in an accessible format and with a foundational knowledge of the topic and context. Our extension and adoption activities in the FOCUS Project have required an agile approach to sharing knowledge and a key focus on upskilling and capacity building so that end-users of the research (farmers, local extension staff and the private sector) can benefit from the findings. Our impact would have been limited had the team not been willing to pivot and respond to the changing needs and situation. Our approach has demonstrated that soil extension is a continuum of learning, ongoing stakeholder consultation is essential, and that practical and field-based training supports an enduring capacity building.

Acknowledgements

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