CAST Cambodia

Abbreviated Version of Strategic Analysis

A collection of excerpts from CAST's Strategic Analysis organized to provide companies and/or individuals responding to the project's Baseline Study RFP with additional information to aid in the development of their proposals

File(s) of interest: CAST Cambodia Baseline RFP_01.14.19v2.pdf
CAST Baseline Study FAQ_01.29.19v2.pdf
CAST M&E Plan Excerpt_01.29.19.pdf

Intervention Strategy

CAST's **overall strategy** is to focus on developing aquaculture SMEs for participation in mid-level to premium markets as a driver for growth of Cambodia's freshwater aquaculture sector. SMEs have the production capacity to supply fish to commercial markets and to drive demand for high-quality inputs. Linking successful SMEs with entrepreneurial, high-input smallholder farmers will better connect these farmers to inputs, services, and markets. CAST will create an enabling environment for SME growth by:

- Working with retailers and wholesalers to strengthen aquaculture SME participation in their supply chains.
- Supporting feed mills and hatcheries to build their supply chains and grow their customer base.
- Promoting professional development, technology transfer and business support services.
- Facilitating a policy environment that is responsive to SME needs.
- Developing a Cambodian national aquaculture association to promote consumption of Cambodia-produced fish, serve as a private sector voice on policy issues, and facilitate learning opportunities for professionals in the sector.
- Unlocking financing to invest in growth.

CAST is a market-driven project that will select species for production and specific beneficiaries for participation based on market needs. All strategies and interventions will be developed and implemented with a capacity building, commercially sustainable exit strategy in mind; this is explained further in the Sustainability & Lasting Impact section.

CAST's **intervention strategy** is designed around four key levers of change as follows:

1. *Market Linkages*: Improved availability and accessibility of quality inputs to increase commercial productivity; better access to mid-value and premium markets for commercial aquaculture
2. *Knowledge Platforms*: Access to information and capacity building for all stakeholders and beneficiaries throughout the value chain from input supplier to producer to consumer
3. *Collective Action*: Improved transactional efficiencies at all levels
4. *Enabling Environments*: Actor coordination and strength in partnerships through synergies and assets associated with partners

Each CAST activity is designed with these four levers of change in mind. Capacity building is at the heart of the design of each activity – both for individuals and institutions. All activities build partnerships and relationships between value chain actors – at local, national and international levels. Creating these direct linkages improves transaction efficiencies and strengthens collaboration across the value chain on issues of common interest. Further detail is provided in the Plan of Operation and Activities section. CAST will take a **facilitative approach** to build (primarily) private sector capacity across the value chain to develop market-based solutions to the challenges facing the sector. Public sector capacity building is a major focus of EU CapFish, but CAST will support efforts to bring the private and public sectors together to address policy issues (such as feed standards) and make public extension and research more relevant to SME needs.

CAST will practice **adaptive management** to allow the project to respond to changing needs and new information. As the project will be working hand-in-hand with local partners (both public and private), CAST needs to be flexible to adapt its approach to individual needs and circumstances. The adaptive management approach will be informed by ongoing market analyses, regular communication with participating SMEs and partners, gender-disaggregated data collection related to activity implementation, a robust monitoring and evaluation system and plan, and quarterly meetings with a project steering committee consisting of project partners. Data gathered through assessments/analyses described in the Plan of Operations & Activities, the monitoring and evaluation system, and learning agenda create a feedback mechanism to guide enhancements and course corrections.

Implementation of the Intervention Strategy through Activities

Collectively, CAST's ten activities will increase domestic aquaculture productivity and capacity to meet at least 25% of growth in domestic mid- and high-value demand and set Cambodian aquaculture on a path toward larger market share capture in domestic and regional higher-value markets. Each activity addresses one or more of the five overarching challenges identified in the strategic analysis: 1) low productivity of commercial aquaculture operations; 2) lack of high-quality inputs (such as feed and seed) in the marketplace; 3) weak market linkages for quality Cambodian-sourced fish; 4) underdeveloped small and medium enterprises in aquaculture and supporting industries; and 5) weak supporting policy environment. The activity design reflects a facilitative approach and the four levers of change with a particular emphasis on the private sector.

To increase agricultural productivity, CAST will target high-productivity aquaculture operations and mid-productivity operations that can shift toward high productivity during and beyond project implementation.[1] CAST defines productivity as kg fish produced per cubic meter in each harvest (Figure C) and reflects level of input intensification. Productivity is a direct function of quality feed and seed inputs, effective management and infrastructure quality to prevent disease and maintain water quality. It is possible for well-managed farms to achieve two harvests per year with six-month production cycles for certain species. High-productivity is farm-size independent, including a range from smallholder high-input systems to large-scale high-input operations.

[1] Justin Grimm-Greenblatt, Robert Pomeroy, Boris Bravo-Ureta, Le Xuan Sinh, Huynh Van Hien & Tessa Getchis (2015)Economic Analysis of Alternative Snakehead *Channa striata* Feed, Aquaculture Economics & Management, 19:2, 192-209,DOI: 10.1080/13657305.2015.1024345

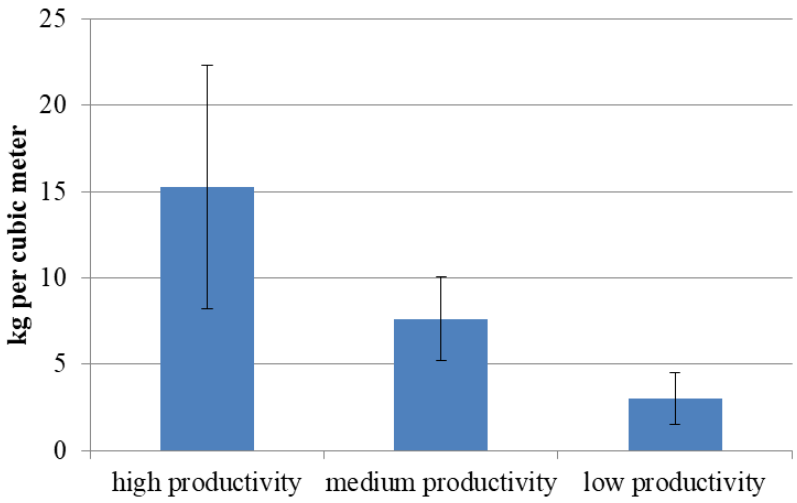

Figure C: Productivity of cultured snakehead systems (both pond and cage) was defined according to kg fish harvested per cubic meter. Error bars represent standard deviation at each productivity level. Data were extracted from Grimm-Greenblatt et al. (2015).

Affordability and availability of high quality inputs is critical to productivity gains and will be a major cast objective. For example, feed constitutes 60 to 90% of variable aquaculture production costs. A study evaluating the economic feasibility of pelleted feed versus low-value small-sized fish as feed for snakehead determined that high-productivity farms increased profits by using pelleted feed in place of small fish, although cost of pelleted feed at the time of the study was too high for mid- and low-productivity farms.[2] Furthermore, as pelleted feed became more available and affordable the number of high-productivity farms would be likely to increase, with medium- and low-productivity operations economically incentivized to shift toward high productivity systems and to pilot pelleted feeds. Notably, affordability of pelleted feed had a stronger positive effect on farm profitability regardless of size than other factors assessed in the study. Consequently, intensive cultivation makes economic sense with pelleted feed (e.g., soybean meal-based feed), including feed developed by CAST partners (Figure D).

[2] Justin Grimm-Greenblatt, Robert Pomeroy, Boris Bravo-Ureta, Le Xuan Sinh, Huynh Van Hien & Tessa Getchis (2015)Economic Analysis of Alternative Snakehead *Channa striata* Feed, Aquaculture Economics & Management, 19:2, 192-209,DOI: 10.1080/13657305.2015.1024345

Figure D: Development of formulated pelleted fish feed containing soybean meal was a major focus of the USAID Feed the Future AquaFish Innovation Lab's recent work to incorporate vitamin C in rations. Updated feed formulations will be tested and used in feed demonstrations and farmer field days through CAST. Photo Credit: Dr. Hillary Egna, AquaFish Director, Oregon State University.

Unit price of U.S. soybean meal exported to Cambodia between January and March 2018 was $387/MT and $376/MT in 2017, down from over $550/MT in 2014.[3] Affordable imported soybean meal and other imported and locally-sourced feed ingredients will help reduce the price of high-quality pelleted feed marketed by Agri-Master, slated to enter the aquaculture feed market in 2018, and other future feed mills entering the aquaculture feed sector. The coming feed revolution in Cambodia, similar to what happened in the past 20 years in Vietnam, will encourage the shift to high-productivity operations that favor the use of pelleted feed. The shift to soy-based pelleted feeds has two secondary environmental and economic benefits that are favorable to the Royal Government of Cambodia's National Strategic Plan for Aquaculture. The use of pelleted feed reduces pressure on low-value small-sized fish for aquaculture feed – the exploitation of these juvenile fish (many from commercially valuable species) and other small fish used to make fermented fish paste, which is critical to food security in the region, was a principal reason behind the recently-lifted snakehead ban.

CAST will stimulate input trade and market linkages for feed, seed, and other inputs (e.g., fertilizer, medication), which will become more affordable, available, accessible and higher quality through CAST's empowerment of local production, marketing and collective input purchase via a program-facilitated focal farmer model and an aquaculture association, thereby strengthening and expanding linkages

[3] U.S. Census Bureau Trade Data queried from https://apps.fas.usda.gov/

between producers with consumers, lowering production costs and reducing transaction costs on the pre- and post-harvest side. The resulting ability to achieve and fill production contracts for premium fish, facilitated by CAST, will reduce market uncertainty, buffer pre- and post-harvest risk for market actors, and ensure consistent supply.

To further expand trade of agricultural products, CAST will work to help producers achieve price premiums for snakehead, pangasius and other cultured species in the target regions by developing and implementing certification schemes targeting fish quality and compliance with international standards and marketing schemes based on "Cambodian-sourced", wild-equivalent, sustainably produced, quality-assured, or safe. Direct contracts with production groups achieving standards and ensuring traceability from producers to consumers could be used to capture further value, assuming willingness to pay in key urban markets, which will be tested in early project implementation. In addition to anticipated demand for Cambodia-sourced, quality fish at the general consumer market, CAST envisions capitalization and entry by qualified beneficiaries in the high-value tourist markets at hotels and restaurants in Phnom Penh and Siem Reap. Achievement of international production standards and quality are necessary to ensure long-term market penetration Cambodia freshwater aquaculture in these high-value markets. Aquaculture producers and value chain actors may be able to capture additional price premiums by timing production cycles toward June 1 to September 30 when the fishing season is suspended during the spawning season north of Phnom Penh to allow fish stocks to regenerate (Figure E). For certain species, price premiums up to 30% above average could be achieved during this period of overall fish supply shortfall in Cambodia.

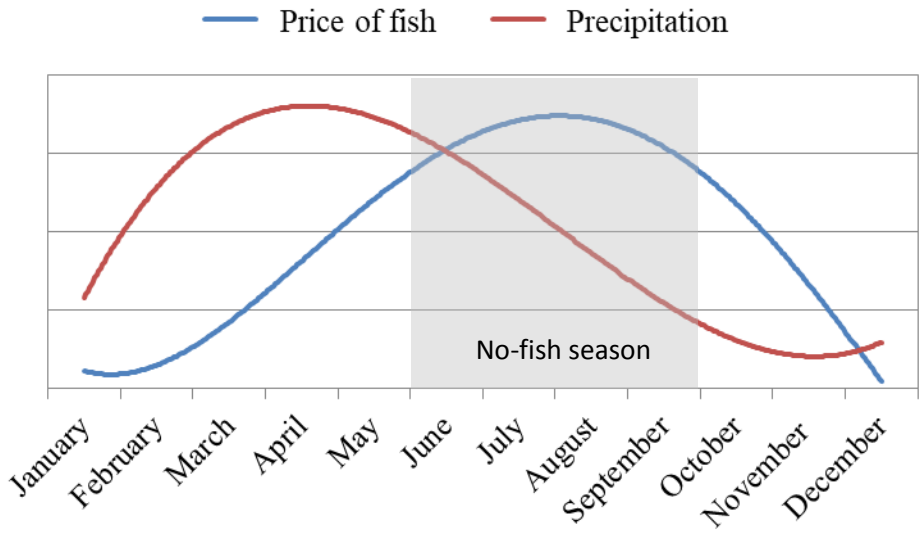

Figure E: Seasonality of precipitation and fish price target regions. Prices drop during the rainy season as supply rises. The fishing season north of Phnom Penh is suspended from June 1 to September 30 to allow wild populations to regenerate, creating opportunity for aquaculture.

CAST will also improve access to market information throughout the value chain and will test fish traceability as a mechanism to capture further value. Finally, CAST will leverage project funds to improve access to finance to spur small and medium enterprise productivity, market linkages and net incomes, while delivering core business development services to hone business models and company value propositions on a path to collectively spur market-driven aquaculture sector expansion and intensification in Cambodia.

Targeted Beneficiaries and Geographies

CAST will target semi-intensive or intensive mid- and large-sized pond and cage aquaculture systems producing highly-demanded species (e.g., snakehead, clarias, pangasius, tilapia, and other freshwater fish and shellfish species as appropriate based on demand and economic potential). CAST will focus its production and enterprise development activities with market development initiatives focused on larger urban markets (e.g., Phnom Penh, Siem Reap) with growing mid- and high-end consumer market segments willing to pay quality premiums. For aquaculture production, CAST will work in the following geographies: Siem Reap, Battambang, Pursat, Kampong Thom, Kampong Cham, and Kandal Provinces and Phnom Penh (Figure F). CAST will work with companies and partners that service or source from these producers regardless of location. Similarly, because CAST will be taking a facilitative approach, and some participating companies (such as feed mills) will have a broader reach, it is possible that there will be indirect beneficiaries outside of the core geographies of focus.

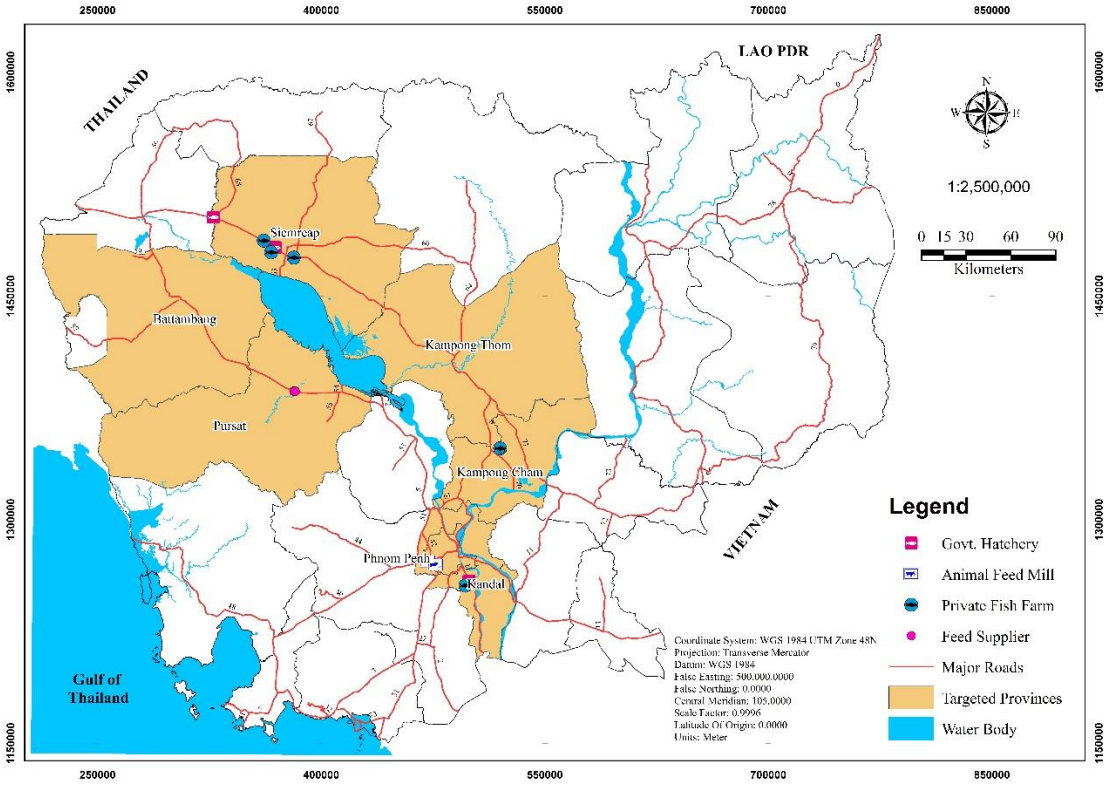

Figure F: Map of CAST-targeted geographies

Geographic Targeting

A recent (2016) evidence-based review of aquaculture in Cambodia suggested that nearly 40% of cage systems and intensive pond-based in Cambodia reside in Phnom Penh and Kandal, which have been selected as primary targets for CAST.[4] These locations were selected not only for their high production

[4] Joffre, O, So N., Chheng P. 2016. Aquaculture production in Cambodia: trends and patterns in recent years. Inland Fisheries Research and Development Institute (Fisheries Administration) and WorldFish.

potential and opportunity to support expansion of high productivity systems, but also for their proximity to major markets with strong potential to capture future price premiums. Over 60% of cage production was estimated in Siem Reap, Pursat and Phnom Penh in 2014, representing additional key geographic targets for this product due to market proximity and high-input productivity potential, including the shift to pelleted feeds containing soybean meal. Pursat and Battambang also contain a growing number of SME hatcheries, including those supported by the USAID HARVEST project (Figure G, orange dots). CAST will build on support from other projects, particularly operations graduating from low-productivity to mid- and high-productivity operations that can be organized to aggregate higher-value supply in response to market demand.

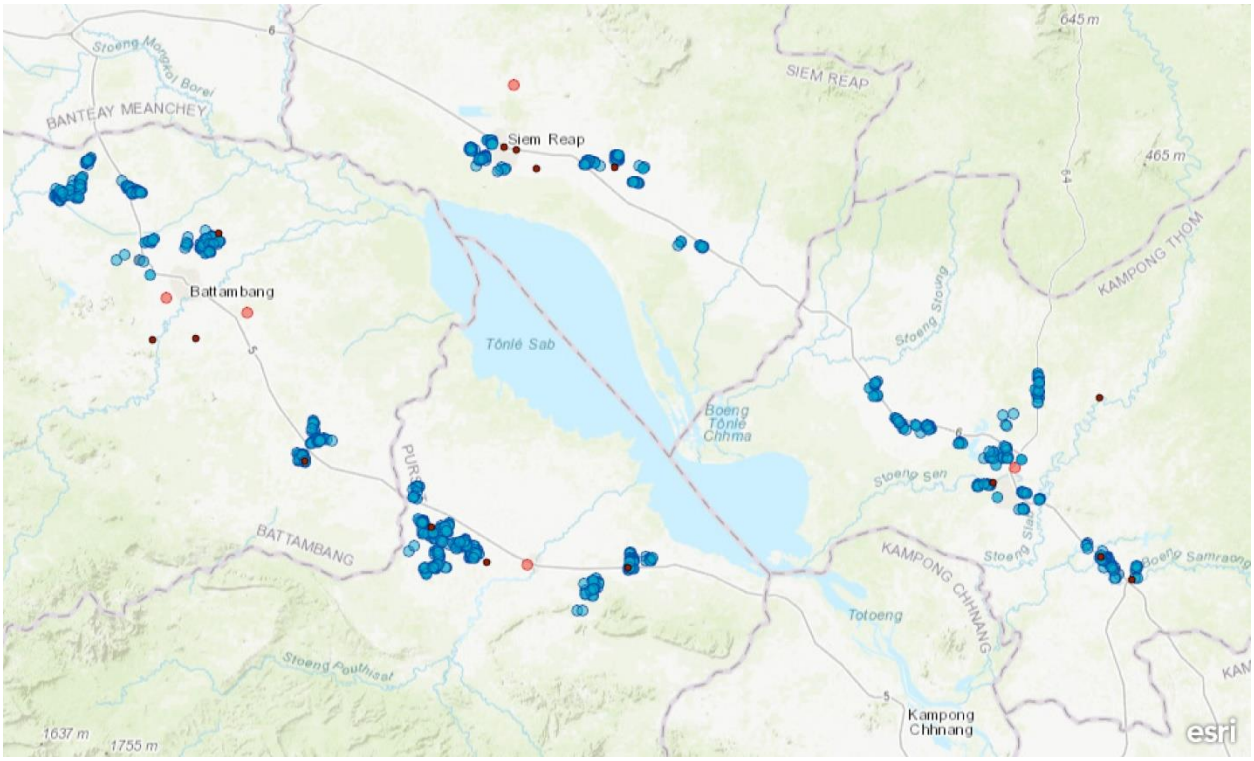

Figure G HARVEST Story map created from USDA Foreign Agricultural Service GIS System at https://fasgis.maps.arcgis.com. Blue dots represent over 1100 aquaculture farms and 14 red dots are hatcheries in the Feed the Future Zone of Influence around Tonlé Sap Lake.

The number of ponds and cages in CAST-targeted geographies (Siem Reap, Battambang, Pursat, Kampong Thom, Kampong Cham, and Kandal Provinces and Phnom Penh) are currently estimated at approximately 8,700 and 3,200, representing nearly 20% of estimated pond counts and 50% of cage counts in Cambodia (Table A).[5] Within these six provinces and Phnom Penh, CAST will target predominantly the following freshwater production systems: (1) freshwater cage culture (catfish, pangasius, snakehead and polycultures) in the Tonle Sap region and Mekong River basins, and (2) small and medium-sized enterprises (SME) focused on intensive, high-productivity pond culture. Targeted cage system productivity averages approximately 100 kg/m^3 per year. There is significant opportunity to

[5] ibid

shift mid- and high-productivity cage culture systems toward formulated soy-based feeds and away from wild seed.

Most commercial SME pond systems are located in Phnom Penh and Kandal and produce up to 300 MT/ha per year of pangasius, clarias catfish, or snakehead. Finally, high-input smallholder systems consist of one to two ponds, focused on tilapia or pangasius production and producing 5 to 20 MT/ha per yr. As a percentage of total production in Cambodia, cages in the target regions represent approximately 25% of the total, SME's in Phnom Penh and Kandal represent approximately 15-20% of the total, and smallholder, high-input systems account for about 10-15% of the total.

Table A: Estimated 2018 ponds and cages in six provinces and Phnom Penh. Estimates generated from data in Joffre et al. (2016).[6]

Location	Ponds	Pond Production (MT)	Pond Production Value ($)	Cages	Cage Production (MT)	Cage Production Value ($)
Pursat	2000	3600	5,940,000	850	14,385	23,734,615
Battambang	3000	5400	8,910,000	850	14,385	23,734,615
Kandal	600	1080	1,782,000	350	5,923	9,773,077
Siem Reap	1500	2700	4,455,000	350	5,923	9,773,077
Kampong Thom	350	630	1,039,500	300	5,077	8,376,923
Phnom Penh	300	540	891,000	250	4,231	6,980,769
Kampong Cham	950	1710	2,821,500	250	4,231	6,980,769
Total in Cambodia	**50,000**	**90,000**	**148,500,000**	**6500**	**110,000**	**181,500,000**

Beneficiary Targeting

High-productivity systems are most profitable and best positioned to take advantage of advanced production techniques and infrastructure improvements. Therefore, CAST will focus on SMEs and high-input smallholders. The key levers of change in this project (market linkages, knowledge platforms, collective action and enabling environments) will help producers shift toward more intensive, high productivity systems and to access premium value markets.

Species and Production Systems: Targeted species in these high-productivity cage and pond production systems will include snakehead (*Channa spp.*), *Pangasius spp.*, *Clarias spp.* catfish, red tilapia (*Oreochromis niloticus*) and other high-demand or high-value species for which price premiums can be achieved in the marketplace through: seasonal production timing, branding and/or certification as "Cambodia-grown", "quality-assured", "sustainably-produced" or "trusted", or marketing toward premium-value markets (e.g., tourism markets). As a whole, the targeted species and production systems in Cambodia currently contribute over an estimated $150 million in revenue, with greatest

[6] Joffre, O, So N., Chheng P. 2016. Aquaculture production in Cambodia: trends and patterns in recent years. Inland Fisheries Research and Development Institute (Fisheries Administration) and WorldFish. Phnom Penh, Cambodia. 14 pp.

contributions from cages, SME pond operations and smallholder, high-input systems, in descending order.

Involvement of Smallholders: Smallholders engaged in high-input pond culture as a primary livelihood objective will be candidates for participation in focal farmer groups, including operations that have graduated from low-productivity systems through support from other aquaculture development programs (e.g., USAID HARVEST and JICA Freshwater Aquaculture Improvement and Extension. Smallholder low-input pond systems will not be candidates for initial inclusion in this project, although production priorities could change as an indirect result of economic and high-productivity benefits demonstrated through CAST.

Logistical Feasibility of the Focal Farmer Model: The USAID-funded HARVEST program was implemented in the Feed the Future Zone of Influence, consisting of four provinces (Battambang, Kampong Thom, Pursat and Siem Reap) containing 34 target districts and 184 communes surrounding Tonle Sap Lake. The beneficiary distribution (Figure H) indicates large producer clusters that are within three to five kilometers diameter, thereby demonstrating the potential for similar clustering through the target region for CAST focal farmer groups targeting high- and mid-productivity operations with strong opportunity for aggregated input purchase and fish harvests to supply premium-value markets relative to normal sales form individual farms

Beneficiary Selection and Target Numbers: SME pond and other high-input producers will be selected from all targeted geographies. Producers in the four provinces surrounding Tonle Sap will be high- or medium-productivity pond operations residing outside the Tonle Sap flood plain (Figure H) or with sufficient infrastructure inside the flood plain to enable year-round production and prevent pond overflow or contamination. Cage operators will be selected from those operating on Tonle Sap Lake, the Mekong flood plain and the Tonle Sap River. CAST will target direct beneficiaries, which will be selected from pond and cage producers, hatcheries and nurseries, large feed mills, input suppliers, village livestock health (extension) workers, and financial institutions, as well as aggregators, distributors, wholesalers and SMEs involved in input supply and processing. CAST will also work with the full range of aquaculture market actors and government staff working in Phnom Penh. Comprehensive targeting will enable CAST to reach indirect beneficiaries.

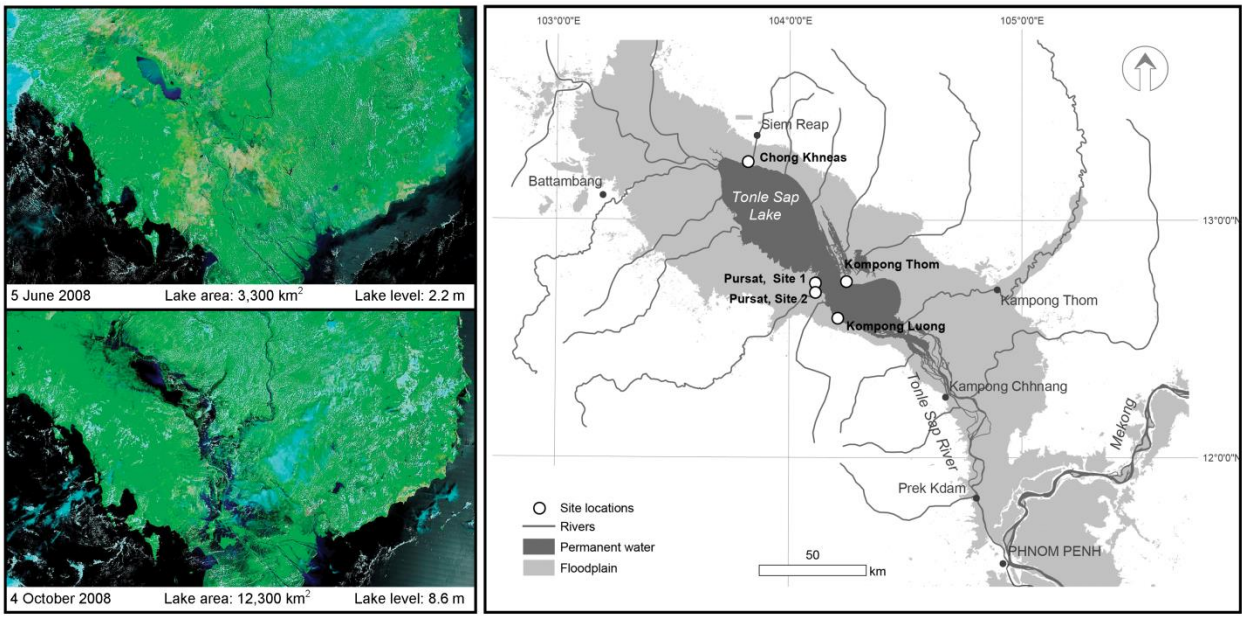

Figure H: Tonle Sap Lake and floodplain based on 2008 MODIS satellite imagery. Figure reproduced under Creative Commons Attribution license from: Holtgrieve GW, Arias ME, Irvine KN, Lamberts D, Ward EJ, Kummu M, et al. (2013) Patterns of Ecosystem Metabolism in the Tonle Sap Lake, Cambodia with Links to Capture Fisheries. *PLoS ONE* 8(8): e71395. https://doi.org/10.1371/journal.pone.0071395.

Illustrative Beneficiaries and Project Participants: In addition to working with SME and high-input smallholder aquaculture producers, CAST will work with a variety of companies across the value chain. The following are illustrative examples of the kinds of beneficiaries with which the project will work:

- Agri-Master is the fourth largest livestock feed company in Cambodia and is currently producing 54,000 tons of feed per year[7]. The company will soon enter the aquaculture feed market with a facility to open later in 2018. CAST will provide technical assistance to the company on feed formulation and build its technical expertise in aquaculture. The company currently offers technical assistance services to its livestock feed customers and would like to offer similar services to aquaculture customers.
- Rathada Hatchery is a mid-size company located in Siem Reap province that currently produces approximately 100,000 fingerlings per year. The company employs ten people and sells tilapia, pangasius and climbing perch fingerlings to commercial and smallholder producers within the province. Rathada Hatchery has noted that customers have limited knowledge on the trade-offs of using different inputs and need technical assistance to make better choices. The hatchery is interested in expanding its business to include sale of fry to nurseries but lacks the technical capacity to increase production. CAST will offer technical and business support services that can help this company achieve its goals.
- CAST met with another hatchery located in Battambang province that currently produces approximately 70,000 fingerlings per year. The company employs five to ten people and produces tilapia, snakehead, and climbing perch to sell to commercial producers and

[7] AgriSource Co. Ltd. EMP Soy Market Assessment for Cambodia: for World Initiative for Soy in Human Health. American Soybean Association. 2016.

smallholder farmers in Battambang. The hatchery would be interested to expand its fingerling production and sell to more farms within and outside the province, there is a need for technical and business management support to help the company grow from a small, family-based business into a relatively larger operation. The hatchery is also interested in being able to offer technical advice to its customers. CAST plans to work with this hatchery to assess its needs and provide a support package.

- CAST met with a collector-wholesaler located in Battambang province. This small business currently buys approximately 3 tons of snakehead fish per day (1,000 tons per year) from cage culture producers and fishers on Tonle Sap and sells to retailers in the city of Battambang and wedding caterers in the province. Cage culture is seasonal, and there are limited pond operations in the area. Therefore, the collector-wholesaler's customers also look to imports from Vietnam to fill gaps in supply. Financing is a key issue for this small business as buying or selling on credit is common and repayment schedules are often unpredictable. This collector-wholesaler could benefit directly from CAST's business support and access to finance activities, and indirectly from CAST's work to support development of commercial aquaculture capable of year-round supply.