

A snapshot of a partnership to drive tilapia farming in Malaita Province, Solomon Islands

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Introduction

Brief history of tilapia development in Solomon Islands

Solomon Islands, like many other Pacific Island countries, has exerted pressure on its coastal fisheries, resulting in over-fishing and degradation of fishing grounds, which is evident in parts of Solomon Islands. Reef fish provide an important source of protein and livelihood for many coastal and inland communities (Cleasby et al. 2014). To supplement this, the Solomon Islands government has prioritised aquaculture development in its development aspirations, given its potential for supporting rural livelihoods.

The Ministry of Fisheries and Marine Resources (MFMR) is the government agency mandated by the Fisheries Management Act 2015 to develop and manage fisheries and aquatic resources in Solomon Islands. In 2008, MFMR developed an Aquaculture Development Plan 2009–2014 to guide the redevelopment of aquaculture in a post-conflict Solomon Islands. Given the plan's high prioritisation of tilapia dubbed the "aquatic chicken" (Pickering 2009), a Solomon Islands National Tilapia Aquaculture Action Plan 2010–2015 was also developed. Both have now been superseded by the Solomon Islands National Aquaculture Management and Development Plan 2018–2023. This policy framework has

provided a structured pathway for sustainable tilapia aquaculture in Solomon Islands.

Since the 2000s MFMR has worked with farmers and other institutions (e.g. the Pacific Community and WorldFish) to pilot the small-scale aquaculture of *Oreochromis mossambicus* (Mozambique tilapia), a non-native freshwater species that has been present in Solomon Islands since the 1950s (MFMR 2018). Focused on two of the largest and most populated island provinces of Malaita and Guadalcanal, pilot sites have targeted food security and income generation (Cleasby et al. 2014). This local research showed that Mozambique tilapia was not viable for intense aquaculture due to its slow growth, fast reproduction (early sex maturation), and lack of genetic variation due to a high degree of inbreeding (Pickering 2009; Lloyd 2011; MFMR 2018). Based on this information and look-and-learn trips to Fiji, Papua New Guinea and Timor Leste (Pickering and Schwarz 2018), MFMR sought to import an improved strain of Nile tilapia for aquaculture. Nile tilapia is widely distributed and farmed in neighbouring countries such as Fiji, Papua New Guinea and Vanuatu (Pickering 2009). Because of the growing interest for Nile tilapia farming in Solomon Islands, MFMR embarked on a plan to import a more viable strain of tilapia, suitable for aquaculture in Solomon Islands (Lloyd 2011; MFMR 2018), and approval for the importation of Nile tilapia was secured in August 2017.

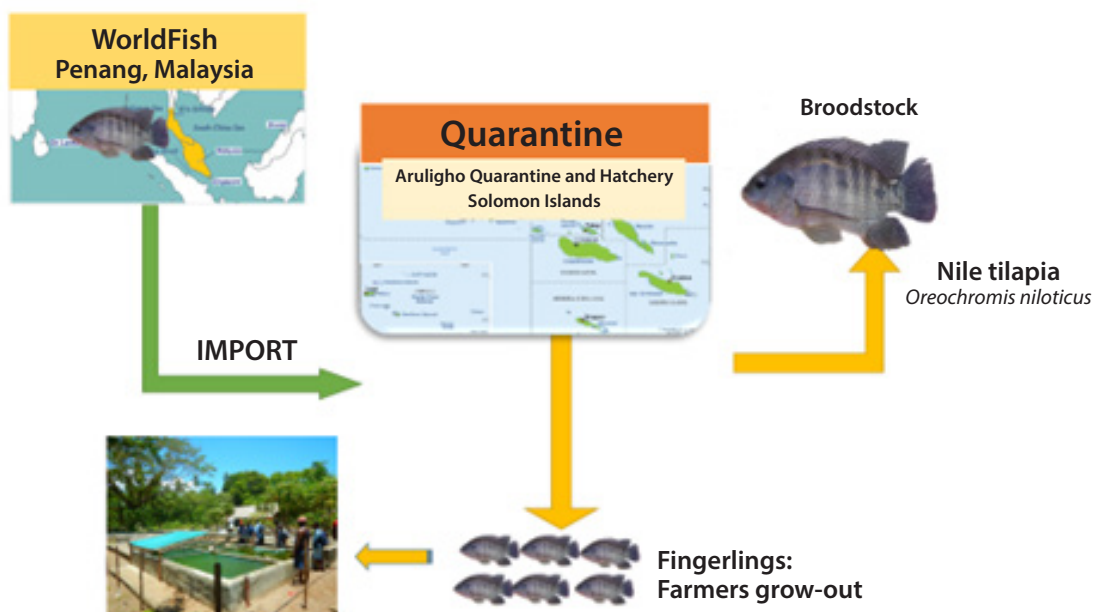


Figure 1. MFMR's tentative importation plan for GIFT tilapia.

Current tilapia development in Solomon Islands.

The tilapia development focus, in line with Solomon Islands Aquaculture Development and Management Plan (2018–2023), was to: establish the necessary infrastructure; improve technological know-how; and import high quality tilapia fries for farming in Solomon Islands. MFMR anticipated the importation of GIFT (genetically improved for farming) tilapia (MFMR 2018) and with the support of partners, including the Pacific Community, a GIFT Importation Plan and other necessary policy documents were developed.

In accordance with Solomon Islands' quarantine and environmental legal requirements, a set of steps will be followed before the fish enter the country (Fig. 1). The necessary infrastructure development and capacity building have been prioritised by special interest groups and supported by donor partners, including the New Zealand Ministry of Foreign Affairs and Trade, the government of Japan, and others since 2017 in accordance with the Solomon Islands Aquaculture Development and Management Plan 2018–2023. A functioning national hatchery is under construction and expected to be completed by the end of 2023.

It is expected that high quality fries will be imported, bred in the national hatchery and quarantine facility. Then, fingerlings (seedlings) will be distributed to well-established farmers in rural communities (Figs. 1 and 2).

Preparing farmers

With the decisions and commitments made to the process of importing an improved strain of tilapia, a parallel workstream is aimed at preparing well-established Mozambique tilapia farmers to become early adopters for the new strain. MFMR has continued to work with farmers in communities in Malaita and Guadalcanal as a mechanism to upskill farmers in preparation for Nile tilapia and for locally relevant approaches to farmers support to be developed. As such, MFMR has collaborated with partners such as WorldFish, the Pacific Community, and most recently the Solomon Islands Association of Vocational Rural Training Center

(SIAVRTC) and the Waikato Institute of Technology (WINTEC) to capacitate farmers and developed workable tools required for the nationwide rollout of Nile tilapia.

From 2017 to 2020, MFMR partnered with SIAVRTC under an MFAT-funded project that worked with 26 farmers and three Rural Training Centers (RTCs) in Malaita Province to upskill tilapia farmers. The project was called Upim Tilapia Project.

This article focuses on the experiences learned during the three years of the project to describe how a partnership between different government agents, donors, educational institutions and farmers helped to improve information and resource dissemination to tilapia farmers in rural Malaita, Solomon Islands.

Materials and methods

The project, which involved SIAVRTC, WINTEC and MFMR, aimed to promote tilapia farming education in rural areas of Malaita Province. Given the limited opportunities to disperse information to remote locations, the project approach was to develop a mobile phone app that could work offline, containing basic technical information required to start and manage a small-scale tilapia farm in Solomon Islands. Information was gathered over a three-year period by working with 26 farmers and 3 RTCs (Ngaligagara, Afutara and APSD) in Malaita Province (Fig. 3). Activities under this project included workshops, field trips and site visits conducted by project field officers and MFMR representatives.

The farmers who were part of this project were selected based on their prior engagement with MFMR and their enthusiasm for farming tilapia. The farmers were divided into four groups according to their geographical proximity, so that they could reach each other on foot. The project supported these farmers with farming materials, capacity building through workshops, and the development of a Tilapia Info Mobile App (Tilapia App).

Farmer visits were conducted monthly by two project officers to monitor progress and submit reports to other members of the project partnership team.

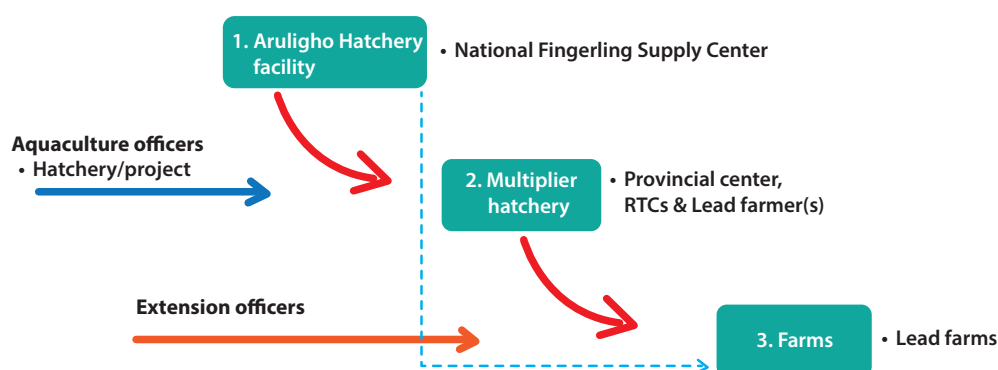


Figure 2. Tentative GIFT grow-out plan.

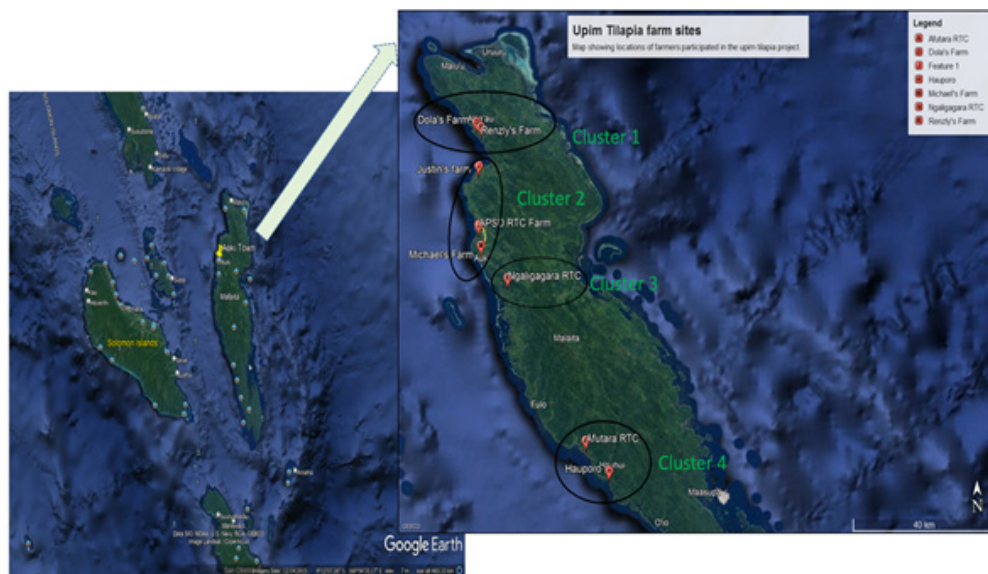


Figure 3. Study area in Malaita located within four constituencies: Lau/Baelelea, West Kwara’ae, Central Kwara’ae, Auki Langalanga and West Areare (not shown on the map).

Results and discussion

Development through a participatory approach.

During the initial planning stage of any project, the right choice of partners or stakeholders is fundamental to project success.¹ In 2017, WINTEC was engaged by MFAT to work with SIAVRTC in order to develop educational materials for aquaculture education at the RTCs.² Because MFMR was the mandated government agency with the necessary technical expertise, and an annual development programme aiming to promote a sustainable aquaculture in Solomon Islands, the project team collaborated with MFMR to identify the tilapia farmers who would be the participants in the project.

The farmers were grouped into four cluster groups, a technique described by (Harohau et al. 2016) based on their geographic area as summarised in Table 1.

A similar approach was observed in Timor Leste during a look-and-learn trip in 2018 at Gleno, Ermera municipality (Pickering and Schwarz 2018; New Zealand Ministry of Foreign Affairs and Trade 2018).

One focal person was appointed for each cluster group to liaise with project team members on all matters relating to project implementation. A cluster leader was selected based on his/her willingness to accept the position and their capability to take up a leadership role.

Table 1. Summary of cluster characteristics.

Cluster characteristics			
Cluster 1	Cluster 2	Cluster 3	Cluster 4
<ul style="list-style-type: none"> • Good community support and engagement • Fish as pet and only harvest fish to share as seedlings • Ponds water fed from ground water • Excellent gender balance 	<ul style="list-style-type: none"> • Farmers sparsely spread • Some ponds located far from home • Big or numerous smaller ponds • Used for family consumption 	<ul style="list-style-type: none"> • Located in Auki township • Less land available • Small size ponds located next to owner’s house • Regular partial harvesting 	<ul style="list-style-type: none"> • North of Auki • Entrepreneurial • Selling tilapia • Income invested into small-scale business activities • Supportive of new farmers

¹ http://cq4pm.typepad.com/cq4pm/2006/04/applied_eq_49_r.html

² <https://www.wintec.ac.nz/about-wintec/news/article/2018/03/04/aquaculture-the-answer-to-an-island's-food-shortage>

It was observed that a small group or cluster of five to ten farmers was easy to manage and promoted good farmer participation and coordination. For example, in cluster 1 (see Fig. 3) there were five farmers from two neighbouring communities and because of their small number, it was observed that cluster coordinator had a small job to visit farms, organise group meetings and group work to support individual farmers. Notably, the leader of cluster 1 was a former Provincial Assembly Member of the Malaita Provincial Government who had good leadership skills and knowledge. This observation is consistent with the recommendation by Harohau et al. (2016) where a cluster group leader with an existing leadership role and a good educational background

could contribute to effective management of a cluster group. Thus, this technique was proven during this project implementation to be a useful tool fostering a farmer-led approach that promotes active farmer participation.

According to a farmer interview with Renzly (leader of cluster 1), a tilapia farmer at Sisifiu Village in Northwest Malaita, smaller groups of farmers meant they felt confident to exchange innovative ideas and technology that would support farm improvement with limited resources. There was also physical evidence of this. Figures 5 and 6 show Renzly's tilapia earthen pond improvement works before and after being trained and supported by the project.



Figure 4. Project participants during the final workshop held in Auki, Malaita Province. Each farmer participant was awarded a certificate of participation at the end of the project.



Figure 5. Farm before project.



Figure 6. Farm during and after project.

Causes and impacts of project on tilapia farming.

Feedback on project activities from participants and the wider communities had been received during stakeholder activities, field trips and monitoring visits. Positive impacts on tilapia farming were recorded due to four key underlying factors (Fig. 7).

Efficient delivery of farming resources

Efficient delivery of resources such as hardware materials, small financial support and networking among and across cluster groups was evidenced by the physical status of the farms. For example, procurement of materials had previously been delayed due to slow government payment processes and logistics due to islands being widespread. The project funding helped considerably towards the effective delivery of project support to farmers.

Development of mobile app for tilapia farming

The second factor affecting farming success was the efficient transfer of technical know-how on tilapia farming through the development of the offline mobile app. This app could be shared through SHAREit and installed on any android device. Information on this app was simplified to suit farmers’ education levels and the Solomon Islands context. To fast-track socialisation of this offline app, the project provided android handsets to all core participants (about 30) and this incentive was highly welcomed by the farmers. Participants are able to transfer the technology to more than 14,000 interested individuals in their communities. The RTC network recorded the highest rate of sharing and distribution of the app.

Project partners

Identifying the right stakeholders was crucial for successful project implementation. In this project, the WINTEC team consisted of expat specialists in various technical fields, while SIAVRTC was the academic platform for wider and effective dissemination of information and technical training. MFMR is the technical government agency responsible for aquaculture development in Solomon Islands. Similarly, without the hard-working farmers and the enthusiasm they had for tilapia farming, this project would not have been successfully accomplished. As noted in Harohau et. al. (2020): “all the prospective farmers have been selected based on their ongoing engagement in tilapia farming under the MFMR”.

Effective monitoring and evaluation

Finally, project progress cannot be measured without the effective monitoring and evaluation work conducted by field officers based in Auki, Malaita Province. Monitoring visits were conducted quarterly and information gathered was shared across to all stakeholders and key findings discussed during the annual stakeholder workshop (see Fig. 8).



Figure 8. Stakeholders’ workshop conducted in Auki, Malaita Province in 2019.

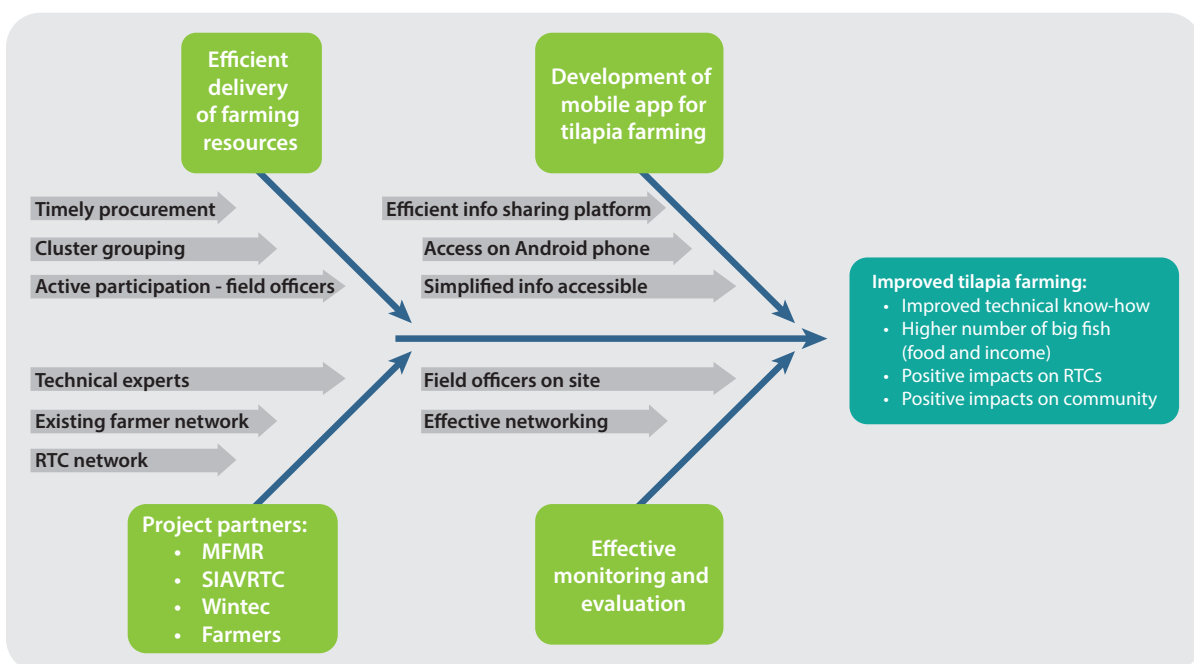


Figure 7. Cause and effect diagram of project Upim Tilapia.

Improved tilapia farming

Four main outcome areas were identified that contributed to improved tilapia farming (Fig. 7).

Outcome 1: Improved technical skills and knowledge

- Pond design, structure and management (Figs. 5, 6 and 9).
- Technical information available in a simplified form to farmers in the remote areas through an offline tilapia farming mobile app.
- Improved capabilities and capacities at RTCs.

Outcome 2. Improved food security and income generation opportunities

- 71% of participants used farmed tilapia for household consumption.
- 43% of farmers sold their fish to earn extra income to support their family.
- 1% of the farmers integrated tilapia farming with local eco-tourism.

A farmer's story 1:

A farmer who lives at Auki Township could not let the problems of space and water shortage bar him from pursuing his dream of becoming a tilapia farmer. Through this project, he was assisted with the design of a rain-fed system pond using local construction plastics as a pond liner to avoid water leakage. The pond was constructed in 2018 and is still in use today (Fig. 10).



Figure 10. Picture depicting two different pond designs for a rainwater-fed system in Auki.



Figure 9. Pond greening is an important skill learned by participants.

Outcome 3. Increased capabilities at RTCs

- Increased tutor capability to deliver aquaculture education.
- Tilapia app distribution through SIAVRTC.
- Innovative feed mixes developed using local ingredients.
- Three RTCs constructed fishponds facilities during the project.

A farmer's story 2:

In 2019, Mr Dola Roboliu, from Madalua Village, was charging a farm entry fee of SBD 5 per individual and SBD 10 per family (i.e. parents + kids) for visiting his site and/or fishing for their own fish, which was paid separately. He estimated that he can collect up to SBD 1000 per week during holiday months on access fees alone. Mr Dola happily said that he also sold some of his fish for SBD 2–5 per fish, depending on size. In December 2019, he conducted partial harvesting of one of his fishponds (10 m x 9 m x 1 m depth) and sold 300 fish, earning SBD 600 within two hours of tilapia live sales at the farm site.



Figure 11. Dola Roboliu's tilapia farm at Madalua Village, northwest Malaita, Solomon Islands.

Outcome 4. Wider community impacts

- A focus on ensuring both men and women participated in project activities that they were interested in.
- Networking and relationship building through cluster connections.
- 35 new farms set-up.
- Increased health and safety knowledge included in the app.
- Huge interests in tilapia farming from other institutions.

Moreover, the sustainability of tilapia aquaculture to contribute to fish supply and demand in Solomon Islands requires that serious investment be committed to this sector. Phillip et al. (2011) reported that a sustainable fish aquaculture production required serious investments into improving fish yields, building skills and organisational arrangements, access to finance and market access. So, in the future, to ensure sustainable GIFT tilapia production will require bringing complementary skills, technologies and investments via partnerships and involving both the public and private sectors.

Issues and challenges

Several issues and challenges were faced during the project’s implementation. The challenges are categorised into technical issues, equipment support, and community issues. Some of these were addressed as the project proceeded through additional information being added to the app (e.g. health and safety information), while others will inform the approach taken to the Nile tilapia farmer rollout.

A farmer’s story 3:

A female farmer and teacher at Ngaligagara RTC demonstrated the feed mix she prepares through a simple processing method. For example, drying and pounding cassava tubers into powder, coconut meal, dried beans, coconut oil, etc... and mixing them together to achieve at least a 15–20% crude protein content. This feed yields comparatively good results in terms of growth rates. She found there were many big fish in her pond after a 4–6 month grow-out period. The technical know-how of feed and feeding is provided to farmers by technical officers from MFMR.



Figure 12. Participants demonstrate local feed mix preparation.

Type of issue	Descriptions
1. Technical issues	Water loss and shortage in some locations, particularly peri-urban areas. Low quality Mozambique tilapia fingerlings.
2. Absence of essential aquaculture infrastructure and equipment locally	Unavailability of local supplies of appropriate and high-quality equipment and supplementary feed. Lack of national hatchery to produce quality fingerlings.
3. Community issues affecting tilapia farming	Theft of fish. Dispute over viable farming sites. Health and safety risks – including drowning risks for children in poorly constructed ponds.

Conclusion

Key lessons learned during the project’s implementation include the value of using technology to engage more youth participants. The development of the tilapia app was seen as a vital breakthrough in the technological innovation to disseminate relevant information to tilapia farmers.

Farmer cluster groups enhanced networking, effective resource sharing, and peace building between communities and are now a proven workable approach for MFMR to adopt when rolling out Nile tilapia in Solomon Islands. We observed sharing of technology, farmer motivation and a stronger awareness of the need to integrate health and safety

as positive impacts. Also, through this project, overall farm production in terms of the number of bigger fish, feeding and feed, and pond design were improved.

For a sustainable tilapia aquaculture programme to contribute to Solomon Islands’ fish supply requires ongoing serious investment be committed to this sector. This was also highlighted by Phillips et al. (2011) who noted that sustainable fish aquaculture production required investments into improving fish yields, building skills and organisational arrangements, access to finance, and market access. Successful and sustainable aquaculture of Nile tilapia will require bringing complementary skills, technologies and investments via partnerships involving both the public and private sectors.

MFMR aims to continue to collaborate and seek further partnership arrangements to support farmers in terms of capacity building and trying out localised, innovative ideas to suit the Solomon Islands context in preparation for the Nile tilapia grow-out programme.

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