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**Fact sheet:**

**Sustainable snakehead aquaculture development in the Lower Mekong River Basin of Cambodia**

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In Cambodia wild snakeheads are generally cultured in smaller cages and ponds. Feed represents more than 70% of the total operational cost and the main type of feed for wild giant snakehead culture is small-sized or low-value fish, representing 60 to 100% of the total feed used depending on feeding strategies adopted by different farmers (So et al., 2005). During the dry season (October to May), the most important source of feed is freshwater small-sized or low-value fish, while more marine small-sized or low-value fish species are used during the rainy season (June to September) (So et al., 2005). Importantly, the snakehead production contributes more than 70% of total aquaculture production in Cambodia due to its popularity as food and high market and trade demand in Cambodia as well as in Viet Nam being found in most Cambodian and Vietnamese dishes at all wealth class levels (i.e. from poor, medium to rich people).

In 2005, the Cambodian Ministry of Agriculture, Forestry and Fisheries banned snakehead farming. Collecting snakehead seed from the wild was seen having a negative impact on wild populations. Moreover, snakehead farming adversely affected poor people dependent upon small-sized low-value fish which were instead being fed to the voracious carnivores. The ministry has said the ban will be released only after the impact of snakehead culture is assessed in detail and domesticated seed and formulated feed become available.

Under third research phase funded by AquaFish Innovation Lab, the Inland Fisheries Research and Development Institute (IFReDI) at Cambodia's Fisheries Administration set out on-station research facilities at Freshwater Aquaculture Research and Development Center (FARDeC) to study weaning performance and grow-out of the wild indigenous *Channa striata* (non-domesticated) from Cambodia compared to those of domesticated snakehead from Vietnamese hatcheries with assessment of survival rate and growth performance of the two types of *Channa striata* larvae/fingerling on pellet feed. Furthermore, economic efficiency of experimental grow-out and product quality (human sensory analysis) of the two types of snakehead on different diets is also assessed at the end of the experimental grow-out.



Weaning young snakeheads at the Freshwater Aquaculture Research and Development Centre in Prey Veng Province, Cambodia

Formulated feed preparation for weaning young snakeheads at the Freshwater Aquaculture Research and Development Centre in Prey Veng Province, Cambodia

The results of this study are summarized as follows:

- Weaning of Cambodian non-domesticated (indigenous) and Vietnamese domesticated (hatchery) snakehead larvae on formulated feed can start at 17 days after hatching with replacement ratio 10% formulated feed per day until small-sized or low value fish completely substituted by formulated feed and weaned snakehead get 45 days old.
- Feed intake (107mg/fish/day) and final weight (170g) of domesticated snakehead is higher than the ones (85mg/fish/day and 146g, respectively) of non-domesticated snakehead, while survival rate (29%) and Cannibalistic rate (467%) of domesticated snakehead is lower the ones (36% and 51 %, respectively) of non-domesticated snakehead.
- Grow-out of non-domesticated and domesticated snakehead on pelleted feed can start at 45 days old fingerling for a period of 6 months to reach a market size. In other words, both Cambodian indigenous snakehead and Vietnamese hatchery snakehead can accept formulated feed or pelleted feed.
- However, Vietnamese hatchery snakehead show higher survival rate (75%) and better growth performance (final body weight: 367g/fish) than Cambodia indigenous snakehead (69% and 233g/fish, respectively) since Vietnamese hatchery snakehead has been gone through more than two-decade domestication.
- Vietnamese domesticated snakehead also show higher feed intake (3g/fish/day) and food conversion ratio (FCR: 1.5) than Cambodian non-domesticated snakehead (2g/fish/day and 1.7, respectively).
- Considering economic efficiency, replacing freshwater small-sized or low-valued fish by formulated feed up to 100% is possible for both Vietnamese domesticated and Cambodian non-domesticated snakehead. However, Vietnamese domesticated snakehead (about US\$0.35/kg fish) shows higher profit than Cambodian non-domesticated snakehead (US\$25/kg fish).
- In regards product quality, formulated or pelleted feed does not significantly affect the quality of both Vietnamese and Cambodian cultured snakehead compared to a diet of freshwater small-sized low-valued fish.

The results of this study are intended to provide information on alternative diets for snakehead to replace freshwater small-sized fish harvested from the wild leading to release the ban on snakehead farming in Cambodia.



Grow-out experiments of snakehead at the Freshwater Aquaculture Research and Development Centre in Prey Veng Province. A. 100% small-sized fish; B. 100% pelleted feed; and C. 50% pelleted feed and 50% small-sized fish



Six-month old grown out snakehead experimented at the Freshwater Aquaculture Research and Development Centre in Prey Veng Province. A. Viet Name domesticated snakehead fed on 100% pelleted, 50% pelleted feed and 50% small-sized fish, and 100 small-sized fish. B. Cambodia non-domesticated snakehead fed on 100% pelleted, 50% pelleted feed and 50% small-sized fish, and 100 small-sized fish

To release the ban on snakehead farming and achieve sustainable development of snakehead aquaculture in Cambodia, the study recommended:

- Collecting striped snakeheads from different natural water bodies across the country to develop sufficient numbers of broodstock at hatcheries for research into breeding and weaning techniques to produce high-quality seed;
- Characterising biologically striped snakeheads from different populations in the Tonle Sap Lake, the upper and lower stretches of the Mekong and Bassac rivers and their associated floodplains to determine favourable traits for aquaculture development;
- Assessing genetic diversity and populations in different locations to maintain the diversity of wild stocks, conserve the species and enhance broodstock diversity when conducting domestication and breeding programmes;
- Domesticating Cambodia indigenous snakeheads with the aim of lifting the ban on snakehead culture in Cambodia;
- Developing practical formulated diets for snakehead broodstock, fry and fingerlings to replace small-sized fish from capture fisheries;
- Optimizing survival and growth rate of Cambodia indigenous snakehead through development of F2 & F3 generation broodstock and genetic selection of wild capture snakehead collected from different natural water bodies in Cambodia;
- Providing extension services to farmers on techniques for snakehead breeding, weaning and grow-out using formulated diets; and
- Encouraging the government, business and development partners to invest in the value chain of snakehead aquaculture development, especially the private sector to formulate and improve commercially manufactured feed that is better integrated into local economy with fewer imported ingredients and lower prices.

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