Aquaculture Value Chain Development: Emerging Policy Insights

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Background

- Synthesis of a decade of IFPRI research on aquaculture value chains in Bangladesh, with partners

1. IFPRI/MSU - Making of a Blue Revolution (2013) – ‘stacked survey’ of 3000 aquaculture value chain actors in main producing regions of Bangladesh to understand characteristics of chain and drivers of transformation
2. MSU/BAU/WorldFish - Fish Innovation Lab (2020) – combined remote sensing with value chain surveys to estimate economic impacts of aquaculture in 7 districts of southern Bangladesh (resurvey of 2013 actors)
3. IFPRI – CGIAR Rethinking Food Markets Initiative (2023/4) – evaluation of cluster-based interventions to upgrade shrimp value chains

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Rapid transformation in the farm segment of the value chain

- Massive increase in production (14 times since 1990)
- Supply response, mainly for domestic market (95% of production)
- Farm commercialization (shift from subsistence to market orientation; 71% marketed surplus in Southern BD)
- Growth at extensive margin (conversion of rice fields)
- Growth at intensive margin (e.g., 123% increase from 1,464 t/ha in 2013 to 3,284 t/ha in 2020) - higher yields, facilitated by technological change
- Technological change facilitated by co-development of off-farm VC segments
  - Adoption of formulated feeds (70% increase in feed suppliers in 10 yrs)
  - Species diversification facilitated by hatcheries

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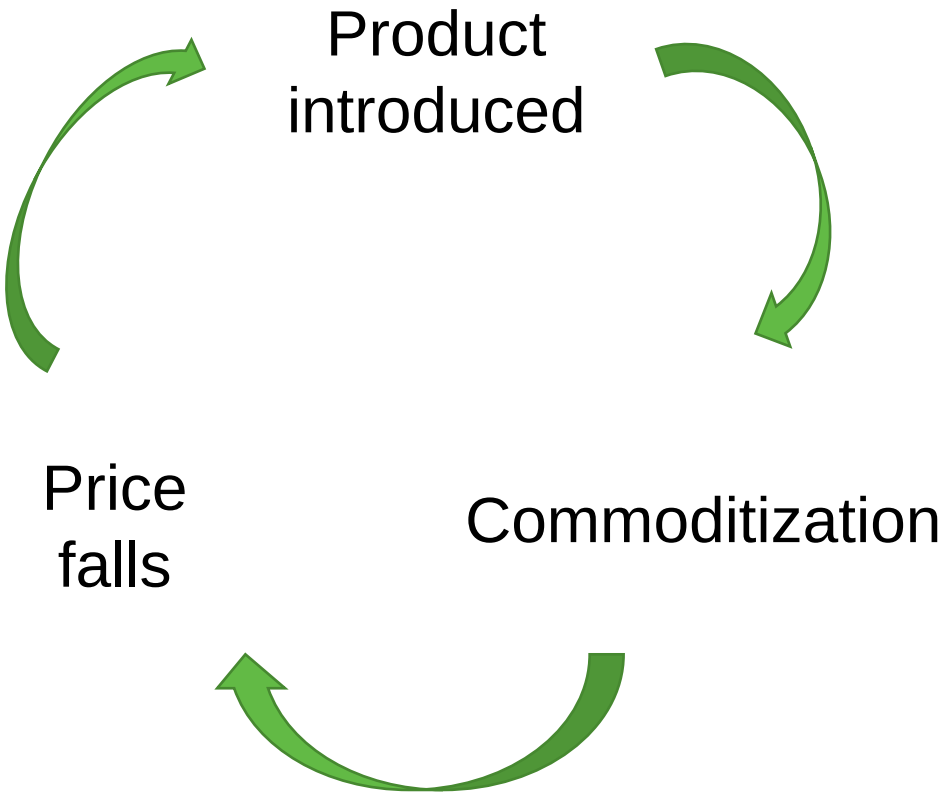
The product cycle in Bangladesh aquaculture



Simultaneous transformation in wholesale & retail VC segments

- Traditional image is of inefficient, uncompetitive, and exploitative traders, but survey in southern BD reveals:
- Disintermediation (transport services allow ~90% farmers to sell directly auction for best price, declining in reliance on collectors)
- Very low loss and waste: <1% (transport services, dense road network, many markets, ice, insulated boxes, oxygen for live transport)
- Declining importance and improving terms of tied output-credit (*dadon*) in shrimp farming (many alternative sources of credit/capital)
- Geographical lengthening of VCs: massive interzone trade in fish

Indigenous innovation: most fish and shrimp in southern BD is delivered to market alive by locally manufactured vehicle

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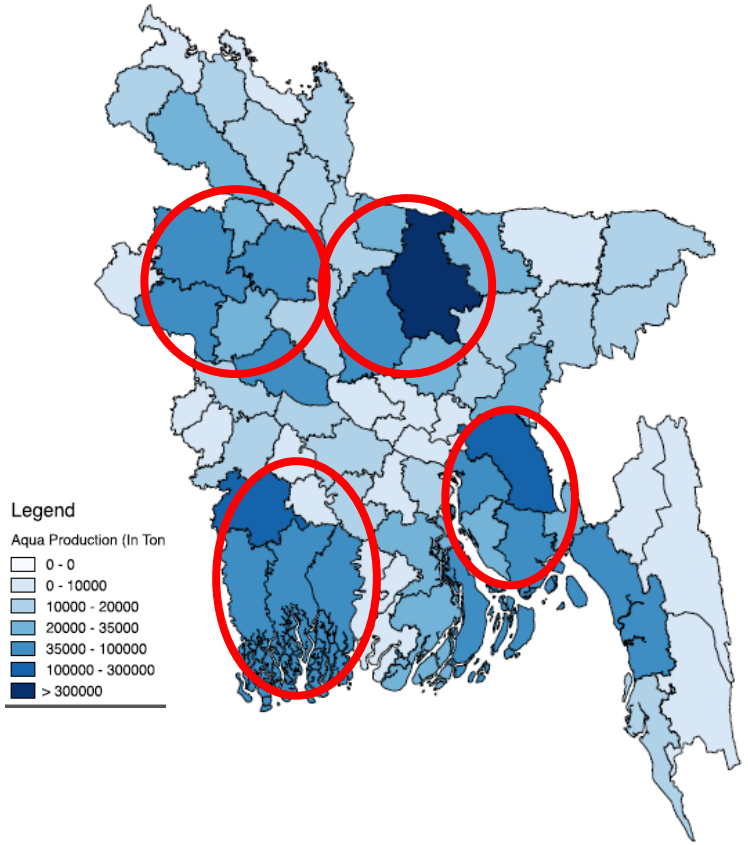
Value chain development has given rise to spontaneous emergence clusters of farms and MSMEs

- Factors contributing to formation of aquaculture value chain clusters include:
  - Agroecology/access to water
  - High density of rural roads, markets, and transport services
  - Communications infrastructure and rural electrification
  - Access to multiple forms of credit and capital
- Clustering gives rise to economies of agglomeration:
  - Co-location of farms and enterprises may lower transaction costs
  - Competition may limit exploitative practices, give rise to services (e.g., extension advice, credit)
  - Demonstration effects & knowledge transfer may lower barriers to entry, accelerate technological change
- These clusters create substantial employment opportunities on- and off-farm



Bangladesh aquaculture production by district, 2015 (Data from DOF, 2016)

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ভাড়া দেয়া হবে
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মোবাঃ ০১৭২৪-৫৪১৫২০।
বিশাং গঞ্জের মোড়, ভালুকা।






Aquaculture value chains clusters in Bangladesh generate a huge amount of economic activity

- Value of farmgate value of production alone = USD1.45 Billion
- >500,000 FTEs in this zone alone (underestimated)
- But mostly for men *(87% of FTEs)

Segment	Men's FTEs	Women's FTEs	Total FTEs	Segment/ total (%)
Hatchery	94	3	943	<1
Feed distribution	43,660	277	43,937	9
Farm	365,297	66,198	431,495	83
Wholesale	31,998	284	31,713	6
Retail	9,873	0	9,873	2
All	450,922	66,762	517,961	100
Total FTEs by gender (%)	87	13	100	-

Authors' estimates of FTE employment in the aquaculture value chain in 7 districts of southern Bangladesh in 2020, by gender

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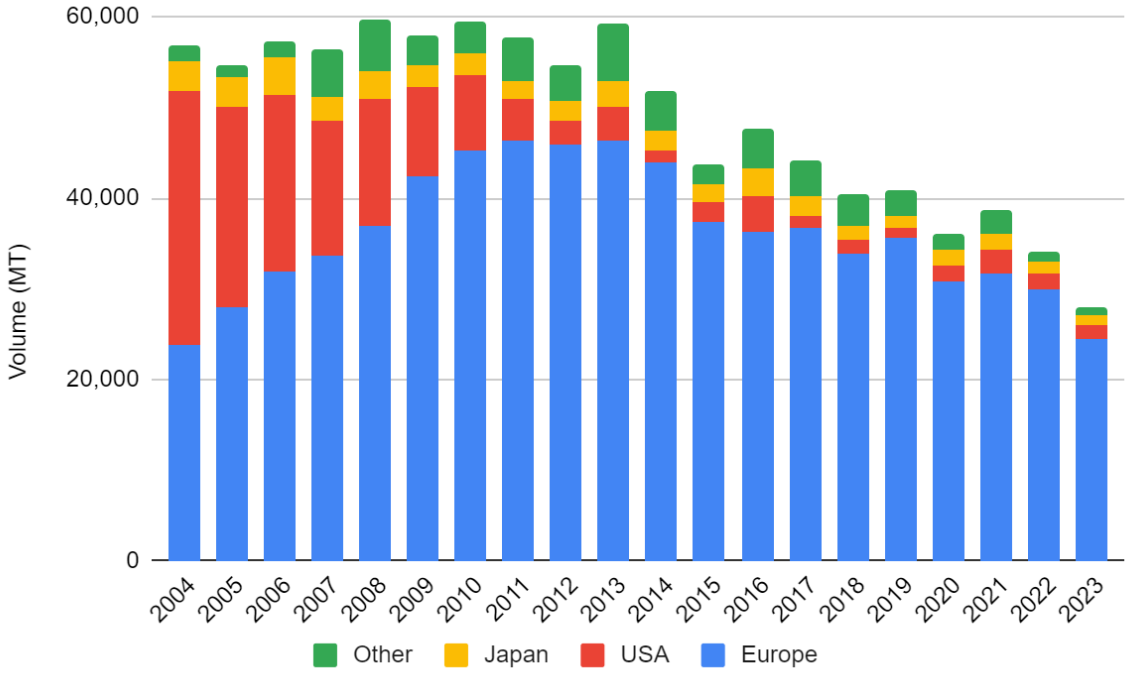
Shrimp production for export has declined, despite rapid growth of aquaculture as a whole



Bangladesh's shrimp exports by destination
(Source: ITC Trademap Mirror Data)

- Shrimp exports halved from 2013-2023
- The share of shrimp in total production in Southern BD decreased from 28% in 2013 to 16% in 2020
- **Supply:** Farmers' shift from shrimp to fish driven by disease, price, domestic demand for fish, increasing fish yields
- **Demand:** Poor international reputation of Bangladesh shrimp processors, International competition, Lack of traceable/certified product

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Numerous value chain interventions have been promoted in the attempt to reverse decline in shrimp exports

- DOF and several private sector players have promoted farmer clusters to:
  - Increase supply of shrimp to processors
  - Improve traceability (possible entry point to certification, needed to diversify export markets).
- DOF formed 300 clusters of 25 farmers which began operating in 2023
  - Cluster farmers must have contiguous ponds and shared water source
  - Members encouraged to deepen ponds, erect fencing, grow only shrimp (no fish), stock only disease-free shrimp seed (SPF-PL), use pelleted feeds, stock and harvest in a coordinated way
  - Clusters where all farmers deepened and fenced pond were considered ‘graduated’ and received subsidized feed and SPF PL
  - All farmers (graduated and non-graduated) received training on best practices

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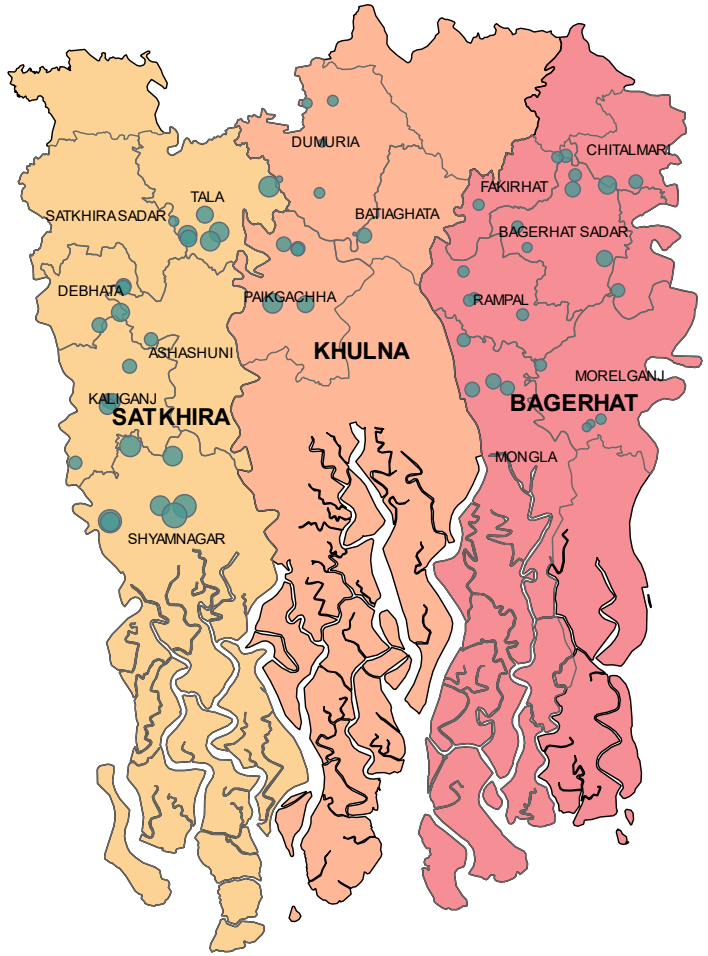
Shrimp cluster intervention impact evaluation

- **Empirical strategy:** Canonical difference-in-differences (DID)
- Mixed methods approach – complement DID estimates with qualitative insights
- Track changes in outcomes of interest among cluster farmers, and compare them to changes experienced by comparison group
- Total sample of 1266 (622 cluster, 600 control)
- **Baseline:** 2022 production cycle (collected Nov 2023)
- **Endline:** 2023 production cycle (collected May 2024)

Sampled clusters



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Being in a cluster didn't significantly increase shrimp yield or farm income

- Revenue from shrimp sales not significantly higher for cluster farms
- Graduated cluster farmers had significantly lower incomes from fish and vegetables due to adopting shrimp monoculture
- Graduated cluster farmers saved money on subsidized production inputs, but not enough offset lower fish and vegetable income
- Cluster farmers' gross margins not significantly higher than non-cluster

Item (BDT/acre)	**Cluster farmers** (vs. all non-cluster famers)	**Graduated cluster farmers** (vs. all non-cluster farmers)
Revenue from shrimp sales	11,000 (18,834)	13,951 (31,222)
Revenue from fish sales	-3,010 (5,998)	-31,323*** (10,994)
Revenue from vegetable sales	-2,487 (7,818)	-12,145** (5,590)
Total revenue	5,905 (22,594)	-29,098 (38,138)
Total production costs	-14,955*** (4,390)	-40,167*** (7,445)
Gross margin	20,860 (22,768)	11,070 (37,189)

(Source: Authors' survey)

Explaining in shrimp cluster intervention impacts

- High up-front costs of cluster entry (pond deepening) prevented farmers in many clusters ‘graduating’. Farmers in non-graduated clusters did not receive subsidized inputs
- Delays and uneven rollout of intervention (e.g., late delivery of SPF-PL to some clusters)
- SPF-PL didn’t reduce shrimp mortality or raise yields/incomes
- Farmers have a strong preference of polyculture because it allows for income diversification and smoothing and is lower risk than shrimp monoculture
- Most cluster farmers found training received helpful, and adopted practices they found appropriate and affordable (e.g., more systematic feeding, prebiotics)

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Emerging policy considerations for the shrimp sector

- Future interventions targeting shrimp farms could be much less prescriptive and focus on delivery of basic training.
- Such interventions would be simpler to implement, less costly, have a lower likelihood of unintended consequences, and more sustainable.
- Low supply of shrimp to processors may be a bigger problem for processors than for farmers, given that farmers have alternatives (fish, veg)
- Processors have responsibility to adopt practices that improve the reputation and quality of Bangladesh shrimp (e.g., not bulking out by soaking or glazing)
- Processors can invest in sourcing direct from farms to ensure traceability, and market the “traditional” or “natural” characteristics Bangladesh’s shrimp to help access higher value market niches

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