

Periurban Aquatic Food Production Systems in Phnom Penh

The numerous plots located around wetlands in periurban Phnom Penh, are important sources of edible aquatic vegetables and fish for the city and other areas of Cambodia. These areas are fertilised by domestic sewage/wastewater discharged from the city. The activities relating to these production systems are intrinsically linked with the livelihoods of many poor people living in and around the city.



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Morning Glory growing in waste water-fed lake

A study and appraisal of the value and impact of these systems was carried out in 2003 as part of an EC funded study in order to understand their sustainability within the overall future development of the city. Four major study areas in and around Phnom Penh were identified as indicative of periurban communities where fish and aquatic plants are cultivated. Kbal Tumnub and Thnout Chrum are two of the main villages located about 5 kilometres from the city centre around the the city's largest wastewater-fed lake (Boeung Cheung Ek, 3403 hectares). Up to 80 % of Phnom Penh's domestic wastewater is pumped into the lake, as well as industrial and chemical effluents from a growing industrial sector, which is also located around the lake. Both villages are known for the cultivation in the lake of considerable volumes of edible aquatic vegetables, especially water spinach (*Ipomoea aquatica*) – commonly known as morning glory, and water mimosa (*Neptunia oleracea*). Boeng Kok lake is a smaller urban wastewater-fed lake located closer to the city centre, where residents of the adjacent village raise snakehead (*Channa striata*), walking catfish (*Clarias batrachus*) and river catfish (*Pangasianodon hypophthalmus*) in net pen

enclosures often located under their houses, which are built on the banks of the lake. The same fish species are also raised in ponds and cages in a more periurban community (Prek Phnov) situated about 10 kilometres to the north of the city close to the suppliers of trash fish from the Great Lake, which are used as a seasonal input into fish feed for the farmers' production.

Commercial production of aquatic vegetables in the city was first established prior to the country's civil war (pre - 1970) when Phnom Penh was known as "The Peaceful Island", but expansions in production were hampered by poor market access. It became re-established on a more commercial scale after the Pol

Pot era (1975-1979), when many people returned to both Phnom Penh and the surrounding areas after almost 10 years of relocation and severe war. Aquatic vegetables, especially water spinach, began to replace rice in Boeung Cheung Ek Lake using the city's increasing supply of sewage and as markets became re-established.

Aquatic vegetables are now intensively cultivated throughout the year. Wastewater provides most of the nutrients, but additional fertilisers and pesticides are also heavily applied. In Boeung Kok Lake, fish farmers feed canteen and restaurant waste, as well as rice and vegetable by-products, to their fish in pens. Pig pens and household

Waste water pump



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Feeding fish along the lake

latrines are also often located over pens stocked with fish, whilst in Prek Phnov trash fish from the river is the main feed used for fish grown on in ponds.

Water spinach seed is obtained from the other villagers. When the water dries up in some parts of the lake people grow water spinach on the land. These plants will then be used as the subsequent seed stock for growing on in water. River catfish seed originating from natural sources and hatcheries in Vietnam are obtained through traders. Hybrid Clarias catfish seed also mainly come from Vietnam.

The aquatic vegetables and fish produced by these communities are mostly sold fresh in marketplaces both inside and outside the city. Collectors transport these products to the marketplace where various traders are involved in buying and selling them. Aquatic vegetables account for nearly half of the total sales of vegetables in Phnom Penh.

Aquatic food products flow from producer to consumer through middlemen or the wholesalers. Sometimes the producers themselves are the wholesalers as they transport their product by motorbike directly to the markets in the city. The middlemen increasingly use small trucks for transportation from farm to market. Retailers from the provinces come to the markets in the city to take fish and aquatic vegetables back to the provinces.

Water spinach is by far the most important aquatic vegetable product sold for human consumption. Urban consumers can eat it fresh and cooked; the majority of the plants are grown in

wastewater. Lower-quality water spinach is also used to feed livestock (mainly pigs) during the dry season. Some urban consumers prefer cultured fish raised around the city, since it is often sold at lower prices than other types of fish. The major species are river catfish, walking catfish and snakehead. Although the price of pangasius (river catfish) is lower, there is still little demand for this fish among higher-income consumers in Phnom Penh because of a widespread perception that it is raised in latrine ponds and pens using wastewater.

Recent studies indicate a number of health-related impacts of urban aquaculture within these communities especially affecting the poorer sections which have a seasonal dimension. These include diarrhoea and skin infections, which are at their most prevalent from April – June) at the end of the dry season and beginning of the rainy season. These problems are probably due to decreasing water levels in the lakes leading to the accumulation and concentration of waste products resulting in poor water quality; this starts in January and becomes acute by March. Fishing and fish trading by people with lower incomes decline during this time of year and these people are then more likely to seek off-farm employment in construction, transportation and the logging industries. Fish farmers also tend to sell their fish at this time. The critical season for this latter group is at the onset of the cooler months (October to November) when fish disease is most likely. In the communities in which aquatic vegetables and fish are important, livelihoods are much diversified. Employment in local factories, motor taxi driving and the rearing of livestock are also all important sources of local household income.

Declining value of aquatic vegetables and availability of affordable credit are the major problems for aquatic vegetable producers. Many of them take credit from NGO micro-credit schemes administered by small associations within the communities. A large proportion of producers also take credit from private lenders at high rates of interest. Some fish farmers are also in debt to private lenders or friends and relatives. Their fish farming systems require relatively high levels of inputs, and as result credit is very important for them.

Although periurban areas are directly administrated by Phnom Penh Municipality, there are a number of other institutions which have roles and responsibilities in these areas. There is a lack of clarity about the role of some institutions with respect to urban aquatic systems in Phnom Penh, especially those concerned with, and relating to, aquatic vegetable production. These institutions usually work independently and are separate from the communities. The local people do not participate or have a voice in the planning process. The government has a policy to promote aquatic production through recycling of wastewater by using natural water bodies such as Boeung Cheung Ek. However this is not reflected

The livelihoods of the people who depend on the lake are uncertain

in any effective zoning as there are an increasing number of factories and growing industrial sector around the lake, making the future livelihoods of the people who live around and depend on the lake uncertain. Increasing urban population and demand for residential construction may also pressurise the government to implement plans to fill up **Boeng Kok** lake to make room for the construction of residential housing, which in turn would increase the volumes of waste disposal and night soil. In contrast, fish farming in non-wastewater in Prek Phnov is likely to continue to grow in the near future as there are no immediate demands for the land and the systems are responding to high demand in the urban markets and are supported by good access to a relatively good quality water supply, and reliable supplies of fingerlings and feed.

References

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Water spinach producer in Beoung Cheung Ek Lake, Phnom Penh

Mrs. Kim Bunthach is one of the water spinach farmers in Kbal Tumnob village (Beoung Cheng Ek area, Phnom Penh.). During the Pol Pot era, she moved from the city to a refugee camp near Thailand's border (Saiy B). She repatriated from Saiy B to live in Kbal Tumnob Village in 1991. At 40 years of age she has seven children, four of whom attend a local public school. Two of her sons have dropped out of school to help her with her farming activities and business, whilst the two youngest (a 5-year-old daughter and a 2-year-old son) are not yet of school age. She spends a lot of her time working in order to support her family and pay her children's studies. In the past she has requested permission for her children to study in a local NGO-funded school, but this was not permitted because her living standard is considered good enough to support them. Her husband is a government worker, who uses his free time to help in the water spinach farm. Mrs Bunthach rents a 2500 m² area plot on the lake located 400 metres from her house.

Generally she spends 6 hours per day harvesting water spinach. During periods when her aquatic vegetables are not growing well and she therefore can not collect them, she spends about 2-3 hours taking care of the plot. In general there are 2-3 cropping cycles per year, because the water spinach can be destroyed by disease, bad weather or lack of water during the dry season which causes the plot to dry up. The rest of her time is spent tending to a small business at her home, however when she is busy harvesting water spinach she has no time for this, so one of her children is left in charge of the business.

Mrs. Bunthach can collect 300-400 bunches (0.3 kg per bunch) of water spinach per day, which she can do continuously for up to a week. After a week the quality of the remaining crop deteriorates, and the plants need to be sprayed to allow regeneration and new growth. Mrs Buntach can then begin harvesting again after a further two weeks. Besides harvesting, which is her

main daily activity, she has to remove unneeded aquatic plants, keep the water spinach floating rafts in order, and routinely spray chemicals and pesticides. She has been farming water spinach since 1991, when the aquatic vegetable had a much lower value

than it does now. Water spinach is sold by weight (3000 Riel per 10 kg – 1US\$ = 4300 Riel). Since 2000 demand for the crop, and consequently its selling price, has been increasing. Mrs Bunthach thinks this is because many new garment factories are being built locally, thereby increasing the demand for food and vegetables from the growing workforce. The price of one bunch of water spinach ranges from 100-350 Riel depending on the season.

The price is highest in the dry season from December to July, because of low water levels and hence poor water quality in the lake. As a result, the overall quality of the water spinach also decreases. To marginally improve the quality of the plants in the dry season, she can pump water from the other part of lake, which does not dry up, into her water spinach plot and also spray the plants with chemicals. This lower quality water spinach can also be sold at a lower price for livestock (mainly pig) feed.

During harvesting Mrs Bunthach often hires 2-3 persons for an average of 2-3 days per month to help her. Daily payment for hired labour depends on the external worker's effort: the more bunches they can collect, the more they earn. Generally the workers are paid 7000 Riel for 100 bunches.

Her water spinach is generally sold to regular customers, however, some is also sold to other customers when the price offered is higher. Two months ago the



Mrs Bunthach faces challenges both as a mother and as a farmer.

owner of Mrs Bunthach's plot chose to stop renting it out, so she has had to stop farming for a while, until she can find another plot to rent. She pays 40,000-50,000 Riel for the chemicals needed to spray her aquatic vegetables. This provides her with enough chemicals to spray the crop 3-4 times. Since they generally need to be sprayed twice a month, this amount will last two months.

Mrs Bunthach faces many challenges in her daily life both as a mother of many children, a working farmer and also a local business owner. Since she does not own any land and the land owner can take back her plot with little prior warning, it is risky to invest her own time and money in planting and caring for the water spinach. Competition for available land and as a result plot rental prices are also increasing. Moreover, plant diseases and poor water quality in the dry season can damage her crops, as well as storms in the rainy season, which can cause widespread flooding in the village, also making it more difficult for farmers to transport their produce to market.

When asked about the future Mrs Bunthach believes that the future of water spinach farming in peri-urban areas, especially at Beoung Cheng Ek lake, is in the hands of the government. If the government chooses to develop this area for other urban development purposes, e.g. construction of residential or industrial sectors, then the cultivation of water spinach will gradually disappear.