

MARKET LINK

for primary producers

A publication of the Market Information Service (MIS) - Ministry of Agriculture and Fisheries
"Linking the market and primary producers"

Introduction

Tilapia belongs to a family of 'Chichildae' and is largely freshwater fish which dwells in shallow streams, ponds, rivers and lakes. Tilapia is one of the most consumed farmed fishes in the world. ¹It is named the 'food fish of the first century' and the 'aquatic chicken', as it was the most cultured



freshwater fish in the world, farmed in more than 140 countries. Tilapia prefers environments with water temperature in the 25-30°C range, and it requires low input during grow out periods and can be farmed successfully on any level.

The global tilapia market reached a volume of 6.4 million in 2018². China is the leading global producer of tilapia, followed by Egypt and Indonesia. The estimated average of tilapia recorded in 2019 is 1.7 million tonnes for China, 1.1 million tonnes for Indonesia and around 900, 000 tonnes for Egypt.³ United States of America is the world's single largest

tilapia importer, constitutes to about 70% of the tilapia markets worldwide.⁴

Tilapia was introduced as a fast growing edible fish into the South Pacific region in the 1950s and became one of the cultured fish commodities for some islands due to its low costs and success in other regions. The Pacific island region is the world's smallest producer of farmed fish, however although still in the infancy, farming Tilapia in the Pacific is on the increase. Commercial tilapia farming is most developed in Fiji islands and to some extent in Papua New Guinea.⁵

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¹<https://www.researchandmarkets.com/reports/4828779/tilapia-market-global-industry-trends-share>

²<https://www.researchandmarkets.com/reports/4828779/tilapia-market-global-industry-trends-share>

³<https://www.aquaculturealliance.org/advocate/goal-2019-global-finfish-production-review-and-forecast/>

⁴ <https://www.aquanet.com/us-tilapia-imports>

⁵ Nandlal, S., and Pickering, T. 2004. Tilapia fish farming in Pacific Island countries. Volume 1. Tilapia hatchery operation. Noumea, New Caledonia: Secretariat of the Pacific Community

FARMING

Tilapia was introduced in Samoa in 1995. Tilapia has been a subsistence fishery in a few villages, but utilized at a larger scale in Savaii. They have been released in main freshwater river system in Savaii for subsistence. In the late 2000, Samoa had 19 tilapia farms in total, 11 on Upolu and 8 on Savaii.⁶

Right now, a recent number of 50 tilapia farms, 39 on Upolu and 11 on Savaii were recorded in Agriculture Census 2020.



Figure 1 Tilapia farm at Satoalepai Samoa

It is best to identify the different types of tilapia when farming it, as it consists of three (3) important genera, and the species that is mostly used for farming.

These are **Nile tilapia** (*Oreochromis niloticus*), **Mozambique tilapia** (*Oreochromis mossambicus*) and **blue tilapia** (*Oreochromis aureus*). The Nile tilapia (*Oreochromis niloticus*) is the most popular farmed species.

Nile tilapia is viewed as the key freshwater species for developing a family community-based aquaculture industry in Samoa.

⁶ Value adding and supply chain development for fisheries and aquaculture products in Fiji, Samoa and Tonga, pg. 6

Tilapia are tough and tolerate a wide range of environmental conditions, and most of the systems used requiring on the suitable environment for tilapia are all used in the Pacific island countries:

- Little environmental modification
- Aquaculture system can be low tech.
- Earthen ponds appropriate design in non-flood prone areas
- Concrete tanks or raceways can be used (more expensive to build and cannot be justified into rural areas)
- Cage in lakes, dams and rivers

The trick to efficient, successful and profitable tilapia farming is to stock with large batches of fingerlings of similar size and age. Only then can all the fish in the pond be harvested at the same time, after which the pond must be completely dried out to kill any leftovers, unwanted fish. A sign of inefficient farming is ponds filled with fish all of different sizes and ages. It is easy to farm tilapia badly, but to farm them well and produce large batches of similar sized fish; management skills and a good supply of quality fingerlings are needed.

Tilapia hatchery operation

The goal of the hatchery is to produce a consistent quantity of fingerlings for various types of tilapia grow-out operations. The fingerlings can be produced in suitably designed ponds, or net enclosures called (“hapa”) in ponds, or tanks (made of concrete, plastic, fire glass, metal, glass, wood). These different systems require different levels of inputs and

management. The choice of system depends on the circumstances of the area and the number of fingerlings that will be required.⁷

Enterprise Background

Tilapia is grown-out from fingerlings in an earthen pond (20m x 20m x 1.5m). Water is supplied to the pond from a river/freshwater spring located approximately 30 meters away from the pond via gravity feeding using PVC piping. Fish are harvested at approximately 6 months using a purse seine net and are then transferred to a cement tank filled with flowing water located next to the pond for 24 hours for purging. After purging, fish are transferred to buckets and sold immediately. Fifty per cent are sold to local villages (family, friends in same village and nearby villages) and fifty per cent to hotels and other retail outlets in Apia. At the end of each six-month production cycle the ponds are drained and left to dry out for 2 weeks prior to the next production cycle.⁸

Production Information

- Production cycle:
6 months (180 days)
- Stocking density:
5/m²
- Pond dimensions
20m x 20m x 1.5m
- Pond area:
400 m²
- Land area used by enterprise: 0.1 acre
- No. of juveniles:
2,000
- Mortality rate:
5%
- No. of fish harvested:
1,900
- Average weight/fish:
300 grams

⁷ Nandlal, S., and Pickering, T. 2004. Tilapia fish farming in Pacific Island countries. Volume 1. Tilapia hatchery operation. Noumea, New Caledonia: Secretariat of the Pacific Community

⁸ Farm Manual 2020 Ministry of Agriculture

The cost structure of tilapia farming in Samoa

INCOME

Harvestable / Saleable Yield:

Approximately 1, 9000 fish are harvested, after considering a 5 percent mortality loss (100 fingerlings)

Market

50% of sales (950 tilapia) are made to local villagers. Buyers pick up fish from the Tilapia farm on the day of harvest. Fish are sold on a per string basis, with five fish per string.

A further 50% of sales (950 tilapia) are made to Apia- based hotels and retail outlets. The producer delivers tilapia to these markets on the day of the harvest. Fish are sold on a per kilogram basis, with a dingle fish weighing 300 grams.

Price

Fish are sold to local villagers for \$5.00 per string (316 strings for one production cycle), to hoteliers and retailers for \$4.50 per kilograms.⁹

DIRECT COST

Juveniles:

Tilapia juveniles (approx. 20 grams / juvenile) are supplied free of charge from the MAF-Fisheries Division's Hatchery.

Feed:

Tilapia are supplementary fed custom-made formulations produced by a local company Farm Tech Company comprised of fishmeal, copra meal, brewer's waste, chicken pellets and flour. Two formulations are used:

⁹ Farm Manual 2020 Ministry of Agriculture and Fisheries

- Fingerling formulation (1.2kg/day for 30 days)
- Adult formulation (10kg/day for 150 days)

The full cost of fingerling and adult formulate on is \$1.66/kg and \$1.44/kg respectively. Fish are fed twice a day.

Chicken Manure

Prior to releasing fingerlings in the pond, one bag of chicken manure is placed in the pond to aid algal blooming, at a cost of \$10.00 per bag. This is of course only for large scale earth ponds.

Otherwise Lau Pele, Manioka or Bok choy leaves are used because it is cheaper or regularly found at the farms.

DELIVERY COST

One trip per production cycle is made to Apia to deliver tilapia to hotel and retail customers at a cost of \$30/trip. Other farmers have hotel chefs visit their farms.

Ice is required to keep fish fresh. Five buckets are purchased @ \$5.00 per bucket.

LABOUR

Family labour is used for the tilapia enterprise for the following operational tasks.

- Feeding: 90 hours – 1 person x 0.5 hours x 180 days
- Maintaining pond periphery: 12 hours – 1 person x 2 hours x 6 months
- Harvesting: 30 hours – 10 people x 3 hrs
- Transfer from purge tank into buckets: 2 hours – 2 people x 1 hours
- Selling to villagers: 4 hours – 1 person x 4 hours
- Delivery to hotels and retail outlets: 4 hours – 1 person x 4 hours

Family labour is also used for pipe installation and pond maintenance. These costs are associated with capital and are hence, only included in the development budget.

- Pipe installation: 8 hours – 2 people x 4 hours (Year 1)
- Pond sludge removal: 2 hours – 1 person x 2 hours (every five years)

An imputed cost for family labour of \$3.00/hour is assumed.

CAPITAL COST

The following capital items are required for producing tilapia under the production parameters stated. These costs are included in the development budget.

- Pond construction: \$4,500 - 30 hrs. Contract labour (\$150/hr.)
- Piping:
 - ❖ 40m x 2” high pressure PVC piping: \$550 (40m x \$13.75/m)
 - ❖ 6 x 2”PVC elbows: \$48.00 (6 x \$8.00/unit)
 - ❖ 2” ball valve: \$113/unit
- Cement purging tank: \$3,000 (9m x 1.5m x 1.5m)
- Net:\$500 (Secondhand tuna purse seine net)
- Buckets: \$200

Source: Farm Manual 2016 Ministry of Agriculture and Fisheries

PRODUCTION AND GROWTH RATE

Recent report from 2018 shows, that cage farming has been successful demonstrated in Satoalepai Lake in Savaii. Two cages were installed with 1000 tilapia each were kept and fed for 8 months until harvest. Survival rate was 80%. This activity was driven and managed by the Satoalepai community.

Second stocking of about 300 fish per cage in September 2017.

A small- scale tilapia incubator system has been set up at Samoa National Fisheries Hatchery

currently held meeting to meet national demand for tilapia fingerlings.

One of the tilapia farms currently on development in Lotofaga- Safata, with ongoing support from the Fisheries division. Producing fish for sale to Apia markets and fingerlings which are supplied to other farmers 'Demonstration farm' for tilapia breeding and nursing, locally-made feed.

CONSUMPTION

A case study of smoked tilapia showed that some people preferred smoked tilapia over smoked reef fish, which suggests that fish smoking, is being practiced.¹⁰ In previous years it was recorded that fish paste was the most preferred product, followed by salted- cold smoked, the surimi while cured – cold smoked tilapia was the least preferred.

The major consumers of tilapia are locals while emigrants Asians and Africans have also been reported buying tilapia from one of the farms. Chinese restaurant owners in Samoa usually bought for restaurant menus and for their own consumption. The communities who are involved in the tilapia fishery consider tilapia a staple protein source especially on the latter where tilapia strings were sold along the roadside.

ADVANTAGE & DISADVANTAGE OF FARMED TILAPIA IN SAMOA

ADVANTAGES

- Little environmental modification is needed.

- Easy to culture
- Moderate local demand
- Strong and positive impact in rural communities.
- Women are commonly involved in the production systems.
- Potential for integrated farming

DISADVANTAGES

- Lack of feeds
- Lack of inbreeding control strategies at farm level
- Lack of marketability (demand/ supply) knowledge;
- Lack of business plans at farm level

¹⁰ Value adding and supply chain development for fisheries and aquaculture products in Fiji, Samoa and Tonga.

GROSS MARGIN BUDGET FOR TILAPIA (2 PER YEAR CYCLE)

ASSUMPTIONS - ONE YEAR'S PRODUCTION (2 CYCLES)		No. of strings sold (village sales): 633	
Production cycle (months):	6	Proportion to hotels, retail outlets:	50% (sold on a per kilo - 1900 fish =570kg)
No. of production cycles per year:	2	Price per string of fish	5
Pond dimensions:	20m x 20m	Price per kilogram of fish	4.5
Pond area (m	400	Feed cost per cycle (\$/kg):	
Stocking density/m	5	Fingerling feed - 1.2kg/day for 30 days	0.83 (Supplied by MAF - free until a profit is made and then at half price)
(A) No. of juveniles:	4000	Adult feed - 10kg/day for 150 days	0.72 (Supplied by MAF - free until a profit is made and then at half price)
Mortality Rate:	5%		
No. of fish harvested:	3800		
Harvestable weight (kg)	0.3	(B) No. of working hours per day	8
Proportion to village sales:	50% (1900 fish sold on a per strings basis)		
No. of fish per string (village sales):	3		

INCOME (\$)	Year 1	Year 2	Year 3	Year 4	Year 5
Tilapia - Village Sales (633 strings @ \$5.00)	3165	3165	3165	3165	3165
Tilapia - Hotels, Retail Outlets (570kg @ \$4.50)	2565	2565	2565	2565	2565
(C) TOTAL INCOME (\$)	\$5,730.00	\$5,730.00	\$5,730.00	\$5,730.00	\$5,730.00

DIRECT COSTS (\$)	Year 1	Year 2	Year 3	Year 4	Year 5
Juveniles (Free of charge from MoA)	0	0	0	0	0
Chicken manure (1 bag/cycle @ \$10/bag)	20	20	20	20	20
Feed	0	0	2220	2220	2220
Transport to local retailers (1 trip/cycle @ \$30/trip)	60	60	60	60	60
Ice (5 bags/cycle @ \$3.00/bag)	30	30	30	30	30
(D) TOTAL DIRECT COSTS (\$)	110	110	2330	2330	2330

(E) GROSS MARGIN (\$ (C-D))	\$5,620.00	\$5,620.00	\$3,400.00	\$3,400.00	\$3,400.00
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FIXED COSTS	Year 1	Year 2	Year 3	Year 4	Year 5
Pound Constructions (30hrs contract labour @\$150hr)	\$4,500.00	\$0.00	\$0.00	\$0.00	\$0.00
Pond maintenance	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Pipes and fittings		\$0.00	\$0.00	\$0.00	\$0.00
2" PVC Piping (40m @ \$13.67/m)	\$547.00	\$0.00	\$0.00	\$0.00	\$0.00
2" PVC Elbows (6@ \$8.00)	\$48.00	\$0.00	\$0.00	\$0.00	\$0.00
2"ball valve	\$113.00	\$0.00	\$0.00	\$0.00	\$0.00
cement purging tank (9mx1.5mx1.5m)	\$3,000.00	\$0.00	\$0.00	\$0.00	\$0.00
Net	\$500.00	\$0.00	\$0.00	\$0.00	\$0.00
Buckets	\$200.00	\$0.00	\$0.00	\$0.00	\$0.00
(F) TOTAL FIXED COSTS (\$)	\$8,908.00	\$0.00	\$0.00	\$0.00	\$0.00
(G) Annual Net Income (E-F)	(\$3,288.00)	\$5,620.00	\$3,400.00	\$3,400.00	\$3,400.00
Net Income/Fish (G/A)	(\$0.82)	\$1.41	\$0.85	\$0.85	\$0.85
Net Income/Family Labour Day (G/K)	(\$90.08)	\$153.97	\$93.15	\$93.15	\$93.15
Cumulative Net Income	(\$3,288.00)	\$2,332.00	\$5,732.00	\$9,132.00	\$12,532.00
FAMILY LABOUR INPUTS (HOURS)					
Task	Year 1	Year 2	Year 3	Year 4	Year 5
Pipe installation	8	0	0	0	0
Feeding	180	180	180	180	180
Maintaining pond periphery	24	24	24	24	24
Hasvesting	60	60	60	60	60
Tranfer to buckets from purge tank	4	4	4	4	4
Selling on-Farm to village	8	8	8	8	8
Transport to market	8	8	8	8	8
Pond Sludge removal	0	0	0	0	0
(H) Total Family Labour Hours	292	284	284	284	284
(I) Average family labour cost (\$/hour)	\$3.00	\$3.00	\$3.00	\$3.00	\$3.00
(J) Cost of Family Labour (\$) (HxI)	\$876.00	\$852.00	\$852.00	\$852.00	\$852.00
(K) Total Family Labour Days (H/B)	36.5	36.5	36.5	36.5	36.5

(L) Net Income - incl cost of family labour (G-J)	(\$4,164.00)	\$4,768.00	\$2,548.00	\$2,548.00	\$2,548.00
cumulative Net Income - incl cost of family labour	(\$4,164.00)	\$604.00	\$3,152.00	\$5,700.00	\$8,248.00

Table 1: Average Prices of Agricultural Commodities at Fugalei market

Commodities (SAT\$/kg)	November 2020	December 2020	Lowest price for 2020 to date	Highest price for 2020 to date
Taro	2.22	1.88	1.88	3.06
Banana	1.01	0.87	0.87	1.36
Taamu	3.25	7.96	3.25	8.78
Coconut	1.06	1.09	0.89	1.09
Breadfruit	1.54	1.17	0.90	2.31
Yam	3.73	3.22	3.22	5.30
Head cabbage	6.36	7.56	6.11	14.71
Tomato	10.81	11.74	9.82	19.92
Chinese cabbage	3.96	6.19	3.69	9.82
Cucumber	3.13	4.01	3.13	5.97
Pumpkin	2.46	2.73	2.46	5.32

Source: Samoa Bureau of Statistics

Table 2: Foreign currency per tala (ST\$)

November- December 2020	USD\$	NZD\$	AUD\$	YEN\$	FJD\$	EURO
1 Samoan Tala SAT\$ =	0.3807	0.5370	0.5165	39.0800	0.7850	0.3115

Source: Bank of the South Pacific

Market Link Newsletter

This newsletter is published bi-monthly and it seeks to assist stakeholders (farmers, consumers, wholesalers, policymakers) make informed market and marketing decisions based on credible, relevant price and supply information. Help us help you by providing constructive feedback on market information issues that will improve the service which will lead to growing a healthy and wealthy Samoa.

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You can contact us by phone, fax and email or come down and visit us. We are located on Level 1, TATTE Building, Sogi or you can write to us at:

Ministry of Agriculture and Fisheries
P.O Box 1874
Phone: (685) 22 561