Evaluating Impacts of Genetically Improved Farmed Tilapia

Challenges and strategy

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Background

❑ Aquaculture is crucial for improved human nutrition and livelihoods.

❑ Genetically improved fish varieties are important for aquaculture productivity growth.

❑ Tilapia is the second most important farmed fish globally.

- *> 5.5 million MT are produced globally every year.*

❑ The Genetically Improved Farmed Tilapia (GIFT) variety was developed by WorldFish/ICLARM and its partners.

- *Faster-growing, high-yielding, and with a high survival rate.*

Bangladesh context

- ❑ Fish contributes >60% of dietary animal protein.
- ❑ Fourth largest tilapia producer in the world.
- ❑ GIFT first introduced in 1994.
- ❑ Further dissemination in 2005 and 2012.
- ❑ Most hatcheries started during 2011-2015.
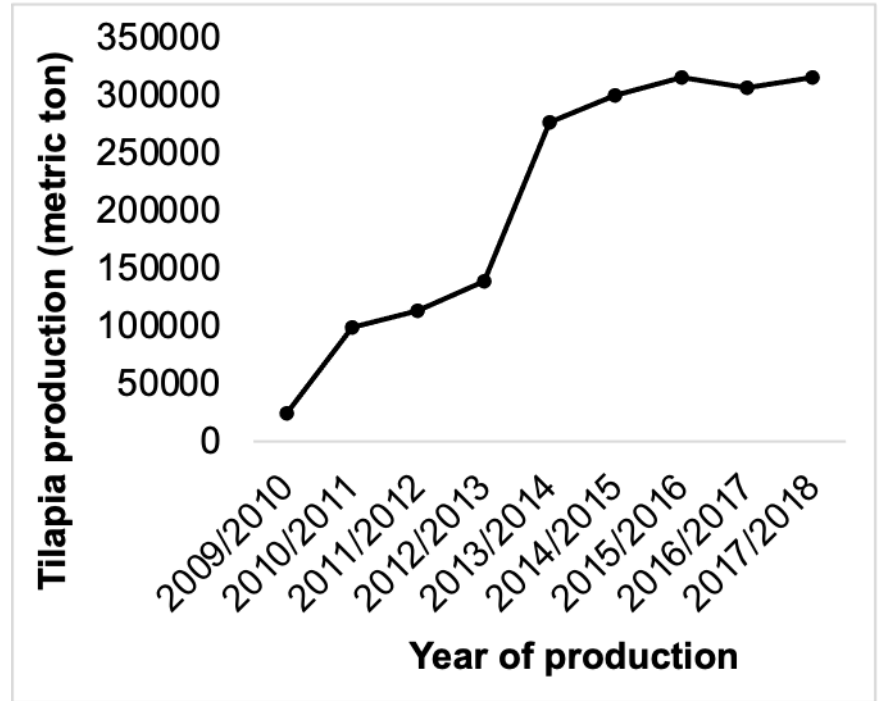
Trend in tilapia production in Bangladesh

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Problem

❑ Previous research (mostly using on-station and on-farm trials) suggested that growing GIFT:

  ❑ increases fish yields and farm income (e.g., Haque *et al.*, 2016)

  ❑ reduces production costs (e.g., Dey *et al.*, 2000);

  ❑ generates rural employment (Asian Development Bank, 2005).

❑ Data and methodological limitations hindered construction of counterfactuals making it impossible to infer causality.

❑ Misclassification of varieties is problematic.

❑ There is need for a rigorous evaluation of the causal impacts of GIFT.

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This study (under SPIA's track 2 grant)

❑ Dissemination of GIFT varies spatially and over time.

❑ WorldFish has information over last 10 years on:

 ✓ years in which new GIFT tilapia was received by different hatcheries and

 ✓ the types of strains produced by different hatcheries.

❑ Useful to track dissemination—to some extent.

❑ Question: Could this information be mapped to farmers?

❑ How can we define **catchment areas** for GIFT?

 ✓ *location of hatcheries, volume of seed sold, number and geographical location of tilapia farmers.*

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Objectives

❑ To describe and document the dissemination process for GIFT via hatcheries to farmers and the implications for how hatchery "catchment areas" could be defined conceptually and empirically in the context of an impact assessment study.

❑ To validate the catchment areas as defined by hatchery data by collecting data directly from farmers.

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Methodology: Two-step approach

Step 1

Catchment areas identification

Listing of all tilapia hatcheries

Validation exercise by partner in Bangladesh

Contact hatcheries for interviews using **CATI** (**134 interviewed**)

KIIs

Step 2

Validating catchment areas

Listing of tilapia farmers

Sampling 3,000 farmers

CATI with 2,956 farmers

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Methodology: Data

Data at hatchery level

- Recall data for last 10 years.
- Buyers of seed.
- Districts and Upazilas where seed was sold.
- Sources of breeder seed for the hatcheries.
- Quantity of seed sold,
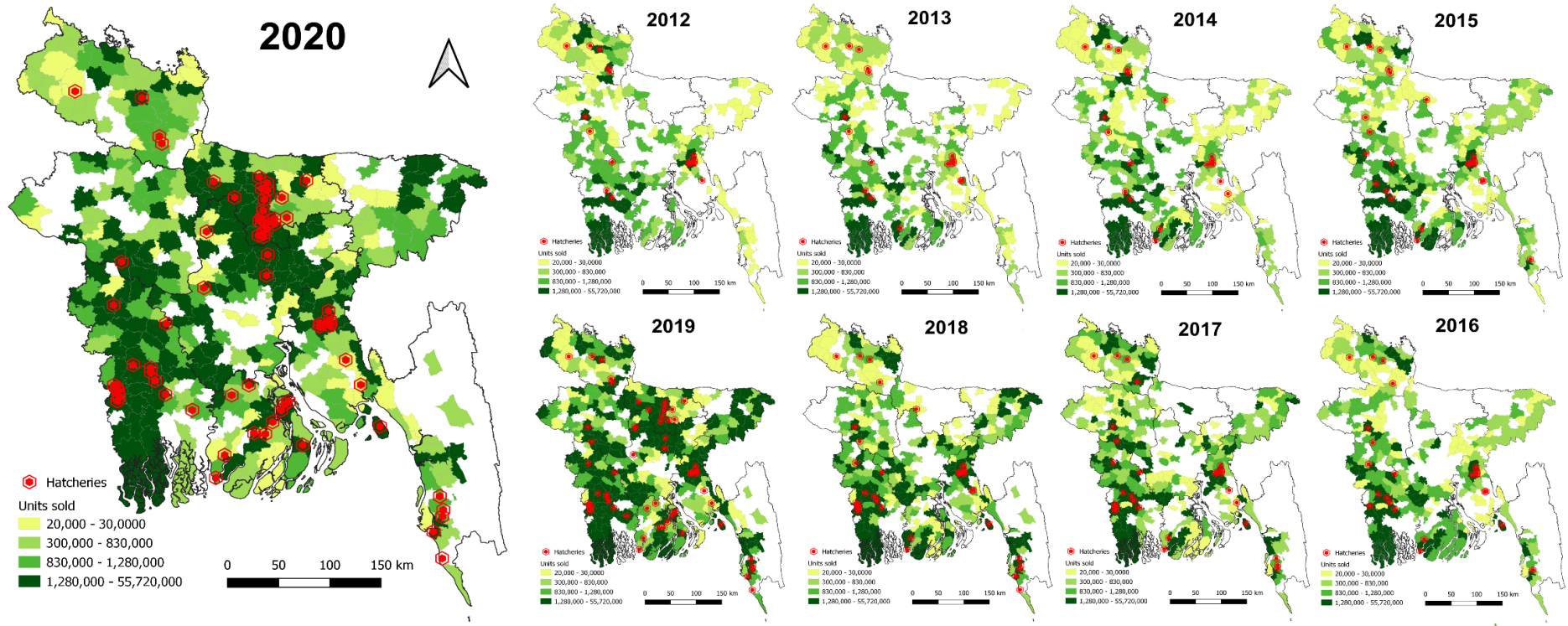- Type of seed produced (i.e., GIFT and non-GIFT seed)

Data at farmer level

- Location details: District, Upazila, and Village.
- Sources (by name) of seed for the last 5 years.
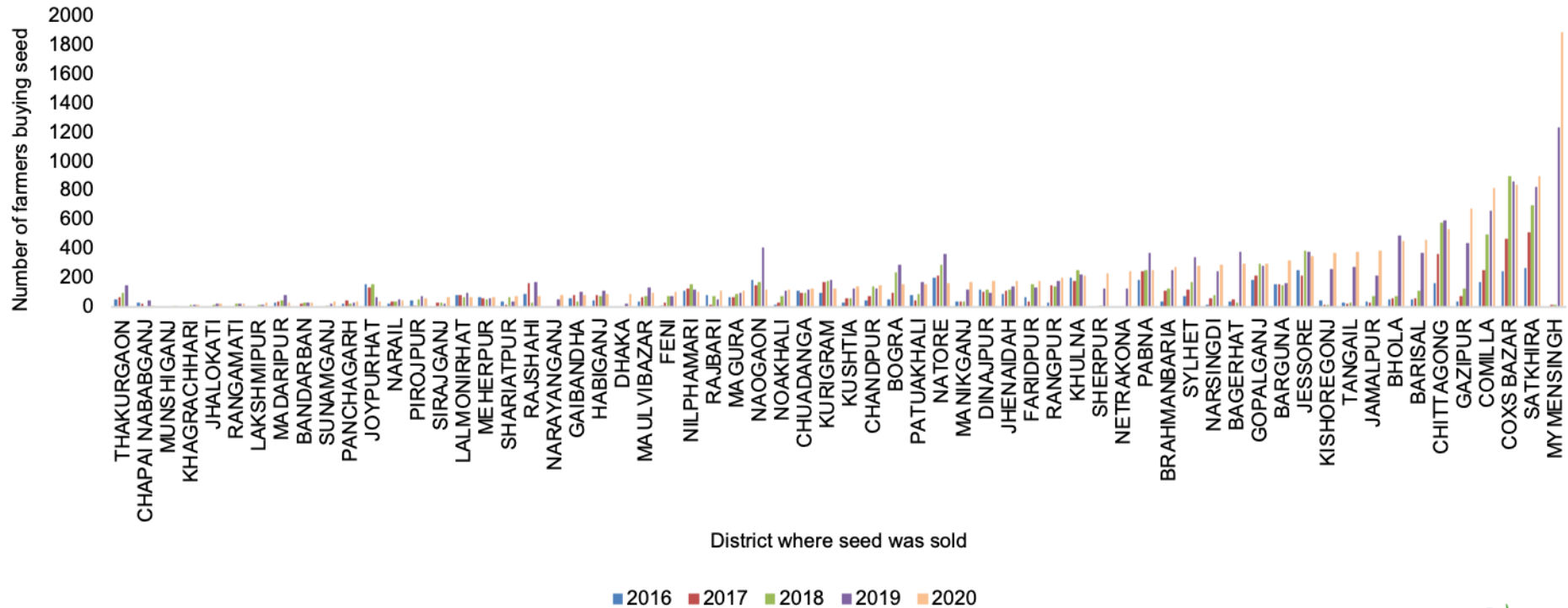- Quantity of seed obtained from [source] in last 5 years.
- Demographic characteristics.

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Analysis

❑ We perform three levels of matching:

   ✓ Level 1: Farmer reports having sourced tilapia seed *from upazilas where surveyed hatcheries* reported having sold seed.

   ✓ Level 2: Farmer reports having bought tilapia seed *from a hatchery surveyed* in our study.

   ✓ Level 3: *Farmer located in Upazila X names a hatchery* as tilapia seed source and the **hatchery confirms** selling seed in the same Upazila X.
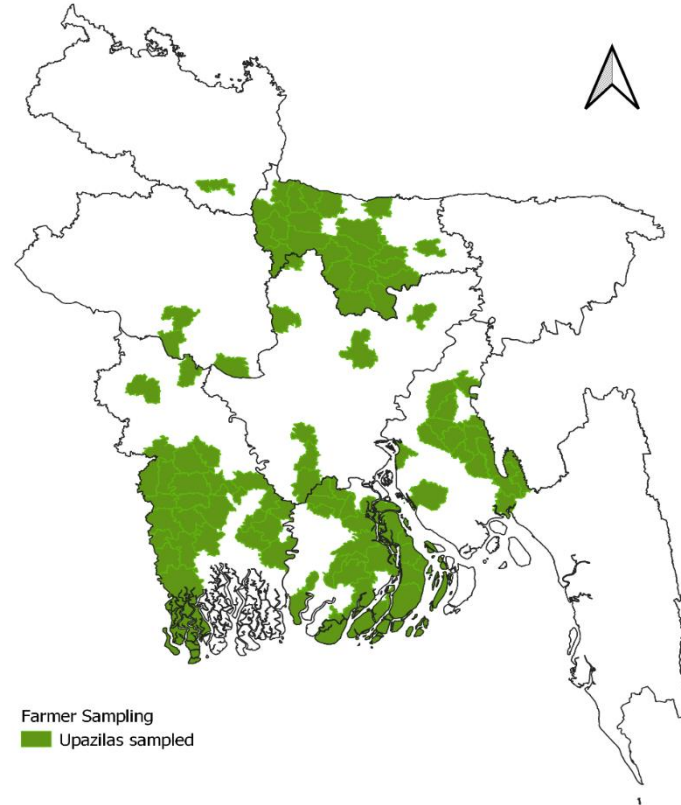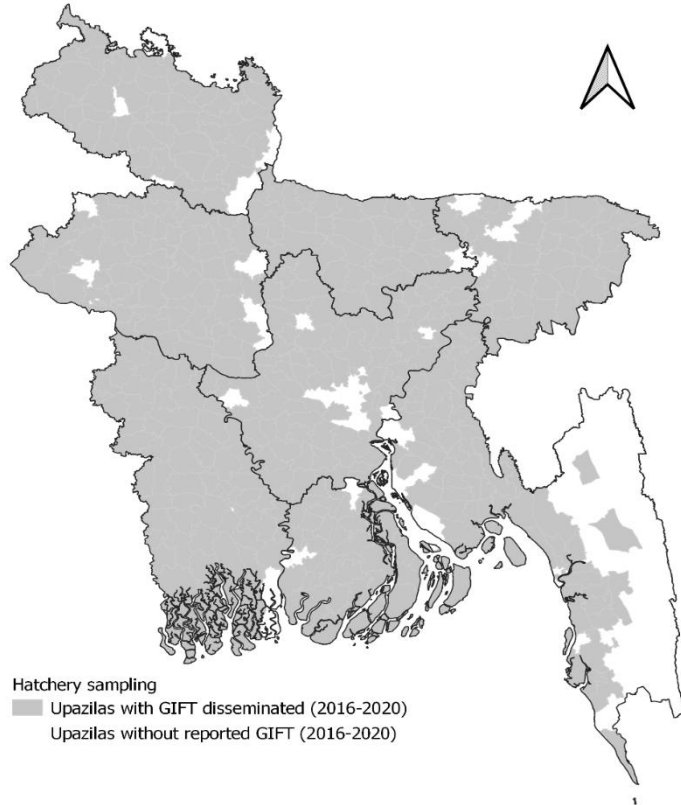
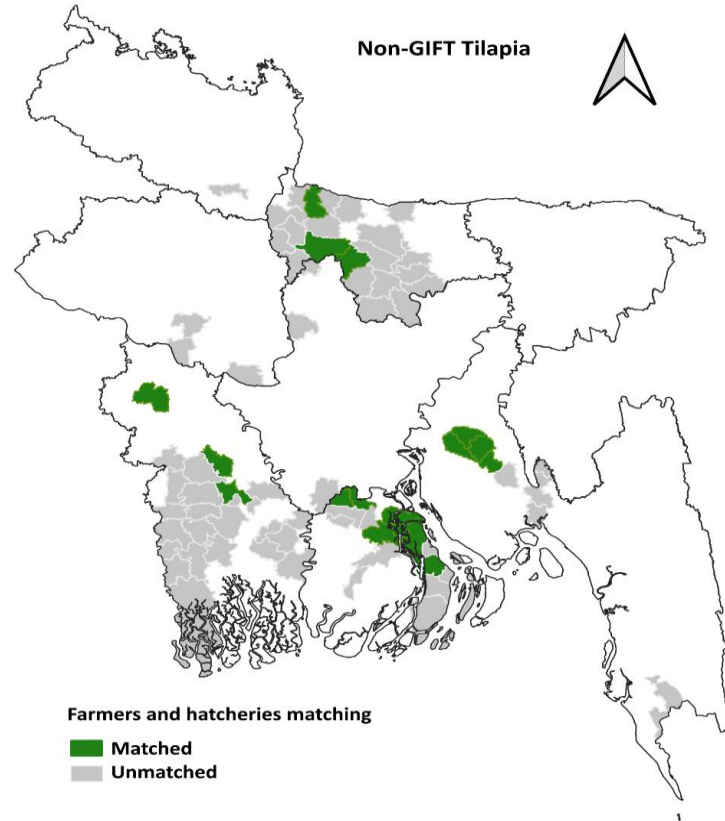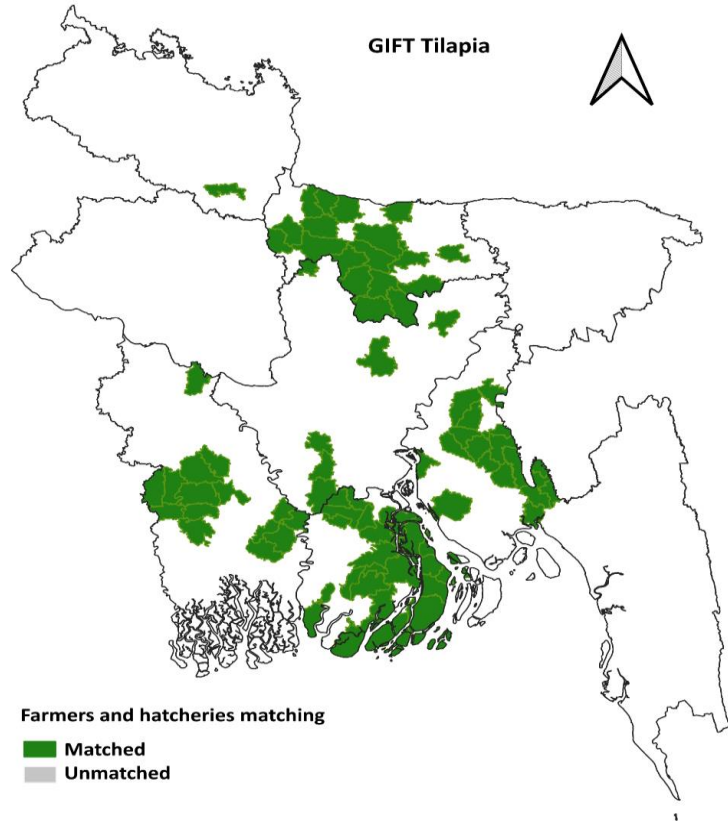# GIFT diffusion between 2012 to 2020

GIFT catchment areas

GIFT catchment areas

Hatchery sampling
- Upazilas with GIFT disseminated (2016-2020)
- Upazilas without reported GIFT (2016-2020)

Farmer Sampling
- Upazilas sampled

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Matching results

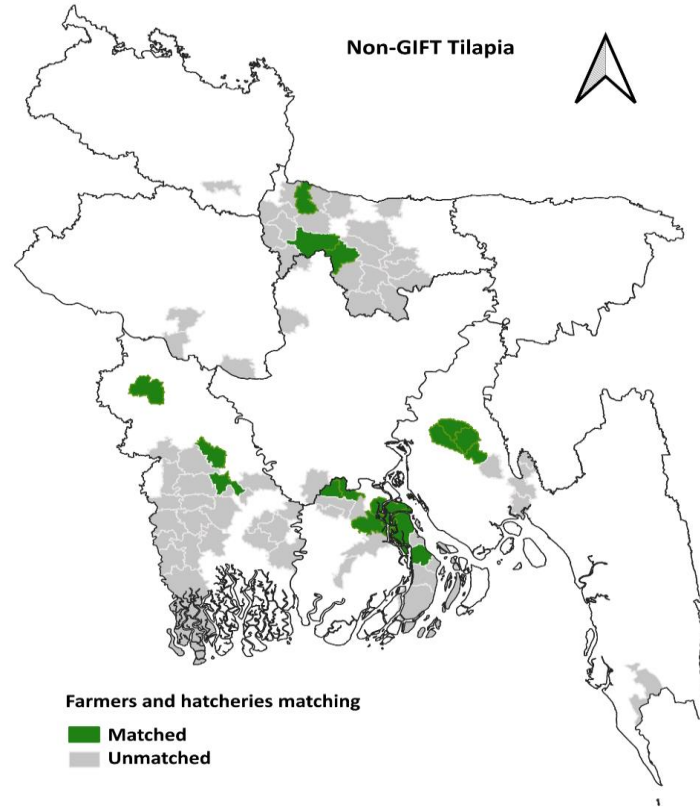|	Gift Tilapia	Non-Gift Tilapia
Level 1 Matching		
No. hatcheries	111	7
No. farmers	1,901	1,163
No. Upazilas	80	79
Level 2 Matching		
No. hatcheries	105	5
No. farmers	706	416
No. Upazilas	49	47
Level 3 Matching		
No. hatcheries	97	0
No. farmers	592	0
No. Upazilas	18	0

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Level 1: matching

Level 2 matching

Level 2 matching

GIFT Tilapia

Non-GIFT Tilapia

Farmers and hatcheries matching

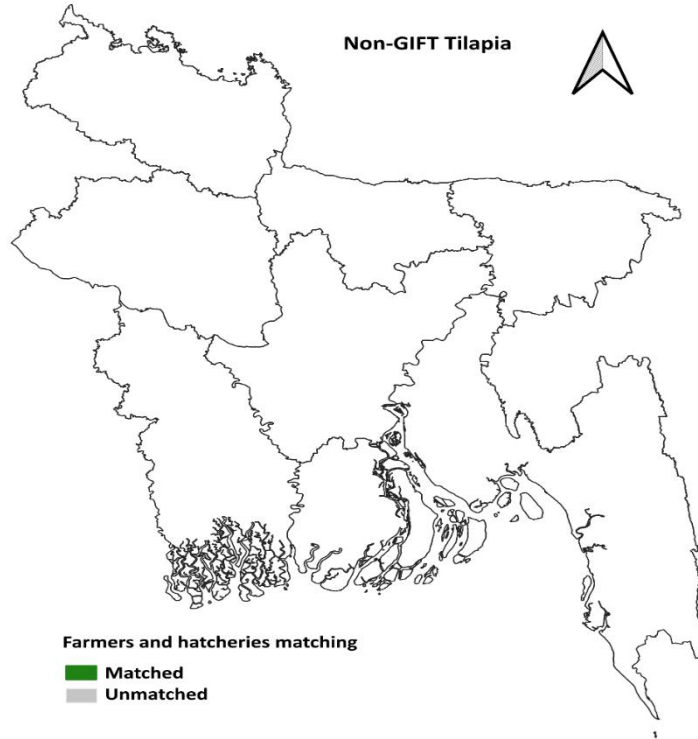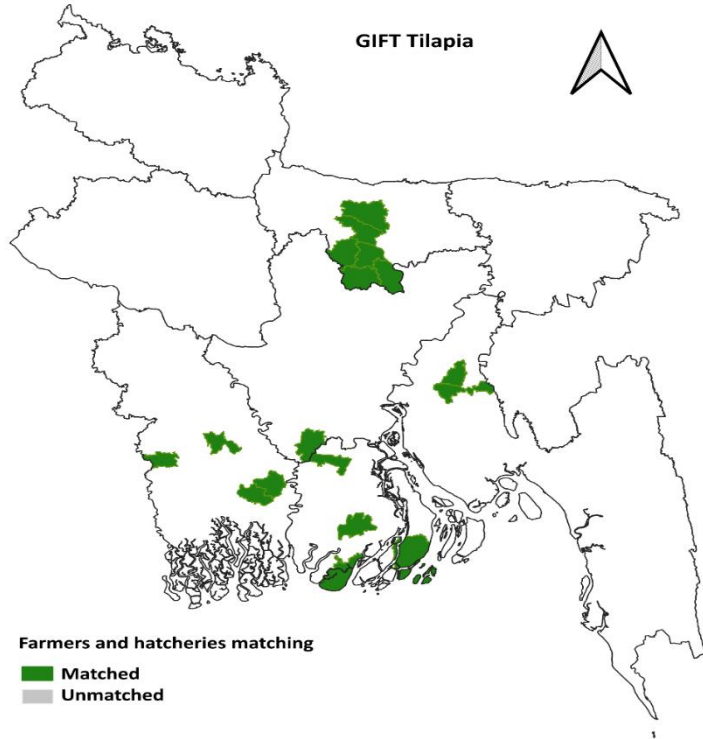- Matched
- Unmatched

Farmers and hatcheries matching

- Matched
- Unmatched

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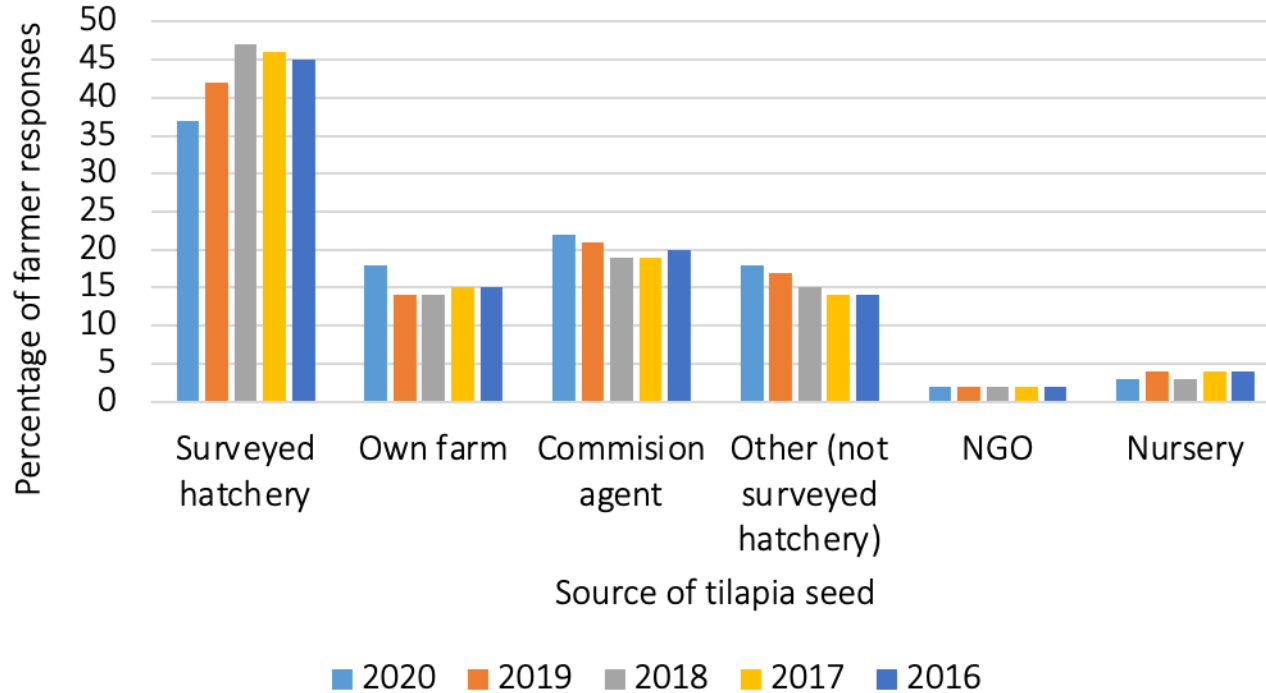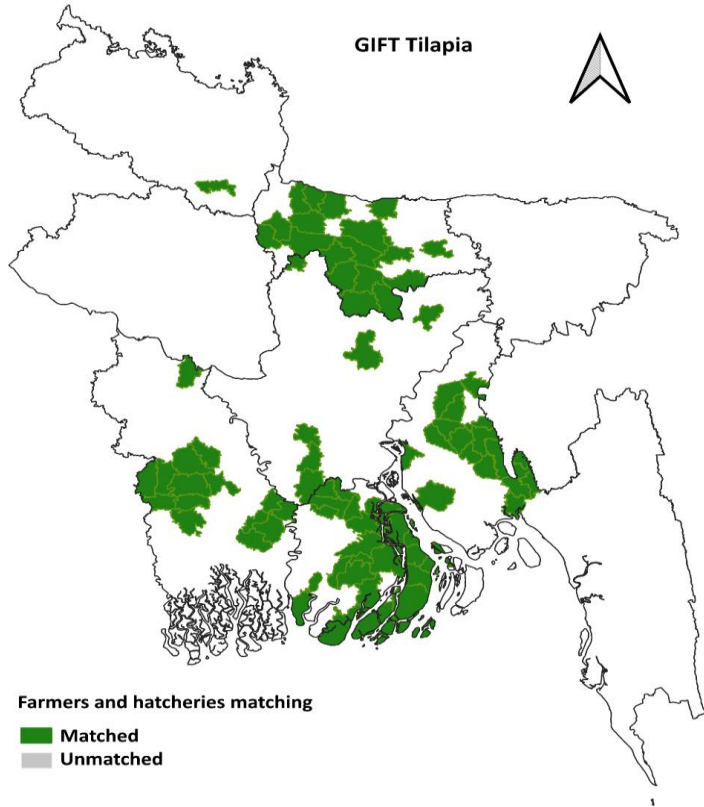
Level 3 matching

Conclusion and next steps

❑ There is sufficient diffusion of GIFT indicating suitability for evaluation of long-term impacts.

❑ We have identified and validated GIFT catchment areas.

❑ Next steps:

- Try to follow up hatcheries we missed in the survey.

- Utilize the information to construct a counterfactual.

- Identify estimation procedure e.g., matching (selection on observables) and others.

- Outcomes: Income, food and nutrition security, poverty, water and input use.

- Heterogeneous treatment effects.

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Thank You

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RESEARCH PROGRAM ON
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CGIAR

Led by WorldFish

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