

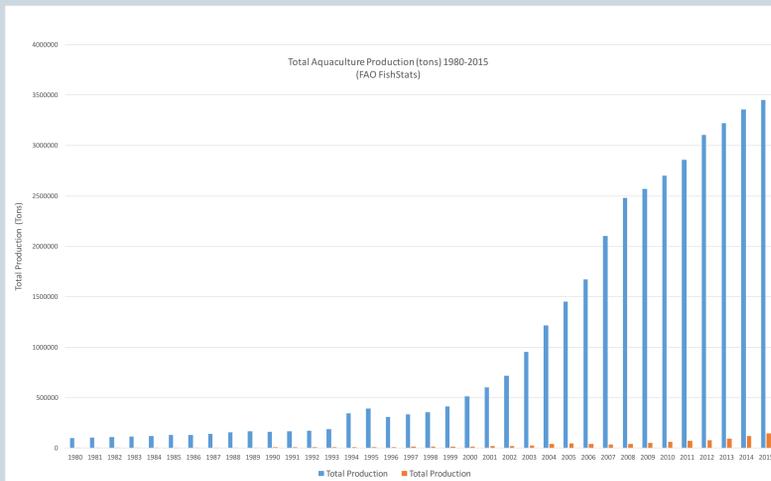
# RESEARCH INNOVATION ACTIONS ACROSS WATERSHEDS AND COUNTRIES: COLLABORATION BETWEEN CAMBODIA AND VIETNAM ON SUSTAINABLE SNAKEHEAD AQUACULTURE

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## ABSTRACT

In an increasingly global economy, it is easy to recognize that aquaculture research is most successfully carried out under the practice of international collaboration. Particularly with natural resources shared across watersheds and borders, the collaborative model integrates people, institutions, and disciplines. International collaboration offers the opportunity for knowledge exchange, institutional support, and synergies toward common objectives. However, this is not achieved without some challenges. Collegiality among people of different backgrounds and across disciplines does not always come naturally, but rather needs to be developed and nurtured. A case study in collaborative research across the Lower Mekong River Delta between Cambodia and Vietnam demonstrates some of these challenges, solutions, and successful innovation for the sustainable farming of the highly-valued snakehead (*Channa striata*).



## INTRODUCTION

The productive Mekong fisheries are essential to the food security and nutrition of the 60 million people of the Lower Mekong Basin. Though production capacity differs among each country, fish are a significant source of income and food security in Cambodia and Vietnam (Figure 1). The rapid growth of freshwater aquaculture in both countries represents an opportunity for development and innovation to improve the livelihood of their residents across the watershed. Collaborators from each country offer unique perspectives and a diversity of resources toward a common goal.

While aquaculture of snakehead in Vietnam has been gaining in popularity because of its high market value, snakehead farming was banned in Cambodia in 2004 in an effort to alleviate pressure on wild populations of small, low-value, freshwater fish that were being harvested for snakehead feed.

AquaFish Innovation Lab researchers — at the Inland Fisheries Research and Development Institute in Cambodia, Can Tho University in Vietnam, and the University of Connecticut–Avery Point, University of Rhode Island, and Oregon State University in the US — have been working in the region for many years to develop technologies and strategies to create a sustainable snakehead aquaculture industry that can meet consumer demand for both countries. These efforts have focused on domestication of snakehead, formulating alternative protein commercial feeds, and developing protocols for weaning and grow-out of hatchery-reared snakehead on formulated feeds.

## TOOLS USED FOR SUCCESSFUL AQUAFISH COLLABORATIONS

- Strong leadership, a shared vision, and collegiality.
- Paired interest in commercially important species and scalable technologies for sustainable practices.
- Human and Institutional Capacity Development:
  - Training of IFRDI researchers in Cambodia by CTU researchers in Vietnam.
  - Trained 1281 stakeholders in Cambodia and 673 in Vietnam since 2008.
  - Development and distribution of leaflets in Vietnamese, Khmer, and English on research results to disseminate key information and enhance uptake of innovative practices by local stakeholders.
- Annual meetings for connecting collaborators.
- Attendance at international conferences to disseminate results and garner information and ideas.
- Advisory committees and oversight from PIs who work in Cambodia, Vietnam, the United States, and other partner countries.



## SUCCESSFUL OUTCOMES FROM THIS COLLABORATION

### Cambodia's Snakehead Farm Ban Lifted

In April 2016, the ban on snakehead farming in Cambodia was lifted; AquaFish-supported collaborative research in Cambodia and Vietnam played a critical role in the design and implementation of the new snakehead aquaculture policy. It is predicted that ending the ban will increase the potential for economic opportunities and improve nutrition and food security for Cambodians, while alleviating negative environmental impacts of overfishing in the Lower Mekong Basin.

### Sustainable Snakehead Feed

AquaFish collaborators successfully addressed the need to reduce reliance on small-sized fish as snakehead feed by formulating a pelleted diet with up to 40% soy protein. The new diet was initially adopted by 10 feed manufacturers in Vietnam and used throughout the region. However, farmers reported deformities, associated with Vitamin C deficiencies in the snakehead fed pelleted feed. AquaFish researchers then explored the appropriate Vitamin C levels for snakehead in two stages: hatchery experiments and on-farm trials. AquaFish research found that soy-based, pelleted feed supplemented with 500 mg of Vitamin C per kg of feed resulted in lower rates of abnormalities, greater growth rates, and decreased production costs.

### Domesticated snakehead strain in Cambodia

Although snakehead have been domesticated in Vietnam for nearly two decades, Cambodia previously had no domesticated strains, leaving farmers to collect fry from the wild. AquaFish researchers sought to change that. They collected wild breeders to investigate spawning success, hatching rate, and larval survival rates after hormonal injections at varying levels. AquaFish results showed that wild broodstocks can successfully develop gonads, mature, and then be semi-artificially induced to spawn using human chorionic gonadotropin (1000 IU/kg for female fish and 3500 IU/kg for male fish). This study laid the foundation to domesticating a Cambodian strain of snakehead to reduce the pressures on wild stocks by snakehead farmers.

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