

# Main Project: Know-How transfer and establishment of a collaboration with Smiling Gecko Cambodia

Pre-Project: Establishment of a fish-farming teaching unit with Smiling Gecko Cambodia

## Know-How Transfer und Kollaboration mit Smiling Gecko Cambodia

Vorprojekt: Aufbau eines Fischzucht-Ausbildungsbetriebs mit Smiling Gecko Cambodia

Final project report

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### Overview

The project started timely in April 2018. Ben Scott (Scientific Assistant, ZHAW) was the responsible project coach in collaboration with two female leaders (Sreymom Y and Theary Soeun) from Smiling Gecko Cambodia (SGC).

During the project, it was possible to establish a working hatchery operation to independently produce tilapia eggs and fingerlings and to establish a grow-out operation in a separate fishpond for an efficient fish production. Furthermore, it was possible to establish a close cooperation with SGC in coaching and education of the fish project as well as the inclusion of other key-components of the SGC scope (e.g. hatchery, industrial kitchen).

### Establishment of a hatchery and grow-out system for tilapia

In a first phase, which lasted until December 2018, a fishpond was taken into operation allowing for the production of brood stock (production of fish eggs) and the grow-out of tilapia in net cages. Furthermore, a hatchery was projected and built for the rearing of fingerlings. The fish project can therefore produce its own brood stock and fingerlings and is able to conduct the subsequent grow out of the tilapia fully independently of outside fry or fish suppliers. Thus, multiple revenue streams were established: the sale of fingerlings and fish meat are interesting business opportunities, as Cambodia is in dire need of clean and healthy tilapia brood stock and fish meat of good quality.

The operation so far has been a success: already in January 2019, 97'000 fry were collected from the brood stock. Due to the large fry production, the establishment of a dedicated grow-out pond was necessary (school pond). An improved design of the net cages, which were developed and built in collaboration with the SGC carpentry, supports the low maintenance operation and improves working safety of the fish project (Figure 1).



Figure 1: **Left:** Sreymom, Ben and Theary installing and cleaning a hapa. **Right:** a sturdy and durable hapa model was developed and put in place in the hatchery and school pond.

It was necessary to establish a laboratory for water analysis, because initially, there was no infrastructure available for the determination of essential parameters for fish health, such as dissolved oxygen and ammonia. The laboratory allows the precise determination of a broad range of important water parameters. This greatly

improved operational security and has the additional benefit of to allow a broad range of scientific projects to be carried out (Figure 2).



Figure 2: **Left:** the school pond with its current size. In the background: Paddle wheels improve management of dissolved oxygen **Right:** a mobile laboratory was shipped to Cambodia, which allows the determination of a broad range of water parameters.

Well-defined standard operational procedures were implemented to carry out the fish project. Sreymom and Theory compiled important documents and processes such as harvesting plans, weekly work plans, infrastructure checks, team meetings and water analysis schedules (Figure 3).



Figure 3: **Left:** Ben conducting a routine water parameter control, just before an approaching thunderstorm. **Right:** Theory conducting an ammonia and dissolved oxygen (DO) measurement for a hapa.

Nevertheless, there were operational challenges: dissolved oxygen (DO) concentrations in the ponds were subject to fluctuations, caused by rising temperatures and sinking water levels, which in one case lead to the loss of a small part of the standing stock. As a solution, paddle wheels were deployed in the fishponds, which enable a supply of DO in a controlled manner. As an instant consequence, the DO concentration in the ponds stabilized, the growth rate of the fish increased, and the feed conversion ratio (FCR) improved.

#### **Cooperation and inclusion of Smiling Gecko Cambodia**

The cooperation with SGC was continuously intensified during the course of the project, especially since Sreymom and Theory were the de facto leaders of the fish project, while Ben acted as a coach. It is anticipated that the project's long-term chance of success is greatly improved, as expertise is steadily transferred and consolidated.

The work of the fish project goes hand in hand with the other SGC projects such as the carpentry, which built the sturdy hapas (Figure 1, right). A part of the produced fish is delivered to the butchery, where it is gilled and descaled and further used in the industrial kitchen for own use in SGC (Figure 4).





Figure 4: **Left:** Ben examining a delivery of fresh tilapia for the SGC industrial kitchen. **Middle:** Descaling of a fresh tilapia by a Cambodian butchery worker. **Right:** The freshly gilled and descaled fish ready for cooking.

### Know-how transfer

So far, multiple staff and students from the ZHAW have visited SGC and contributed to the success of the program: Fridolin Tschudi visited SGC twice for coaching and management purposes, as well as to supervise the construction. Moritz Lüchinger wrote his master thesis about education programs for rural fish farmers. Silvan Oberhänsli (UI Student, ZHAW) carried out his bachelor thesis on determination of an adequate feed for the grow-out of the tilapia during a six-months stay at SGC. Luca Regazzoni (Scientific assistant, ZHAW) visited SGC in spring 2019 for one month and helped setting up and operating the analytic laboratory. Thomas Kimmich (Head gardener, Grüental, ZHAW) arranged and set up several plantations, among them a decentralised wastewater treatment plant to improve the water quality of the fish ponds. Delia Huser (UI Student, ZHAW) carried out her bachelor thesis on biological pest management in fall 2018. In June 2019, Gabriel Köppel (UI Student, ZHAW) will carry out his Bachelor thesis on examination of soil improvement techniques at SGC, and in September 2019, Raphael Zürcher will carry out his bachelor thesis on on-site fish feed production from recycled waste material.



Figure 5: **Left:** Fridolin Tschudi explains how to connect PVC pipes for the newly built hatchery. **Right:** Silvan Oberhänsli, Sreymom Y and Theory Soeun during a scheduled team meeting.

### Plans for future projects and collaborations

#### Research and Development:

Production of textiles from fibres (together with Marianne Leupin, ZHAW) and use of fish leather (in collaboration with Atelier Oi, La Neuveville, Switzerland) are currently being developed to increase revenue and reduce wastes from the tilapia production.

A REPIC funding application will be submitted to finance the development of a training operation for local fish farmers. The initial REPIC outline was accepted in March 2019, and the final application will be handed in by August 2019. Collaborations with important Southeast-Asian stakeholders (Asian Institute of Technology, Worldfish Cambodia) have been established for the REPIC project application.

Education: In 2018, students of the ecotechnology module (5<sup>th</sup> semester, BSc UI) carried out a project work on a topic that is relevant for the sustainable development of the SGC project. This will be repeated in 2019, when

students will study water, energy and nutrient flows of the SGC Project. This raises the awareness of the students for the importance of low tech solutions for developing countries. It is expected that this increases the interest of the students in the project and leads to more student exchanges that support the project. To create a financial basis for this exchange, a student exchange program funded by the Vontobel foundation is planned.