



AwF –Farmer to Farmer Trip Report

The focus of this collaboration was to discuss options for improving profitability and sustainability with soft-shell crab farmers in Malaysia and the Thailand-Burma border region. The majority of farmers were in the Ranong, Thailand area. We were hosted by Ms. May Myat Noe Lwin who has served as an AwF volunteer to farmers in Banda Aceh, Indonesia. Ms. Lwin speaks Burmese, Thai and English and is considered the leading soft-shell crab producer in the area. The basic cultural method is to purchase live crabs from fishers and then to hold the crabs in individual boxes until they molt (develop a new exoskeleton and cast off the old exoskeleton or shell). The new “shell” is very soft and if placed immediately in fresh water it will remain soft. In the soft shell condition, the entire crab is edible and is considered a delicacy in most countries around the world.

Obtaining soft-shell crabs is very labor intensive as the crabs must be inspected every 4 hours around the clock to ensure that they are removed from salt water and placed in fresh water before the new shell hardens. In addition, each crab must be kept in a separate box as they are cannibalistic. The typical farm will contain an array of 10,000 to 50,000 boxes. Crabs molting is affected by tidal and lunar cycles with peaks during certain times of the month, although some are molting (also called shedding) on any given day. However, as consumer demand does not follow lunar or tidal cycles, many thousand crabs must be maintained in order to have a consistent number molting on each day for fresh sales.

The crabs are reared in ponds that are typically operated with tidal exchange of water. So at high tide the pond is filled and then boards are placed in a sluice gate to hold the water. At the end of the low tide cycle as the tide starts to turn, several of the boards are removed so much of the water escapes, only to be refilled in a few hours by the incoming tide. After which, the boards are replaced to impound the new water.

Heavily stocked ponds containing thousands of crabs can deplete the available oxygen during neap tides with reduced tidal flow. We discussed options for growing the red seaweed *Gracilaria* as an additional crop in the ponds. *Gracilaria* is farmed in many countries as both a vegetable crop for human consumption and as a source of agar. Agar, which is a polymer of sugar, has a local market as a cooking ingredient for various dishes and desserts. On the international market, it is dried, further processed and used as microbiological agar for bacterial cultures. The seaweed culture benefits the pond environment by absorbing CO₂ and ammonia produced by the crabs and gives off oxygen. The ammonia is used as nitrogen fertilizer to produce more seaweed biomass. The market price for seaweed is not very high and additional market demand must be encouraged.

Another polyculture crop we discussed was tilapia. Tilapia are a popular farmed fish in Thailand, Burma and Malaysia and can be easily produced in cages in the crab ponds. The benefits are that the farmer gains another highly marketable crop, but the problems of depleted oxygen and ammonia production are exacerbated with too many tilapia.

Soft shell crab polyculture notes from individual farm visits.

1. Mr. Khoo Eng Wah – operating mud crab (*Scylla sp.*) hatchery
Farm was in greenhouse with ponds. North Selangor state, north of Port Klang, Malaysia

Buying berried female mud crabs (*Scylla sp.*) at 5 ringett per female from fishermen / crab collectors

Puts berried females in tanks until they released the fertilized eggs. Eggs hatch overnight and reach zoea stage in 24 hours. Moved zoea 1 into greenhouse pond (Designed by his engineer son). Grew in pond for 25 days to juvenile crab stage. Then move to nursery pond with liner with fish net as substrate. Counted 25,000 into pond (0.05 ha each). One reservoir pond and one nursery pond. Aeration into all ponds from blower through diffusers with diesel backup generator. Stocked at low density to ensure adequate resources for crab growth. Has not really started selling juvenile crabs yet. Survival rate only 10% at this time.



Juvenile crabs in greenhouse pond



Mr. Khoo, college intern and Fitz



Juvenile crabs counted for stocking into pond

First feeds were algae (*Isochrysis* and *Tetraselmis*), rotifer and then *Artemia*. Then fed *L. vannamie* PL feed.

Stock into mangrove ponds for growout. One hectare ponds (2 ponds). Blue swimmer crab (*Calinectes sp.*) is a future target species.

Afternoon visit to Sepang, office and house of Mr. Khoo.

2. Soft shell crab - Integrated Crab Systems Mud crab - owned by brother of the Gold Coast Palm Resort developer

740,000 cages planned, 450,000 operating and still installing additional units, salinity in system was 20-30 ppt. flow – through with trickling water to each cage and overflow standpipe. The planned target is to check each cage every four hours. Cages made to order in Thailand. Currently have 20 employees and 10 or 12 more doing system installations. Eventual plan to have 30-40 employees.



Crab systems farm



Crab escaping open box



Technician checking each box every 4 hours

3. Ranong, Thailand

The CNN Aquaculture farm is in Kah Nam Houm area outside of Ranong city. There are 10 farms in the group, with individual ownership. All of the farms are in converted shrimp ponds. Raw seawater is used in each pond. The incoming water is filtered with net screens or filter socks. Each crab is stocked into a single crab box (manufactured in Thailand). Crabs are mostly purchased from fishermen who catch wild crabs on the Thai and southern Burma coasts. Each crab is fed every second or third day depending on tide cycle. The crabs are fed cut fish (three basic species are used).

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Ms. Lwin, manager of CNN Aqua



Farm staff at CNN Aquaculture



Feeding each crab in individual box

Each farm employs 5 to 10 workers. The staff must inspect every stocked crab box six times a day and individually fed every second or third day. These jobs are typically done by men. Each box must be cleaned by hand between stockings. This is typically done by women staff, although it should be noted that Ms. Lwin frequently does every job around the farm.

During the visit we toured several of the farms and met with farm owners and workers to discuss Best Management Practices. The focus was on polyculture with tilapia and shrimp, although we also reviewed biosecurity and disease problems along with water quality, feeding and handling. The farmers are very interested to improve quality at minimal costs in an effort to gain better market share and profitability.

4. Ngao district, outside Ranong

The Ngao district is home to another cluster with 15 soft shell crab farmers, all using converted shrimp farms. Mr. Sagnob, from Bangkok, has been there four years, and is a typical producer. We spent considerable time with Mr. Sagnob. Other farmers were visited in the cluster for shorter periods. Again Ms. Lwin provided translation and her own expertise as the most accomplished of the crab farmers.



Mr. Sagnob, farm owner and manager



Crab boxes in pontoon area in converted shrimp pond

For 3. and 4. above. Generally pay collectors 80 baht per kilo and sell for 240 baht per kilo. Crabs will moult depending on growth, temperatures etc. Need to have many crabs in order to have sufficient number of fresh moults for market every day.

Most farm staff are immigrant workers from Burma.

5. Visit to Ranong fishing piers and sales docks.

In Ranong we also met with Burmese fishermen bringing crabs for the farms and small forage fish to be used as feed. These fish constitute an important market for fish that would otherwise be discarded as by-catch or converted to fish meal with virtually no return to the fishermen.



Polyculture suggestions for crab farmers.

Stock tilapia into the ponds

BENEFITS

1. Extra income
2. Tilapia clean cages by grazing periphyton and other fouling from the boxes
3. Additional low cost food for workers

COSTS

1. Fingerlings should be all male
2. May need to feed tilapia for more rapid growth
3. DO not want tilapia to compete for resources, especially oxygen or to increase ammonia or nitrites.

Stock *Gracilaria* in ponds

BENEFITS

1. Extra income
2. *Gracilaria* absorb nitrogen, CO₂ and other crab wastes
3. *Gracilaria* provides abundant oxygen during the day
4. Additional low cost food for workers

COSTS

1. Collect or purchase starter material
2. *Gracilaria* use O₂ at night
3. Need to invest time and maybe funds to develop markets.