

# An overview of fish seed supply in three provinces of the Mekong delta region of Cambodia\*

by

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## **1. Abstract**

Fish and other aquatic animals are vital to the diet of Cambodians, providing 75% of animal protein intake (Interim Mekong Committee, 1992). While the human population has increased, capture fishery production is at or near its peak. The development of small-scale aquaculture is seen as the main method to augment a potential future shortfall of wild fish to improve nutritional intake, while increasing food security and providing income generation. To stimulate development of small-scale fish culture the Department of Fisheries, several NGO's and development projects have worked collaboratively to promote the establishment of local fish hatcheries and nurseries in key provinces.

This paper presents an overview of seed production in Kandal, Prey Veng and Takeo provinces of the Mekong delta region. There are currently 3 large-, 2 medium- and 8 small-scale hatcheries and 51 fish seed nurseries in the three provinces. Tilapia (*Oreochromis niloticus*), silver barb (*Barbodes gonionotus*), common carp (*Cyprinus carpio*) and silver carp (*Hypophthalmichthys molitrix*) being the main species being produced. In 1999 a total of 5.5 million fry were produced by hatcheries in Kandal, Prey Veng and Takeo provinces. All the hatcheries in the region have production constraints and are operating at below full capacity.

Extrapolated estimates indicate that potential demand for fish seed is far greater than current production capacity of the seed supply centres in the provinces of the Mekong delta region. Nursery farmers can not access local sources of fry, READ will therefore promote small-scale hatcheries in the region to address this constraint.

## **2. Introduction**

Rice and fish are major items in the diet of Cambodian people, with fish providing 75% of animal protein intake (Mekong Secretariat, 1992). An expanding population has an increased demand for fish, though the supply of wild caught fish is at or near its maximum sustainable yield. The development of small-scale aquaculture is seen as an important way to meet the growing demand for fish, while also offering improved food security, nutrition and employment and income generation opportunities. The timely supply of good quality fish seed is vital for aquaculture development.

Fish seed can either be collected from the wild or produced in hatcheries. In Cambodia, snakehead (*Channa spp.*) and river catfish (*Pangasianodon hypophthalmus*) are the main species collected from the Mekong River and its tributaries. The total amount of seed collected was 559,000 and 5,060,000 in 1987 and 1998 respectively. Wild seed is sold to intensive commercial pond and cage culture farmers in both Cambodia and Viet Nam. Collection of wild seed with fine meshed bag nets may damage the wild fisheries, so efforts have been made to boost hatchery production of fish seed.

In Cambodia artificial spawning was first conducted by Department of Fisheries hatcheries, primarily for restocking of natural water bodies (enhanced fisheries), but also for research purposes. Later, the Department of Fisheries actively promoted the establishment of provincial fish hatcheries and nurseries as part of its policy to encourage farmers to culture fish. Thereafter NGO's, development projects and the private sector followed the government's lead.

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Initially, NGO's and donor funded development projects distributed free or subsidized fish seed to farmers to accelerate small-scale aquaculture development in Cambodia. However, repeated experience showed that when the subsidies ended, very few farmers continued to buy fish seed from central hatcheries for on-growing. In remote areas poor infrastructure and lack of transport deterred farmers from travelling to the central provincial hatcheries. The Department of Fisheries and NGO's responded to this constraint by promoting strategically located hatcheries (primary producers) and nurseries (secondary producers) at the village level in fish seed shortage areas, thereby ensuring supplies of fish seed over a wider geographical area.

In a little over a decade a network of fish seed producers, both hatcheries and nurseries, has been established for the purpose of stimulating the development of small-scale aquaculture in the Mekong delta region of Cambodia. This paper presents an overview of the current demand for fish seed, the status of fish seed supply centres, the fish species produced, production capacities and the problems and constraints faced by each level of the seed supply network and the channels by which fish seed reaches grow-out farmers.

### **3. Methodology**

First a literature review was conducted of reports held by various government agencies and NGO's. Written notification was then sent to all NGO, private and government hatcheries and nurseries asking them to cooperate with the study and to provide preliminary seed production data. Based upon this feedback, hatcheries in Cambodia were segregated into 3 groups i.e. small, medium and large-scale. A formal questionnaire survey designed to give both quantitative and qualitative data was conducted for all small- (n = 8), medium- (n = 2) and large-scale (n = 3) hatcheries. However because of time and budgetary limitations data was collected for a randomly selected sample of 22 of the 51 (43%) fish seed nurseries in Kandal, Prey Veng and Takeo provinces. The survey was conducted between early September and late November 1999.

The Rural Extension for Aquaculture Development (READ) project is conducting a long-term comprehensive pond population survey. Data from 4 out of 10 districts in Takeo, 2 out of 12 districts in Prey Veng and 3 out of 10 districts in Kandal provinces were used to estimate current and potential demand for fish seed.

All data was entered and processed using the software programme Statistic Program for Social Sciences (SPSS). Simple statistical techniques such as: frequency, percentage, mean, standard deviation, correlation and multiple regression analysis were used in data analysis.

### **4. Results and discussion**

Hatcheries producing, less than 50,000 seed, 50,000 – 1,000,000 and more than 1,000,000 were classified as small, medium and large-scale hatcheries respectively (see Table 11.1). The 3 large-scale hatcheries (1 government and 2 NGO owned), in the project area are multiple purpose facilities built for seed and food-fish production, research, extension and conservation of endangered species. One of the medium-scale hatcheries was established by the government and the other one by an NGO. Both were producing fish seed and marketable fish. Individual farmers own all the small-scale hatcheries and nurseries, with financial and technical assistance being provided by NGO's and development projects.

Table 11.1: The number of hatcheries and nurseries in four provinces.

Provinces	Large-scale hatchery	Medium-scale hatchery	Small-scale hatchery	Nursery
Kandal	1	1	1	16
Takeo	1	0	4	16
Prey Veng	0	1	3	19
Phnom Penh	1	0	0	N/A
Total	3	2	8	51





Table 11.8: Quantities of fish seed produced by small-scale hatcheries in 1999

Production	Takeo	Prey Veng	Kandal	TOTAL
Small-scale hatcheries	545,782	126,420	1,000	673,202

Table 11.9: Quantities of fish seed from small-scale nurseries by province in 1999

Production	Takeo	Prey Veng	Kandal	Phnom Penh	TOTAL
Small-scale nursing	195,310	9,110	7,500	31,500	243,420

Table 11.10: Problems faced by large- and medium scale hatcheries

Problem	Large-scale hatcheries			Medium-scale hatcheries	
	Chraing Chamres	Bati station	Toulkrasang	Chak Angre	Potamom
Water supply	2	5	1	-	-
Insufficient technical staff	5	4	4	2	3
Insufficient budget	1	3	5	3	1
Poaching and theft	3	2	3	1	4
Predators	4	1	2	-	-
Transportation difficulty	-	-	-	5	2
Insufficient broodstock	-	-	-	4	5

In addition to common problems faced by large-scale hatcheries, medium-scale hatcheries suffer from the additional problem of having insufficient broodstock. The Potamom hatchery is located far from a main road and fry can remain unsold because of transportation difficulties. The hatchery owner therefore relies on MCC (an NGO) credit to continue operating. Poaching and theft and insufficient trained staff for breeding and nursing are the main problems at the Chak Angre hatchery.

Small-scale hatcheries face numerous problems. Key ones include lack of fish spawning knowledge and training, poor or insufficient water supplies, difficulties in purchasing hormone for induced spawning and transporting fry.

In the past the majority of small-scale nurseries received their fry from small-scale hatcheries. Recently small-scale hatcheries have been unable to meet the increasing demand for fry from small-scale nurseries, so nurseries have also been purchasing fry from large- and medium-scale hatcheries. Nursery farmers play an important role in the provision of in-formal credit to grow-out farmers. Many farmers have insufficient cash to pay for their fish seed at the time of purchase and therefore can only pay for fish seed at harvest time. The provision of credit and the distribution of fingerlings are the two most serious problems for nursery farmers.

Today large and medium-scale enterprises charge customers for delivery of fish seed to a customer's pond, on top of the price of the fish seed. Transportation methods for fish seed differ from place to place and from enterprise to enterprise. Fish are normally starved for 24 hours before transportation to prevent their faeces from fouling the water and reducing water quality. Fish are transported in jars and buckets for short distances. Plastic bags and oxygen are used to ensure high survival over longer distances. Transport modes include bicycle, motorbike, bus and car.

The area of ponds suitable for aquaculture was taken from the on-going READ pond population survey. Under this survey there are 3 pond size categories, namely less than 80 m<sup>2</sup>, 80 – 1,000 m<sup>2</sup> and bigger than 1,000 m<sup>2</sup>. The present and potential demands for fish seed were calculated. Current demand being defined as demand for fish seed from ponds that are currently stocked with fish or currently practicing aquaculture, while potential demand refers to demand for ponds that could be brought under aquaculture. Potential demand was calculated at 2 levels. Level 1 assumes that all ponds between 80 – 1,000 m<sup>2</sup> are stocked and level 2 assumes that ponds bigger than 1,000 m<sup>2</sup> are also stocked. It was assumed that ponds less than 80 m<sup>2</sup> would not be used for fish culture. A stocking rate of 3 fry per square meter is used to calculate the fry demand. Table 11.11 shows that there is a total area of 1.85 million m<sup>2</sup> of pond suitable for growing fish in the 9 districts of 32 surveyed to date.

Table 11.12 shows the current and potential demand for fish seed for the 3 provinces in which READ works. It has been assumed that the numbers and the proportion of small, medium and large ponds in the un-surveyed districts (23) is the same as the 9 districts that have already been surveyed, to calculate extrapolated demand.

Table 11.11: Number and area of ponds in the project area by province

Pond type	Province							
	Kandal *		Prey Veng **		Takeo ***		TOTAL	
	Number	Area (m <sup>2</sup> )	Number	Area (m <sup>2</sup> )	Number	Area (m <sup>2</sup> )	Number	Area (m <sup>2</sup> )
Cultured pond	120	14,400	225	23,426	433	124,187	778	162,013
< 80 m <sup>2</sup>	79	3,555	2,691	91,494	3,325	199,754	6,095	294,803
80– 1,000 m <sup>2</sup>	625	130,625	209	30,982	7,815	191,694	8,649	353,301
> 1,000 m <sup>2</sup>	36	72,000	1	3,500	532	970,939	569	1,046,439
TOTAL	860	220,580	3,126	149,402	12,105	1,486,574	16,091	1,856,556

- \* Survey conducted only in 3 out of 10 districts in Kandal province
- \*\* Survey conducted only in 2 out of 12 districts in Prey Veng province
- \*\*\* Survey conducted only in 4 out of 10 districts in Takeo province

Table 11.11 shows that if all ponds over 80 m<sup>2</sup> in the READ area were stocked with fish the demand for fish seed at 17 million fingerlings would be far in excess of the total hatchery production of 5.5 million fry in 1999.

Table 11.12: Demand of fish seed in the project area by province

Province	Kandal	Prey Veng	Takeo	Total
Current demand	187,629	70,278	372,561	630,468
Potential demand level 1	391,875	92,949	575,082	1,059,906
Potential demand level 2	216,000	10,500	2,912,817	3,139,317
Total demand for surveyed ponds	795,504	173,727	3,860,460	4,829,691
Extrapolated total demand	2,828,459	617,696	13,726,080	17,172,235

## 5. Summary

A survey of all 3 large-scale hatcheries, 2 medium-scale hatcheries, 8 small-scale hatcheries and 43% (22 of 51) of small-scale nursing centres showed the hatcheries produced a total of 5.5 million fry and 243,000 fingerlings in 1999. All the hatcheries were operating at below full capacity for a variety of reasons. Based on extrapolation the current supply of fish seed in the three Mekong Delta provinces is well below the potential demand. The majority of fingerlings are produced between July to October for stocking in small-scale aquaculture systems and in particular ponds. Tilapia (*Oreochromis niloticus*), silver barb (*Barbodes gonionotus*), common carp (*Cyprinus carpio*) and silver carp (*Hypophthalmichthys molitrix*) are the main species produced.

Fish seed are distributed not only in the three Mekong Delta Provinces where the large-scale and medium scale hatcheries are situated, but are also distributed in western and northeastern parts of the country. Water supply and predators were the two major problems faced by large-scale hatcheries, while lack of broodstock and trained staff are constraints of medium-scale hatcheries. Generally small-scale hatcheries face a wider range of problems, including insufficient fish breeding skills, poor water supplies, difficulties in obtaining hormone and fingerling transportation problems. Poor roads and public transport, long transportation distances and limited experience of seed transportation results in transportation mortality as high as 30%. The current major problem for nursery farmers is the insufficient supply of fish fry from local small-scale hatcheries. READ will therefore promote localised small-scale hatcheries to mitigate this constraint.

## 6. References

Interim Mekong Committee 1992. **Fisheries in the Lower Mekong Basin**. Annex 1 and 5.

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