

TOPIC AREA:
POLICY DEVELOPMENT



**Policy Recommendations to Improve Food Security and Household Nutrition
Through Sustainable Aquaculture and Aquatic Resource Management
in Cambodia and Vietnam**

Policy Development/Activity/13PDV01UC

Touch Bunthang¹, Chheng Phen¹, Prum Somany¹, and Robert Pomeroy²

¹*Inland Fisheries Research and Development Institute, Fisheries Administration, Phnom Penh, Cambodia*

²*University of Connecticut, Groton, CT, USA*

ABSTRACT

Changing hydrology, sedimentation, water quality by hydroelectric dams, population growth, and climate change are said to be affected to the fish production, livelihood opportunity, food security, nutrition, and its implication to health. The other five investigations of the project provided science-based information on the impacts of climate and non-climate drivers of change on fish value chains, vulnerable populations, aquaculture production systems, and capture fisheries. The objective of this activity was to provide science-based policy recommendations to government and fisheries and aquaculture communities and households, including vulnerable subpopulations such as women and children on the potential risk of lacking food security and malnutrition due to the impacts of climate and nonclimate drivers of change on fisheries and aquaculture and planned (policy-driven) adaptation strategies through dissemination the appropriate communication products from the other five investigations to target audiences. Two hundred eighty seven (287) target audiences (decision maker at ministerial levels, IFRDI/FiA officers and government officers, national mass media, university academy, scientist and researchers, international agencies, local authorities, farmer, aquaculturists, fishers, fish processors, and housewives received the appropriate communication products, of which 77% were women. The project (October 1, 2013 to December 30, 2015) has provided the direct benefits to stakeholders in both countries Cambodia and Vietnam 19 graduate and undergraduate students; 605 trained farmers, processors, and women; 4600 are direct benefit from the project and 1,001, 200 are indirect benefit from the project. A numerous communication products were provided seven final technical reports of six investigations. They are 1) impacts of climate change on snakehead fish value chains in Lower Mekong Basin of Cambodia and Vietnam; 2) alternative feeds and processing for freshwater aquaculture species; 3) alternative feeds and processing for freshwater aquaculture species; 4) Estimating carrying capacity for aquaculture in Cambodia; 5) food and nutritional consumption survey: women and preschool-age children in Cambodia; 6) nutritional composition of nutrient density of commonly-consumed fish, Other Aquatic Animals, and processed fish consumed by women and children in Cambodia; and 7) policy recommendations to improve food security and household nutrition through sustainable aquaculture and aquatic resource management in Cambodia and Vietnam.

INTRODUCTION

The productive Mekong fisheries are essential to the food security and nutrition of at least 60 million people of the Lower Mekong Basin (LMB). Fish, from capture and culture, are a significant source of income and food security in Cambodia and Vietnam. The combination of high fish biodiversity, high productivity, high exploitation rate, long-distance migrations, and fish trade make protecting these fisheries and aquaculture of great importance. However, they are highly vulnerable to climate and non-climate related drivers of change which have led to flow change and ecological change in the Mekong basin, especially downstream countries like Cambodia and Vietnam. This includes increased temperatures; changes in rainfall patterns; changes in the hydrological regime (water levels, duration of flooding, timing of flooding); changes in run-off or sediment load/movement; and increased instances of extreme weather events (storms, floods and droughts). Saline water intrusion in the Mekong River was about 20 km at the end of the 20th century and is now up to 50 km. And more important the rapid increased population, which is estimated up to 20 million at 2013. These drivers of change have posed significant challenges for fisheries and aquaculture production, household income, livelihoods, markets and trade, gender issues, food security and the nutrition and health of people, especially poor households, in the LMB of Cambodia and Vietnam. However, a complete understanding of the impacts of each individual driver and a combination of drivers is only just beginning.

The other five investigations of this project provided science-based information on the impacts of climate and nonclimate drivers of change on fish value chains, vulnerable populations, aquaculture production systems, and capture fisheries. Adaptation strategies for aquaculture and fisheries systems have examined in several of the investigations of this project. These investigations have addressed the goal of project through fish value chains, development of feeds and feeding strategies and processed products, sustainable snakehead aquaculture systems, estimating carrying capacity for aquaculture, food and nutrition security vulnerability of women, and policy and outreach.

Investigation 6: “Policy recommendations to improve food security and household nutrition through sustainable aquaculture and aquatic resource management in Cambodia and Vietnam,” which focused on policy and outreach to address the impacts on vulnerable population.

A suite of potential adaptation options was not sufficient to address these drivers of change. There was a need to provide this information to government and fisheries and aquaculture households and vulnerable populations to be able to make informed and deliberate decisions on adaptation.

The purpose activity was not to generate new information but to disseminate and communicate information generated by the studies in the project, specifically, science-based policy recommendations. This investigation has provided this information through a suite of different communication methods and approaches for each audience.

OBJECTIVES

The objective of this activity was to provide science-based policy recommendations to government and fisheries and aquaculture communities and households, including vulnerable subpopulations such as women and children on the potential risk of lacking food security and malnutrition due to the impacts of climate and nonclimate drivers of change on fisheries and aquaculture and planned (policy-driven) adaptation strategies through dissemination the appropriate communication products from the other 5 investigations to target audiences.

Materials and methods. To achieve the above objective, the methods and actives were set as followings:

Audience analysis. The identification of target audiences (scientists, researchers, government officials, NGOs, fishers, aquaculturists, women) and their specific information requirements and methods of receiving information, and appropriate communication products (e.g, technical report, journal articles, web media) and the style of communication including scope, where and how to receive information, language, technical content.

Project products. The project documents were reviewed for the communication products.

Communication and dissemination strategy. Communication strategy was formulated and implemented by PI/communication expert. The communication strategy was a combination of approaches, techniques, and messages to reach different audiences. At a minimum, the strategy aimed to effectively disseminate the following to key audiences of five technical reports: 1) Marketing, economic risk assessment and trade (MER) - impacts of climate and non-climate drivers of change on fish value chains; 2) Sustainable feed technology and nutrient input systems (SFT) - continuation of snakehead feed work; 3) Climate change adaptation: indigenous species development (IND) - sustainable snakehead aquaculture development in Cambodia; 4) Watershed and integrated coastal zone management (WIZ) or mitigating negative environmental impacts (MNE) - carrying capacity work; and 5) Enhancing food security and household nutrition vulnerability of women and children focus on nutrient dense commonly consumed fish from capture fish and aquaculture in Cambodia; and two science-based policy brief/recommendation.

RESULTS

Two hundred eighty seven (289) target audiences received information with appropriate communication products, of which five were decision maker at ministerial level; twenty one were inland fisheries research and development institute of fisheries administration (IFReDI/FiA) officers and government officers; two national mass media; twenty three were university academy; eight were scientist and researchers; two were international agencies (WorldFish and MRC); thirty were (30) local authorities; and one hundred ninety eight (198) were famers, aquaculturists, fishers, fish processors, and housewife (Table 1). Seventy seven (77%) of target audiences were women receiving the appropriate communication products (Figure 1). The higher number of the female were target audiences receiving appropriate communication products were women as Village Health Workers, farmers, aquaculturists, fishers, fish processors, and housewife, while other sectors were high dominance of men in decision makers of Sector Ministers and Department, head of the key government agencies, sector of department, representative of key line agencies at national and provincial level, leader of Commune Councils.

In quantitative terms, the project conducted a series of national workshops in 2015, and the other series of provincial consultation and dissemination workshops in September 2015. The research was regularly reported as quarterly and annual reports, and presenting in the national and international events. In addition, it was noticed that the research results were disseminated through AquaFish and IFReDI website; and national, regional, international publications and broadcasted on national television for a broader audiences

Numerous communication products of the project were listed. They include:

- Seven final technical reports of six investigations. They are 1) impacts of climate change on snakehead fish value chains in Lower Mekong Basin of Cambodia and Vietnam; 2) alternative feeds and processing for freshwater aquaculture species; 3) alternative feeds and processing for freshwater aquaculture species; 4) Estimating carrying capacity for aquaculture in Cambodia; 5) food and nutritional consumption survey: women and preschool-age children in Cambodia, 6) nutritional composition of nutrient density of commonly-consumed fish, Other Aquatic Animals,

and processed fish consumed by women and children in Cambodia; and 7) policy recommendations to improve food security and household nutrition through sustainable aquaculture and aquatic resource management in Cambodia and Vietnam

- Two policy briefs. They are: 1) Role of fish in food and nutrition security in women and preschool children, and 2) Toward sustainable snakehead farming in Cambodia and Vietnam.
- Fact sheets
- National and international journals
- PowerPoint presentations
- Posters
- Successful story and lesson learn
- Video clip
- Hand books/training manuals (Hand Book of Snakehead Culture Using Pellet Feed, and A Manual of The Process of Dried Snakehead (*Channa striata*)).

The project (1 October 2013 to 30 December 2015) has provided the direct and indirect benefits to stakeholders in both countries Cambodia and Vietnam as the followings:

- 1) Impacts of climate change on fish value chains in the Lower Mekong Basin of Cambodia and Vietnam:
 - Two hundred scientists, researchers, resource managers, government officials, and NGOs in Cambodia and Vietnam have better informed and have better information on current and potential impact pathways of climate and non-climate drivers of change and corresponding adaptation strategies for snakehead fish value chains in Cambodia and Vietnam.
 - Ten researchers in Cambodia and Vietnam were trained and have experienced on using value chain analysis to analyze sector-specific impacts of climate and non-climate impact pathways on fish value chains.
 - This study supported research activities of a PhD student, two master students, and dissertations of four undergraduate students.
- 2) Sustainable feed technology and nutrient input systems continuation of snakehead feed:
 - Women in An Giang province were trained on small-scale farming of snakeheads using formulated feed.
 - Women in An Giang province were trained on processing of salty fermented and dried product from cultured snakehead (*Channa striata*).
 - This investigation has developed a manual of the processes of dried and fermented snakehead (*Channa striata*).
 - It supported dissertations of four undergraduate students (three female and one male). Three faculty members (female) at CTU and two local staff (female) participated in this project. Thirty women were trained on the processes of dried and fermented snakehead. One-hundred manuals of the processes of dried and fermented snakehead (in Vietnamese) were delivered to farmers.
- 3) Sustainable snakehead aquaculture development in the Lower Mekong River Basin of Cambodia:
 - Three undergraduate students were supported and trained by this investigation through their B.Sc. thesis research.
 - About 20,000 farmers in Cambodia were benefit in Cambodia and Vietnam by restarting their snakehead culture leading to increased household income and improved snakehead fish market and trade.

- 250 scientists, researchers, government fisheries officers/managers and policy makers, extension workers, NGO staffs, and private sector working on the issues of snakehead aquaculture in Cambodia as well as in other Mekong riparian countries were better informed and consulted of research methods and findings, and have better recommended policies and strategies for sustainable snakehead aquaculture.
 - At least 1,000,000 indirect beneficiaries in Cambodian and other Mekong riparian countries who consume snakehead fish in their protein diets leading to improved their household food and nutrition security
- 4) Estimating carrying capacity for aquaculture in Cambodia:
- About 2,000 government regulators/managers and officers in Cambodia have improved understanding of environmental carrying capacity.
 - 100 scientists and researchers who can apply models to the calculation of carrying capacity for specific bodies of water in Cambodia as well as in the Lower Mekong Basin.
- 5) Enhancing food security and household nutrition vulnerability of women and children focus on nutrient dense commonly consumed fish from capture fish and aquaculture in Cambodia:
- This investigation has provided recommendations for better nutrition in women and children in Cambodia.
 - Two Master's students were involved in this investigation (one female and one male).
 - Four undergraduate students were also supported for their dissertations (two females and two males). Three IFRaDI staff were involved (one female and two males).
 - Two hundred and twelve participants (155 women) attended the series of consultation and dissemination meetings and workshops on results of the investigation, and formulating recommendations for better nutrition in women and children.
 - Three hundred fact sheets and policy briefs were directly provided to the women sampled in the study. One thousand and two hundred (1,200) fact sheets and policy briefs were delivered to IFRaDI/FiA staff, scientists, researchers, government officers, NGOs, and women which are direct and indirect benefits from the projects.

CONCLUSION

The project (1 October 2013 to 30 December 2015) has provided the direct benefits to stakeholders in both countries Cambodia and Vietnam 19 graduate and undergraduate students; 605 trained farmers, processors, and women; 4600 are direct benefit from the project and 1,001, 200 are indirect benefit from the project. Seven final technical reports of six investigations. They are 1) impacts of climate change on snakehead fish value chains in Lower Mekong Basin of Cambodia and Vietnam; 2) alternative feeds and processing for freshwater aquaculture species; 3) alternative feeds and processing for freshwater aquaculture species; 4) Estimating carrying capacity for aquaculture in Cambodia; 5) food and nutritional consumption survey: women and preschool-age children in Cambodia; 6) nutritional composition of nutrient density of commonly-consumed fish, Other Aquatic Animals, and processed fish consumed by women and children in Cambodia; and 7) policy recommendations to improve food security and household nutrition through sustainable aquaculture and aquatic resource management in Cambodia and Vietnam. Two hundred eighty seven (287) target audiences (decision maker levels, IFRaDI/FiA/MAFF officers and government officers, national mass media, university academy, scientist and researchers, international agencies, local authorities, farmer, aquaculturists, fishers, fish processors, and housewife) received the appropriate communication products, of which 77% were women.

Having seen the qualitative outcomes of this project, in particular the promising achievement of formulated feed of *Channa striata*, the leaders of Fisheries Administration and Ministry of Agriculture Forestry and Fisheries advise IFRaDI to accelerate the aquaculture domestication of *Channa striata* and *Channa micropeltes* and the development of formulated feed for these commercial important species aiming at leasing the ban on snakehead fish aquaculture in the country.

The results of the study of nutrition on women and children in rainy season are a basic nutritional knowledge in Cambodia and, more importantly, there is a crucial need to further study on nutrition on women and children in dry season in order to serve as the fundamental data/information for nutrition planning and management for alleviating malnutrition and micronutrient deficiencies among women and children in Cambodia.

QUANTIFIED ANTICIPATED BENEFITS

This investigation has disseminated and communicated information generated by the studies in the project, specifically, science-based policy recommendations. One thousand and three hundred scientists, researchers, government fisheries officers/managers and policy makers, extension workers, NGO staffs, private sector, university lecturers, students, fisheries and aquaculture households in Cambodia and Vietnam as well as in other Mekong riparian countries were better informed and have better information on current and potential impacts of climate and non-climate drivers of change on food security and nutrition and corresponding adaptation strategies.

ACKNOWLEDGMENTS

This paper honors our dear IFRDI colleagues and students. Special thanks are given to the AquaFish Collaborative Research Support Program (CRSP) for financial support.

LITERATURE CITED

- Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit, and K. Takahashi. 2007. "Assessment of adaptation practices, options, constraints and capacity. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II." Fourth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 717–743. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, eds. Cambridge, UK: Cambridge University Press.
- Smit, B., and J. Wandel. 2006. "Adaptation, adaptive capacity and vulnerability." *Global Environmental Change* 16(3): 282–292.
- Smit, B., I. Burton, R.J.T. Klein, and R. Street. 1999. "The science of adaptation: A framework for assessment." *Mitigation and Adaptation Strategies for Global Change* 4(3): 199–213.

TABLES AND FIGURES

Table 1. Target audiences receiving information with appropriate communication products.

Institution	Number of Target Audiences Involved	Gender	
		Male	Female
Decision maker level including Minister, Ministry of Agriculture Forestry and Fisheries	5	5	0
IFReDI/FiA officers and government officers	21	18	3
National Mass Media	2	2	0
Universities academy	23	17	6
Scientists and researcher	8	6	2
International agencies	2	1	1
Local Authority	30	18	12
Farmers, aquaculturists, fishers, fish processors, and housewife	198	0	198
Total	289	67	222

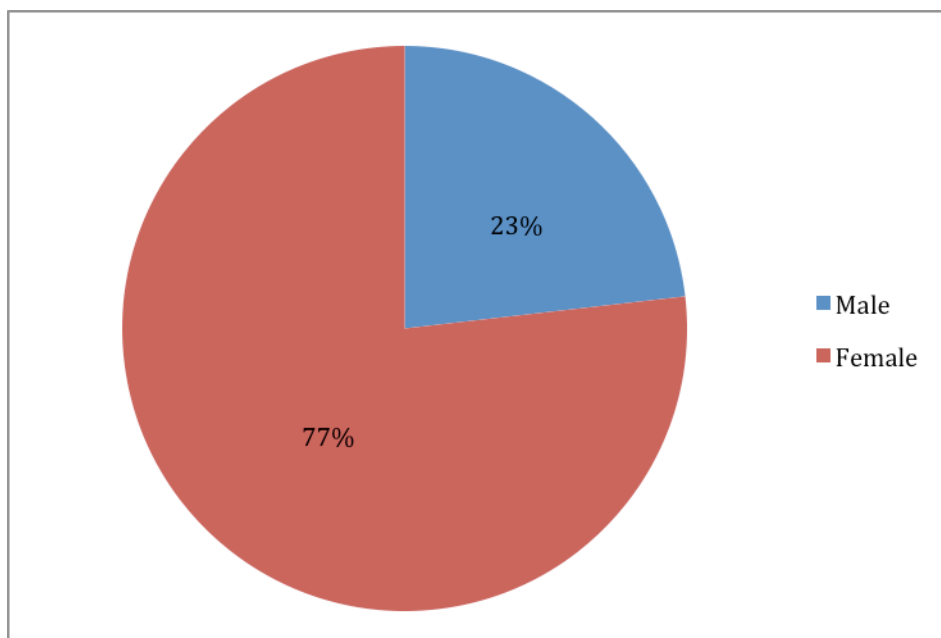


Figure 1. Gender profile of target audiences receiving information with appropriate communication products.