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HARNESSING MACHINE LEARNING TO ESTIMATE AQUACULTURE'S CONTRIBUTIONS TO THE ECONOMY OF SOUTHWEST BANGLADESH

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World Aquaculture Singapore 2022
December 1, 2022

Photo: Google Earth

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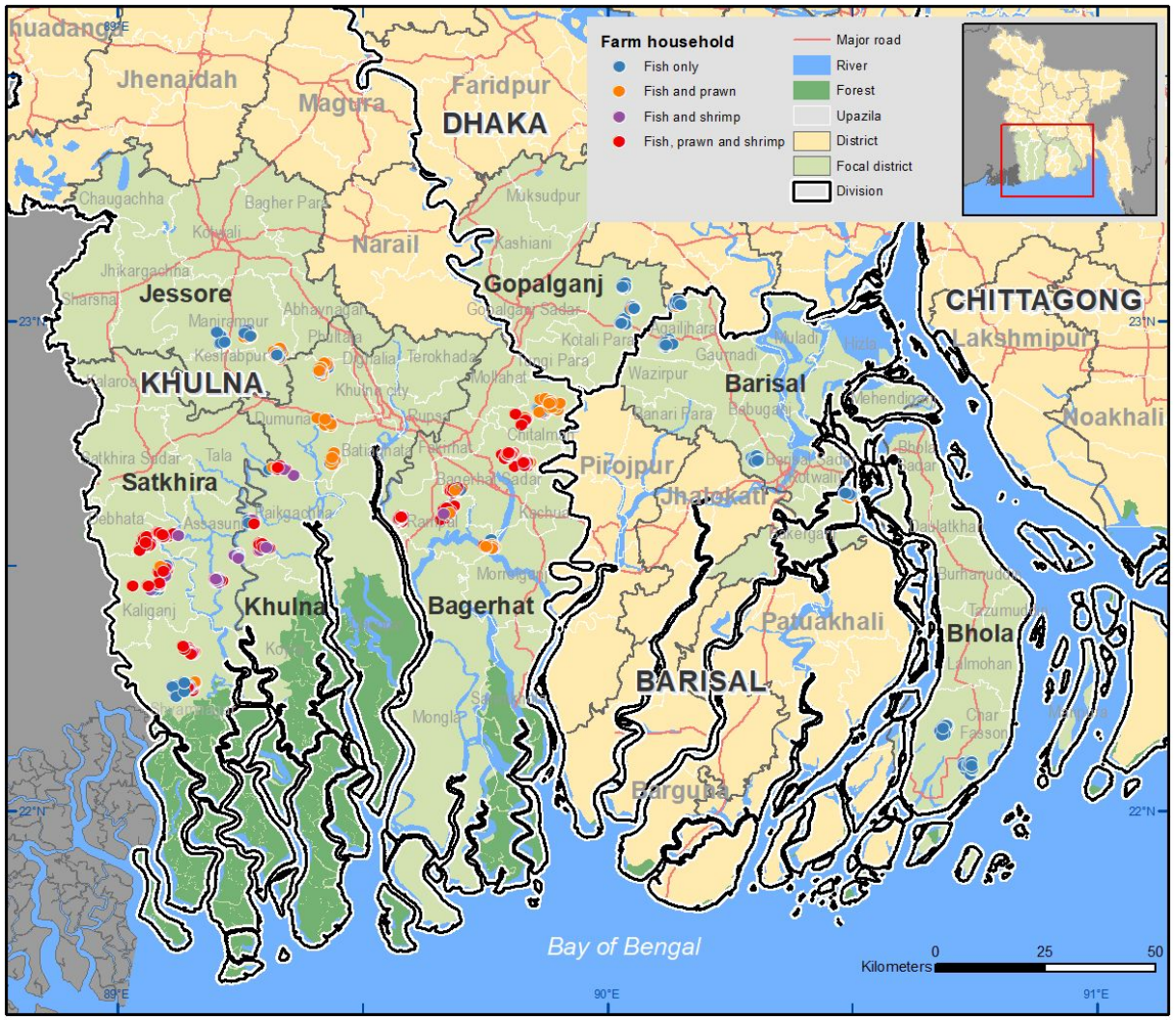
PROJECT OVERVIEW

- "Harnessing Machine Learning to Estimate Aquaculture Production and Value Chain Performance in Bangladesh"
- Worked in seven main aquaculture districts in SW Bangladesh in 2020-21
- **Component 1** Survey a representative sample of 721 farmers, 329 fish traders, 79 feed suppliers, 80 hatcheries
- **Component 2** Use machine learning to extract and analyze data on aquaculture from remotely sensed images;
- Combine with survey data to estimate aquaculture's contributions to the regional economy

ZONE OF INTEREST

Jashore
Satkhira
Khulna
Bagerhat
Gopalganj
Barisal
Bhola



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METHODOLOGY

- Estimated total aquafarm area in 7 districts of S Bangladesh from remote sensed images using machine learning.
- From survey, calculated average rates of: Farm productivity (t/ha); Gross revenue (farmgate value + own consumed & gifted value); Gross margins (gross revenue - production costs); Feed use (t/ha); Employment (FTEs/ha)
- Multiplied per ha average by total area to estimate total: Quantity of production, Value of production, Farm income, Amount of feed used, Jobs created.
- Can use same technique to estimate total production of micronutrients & number of people employed upstream and in downstream value chains in the same districts

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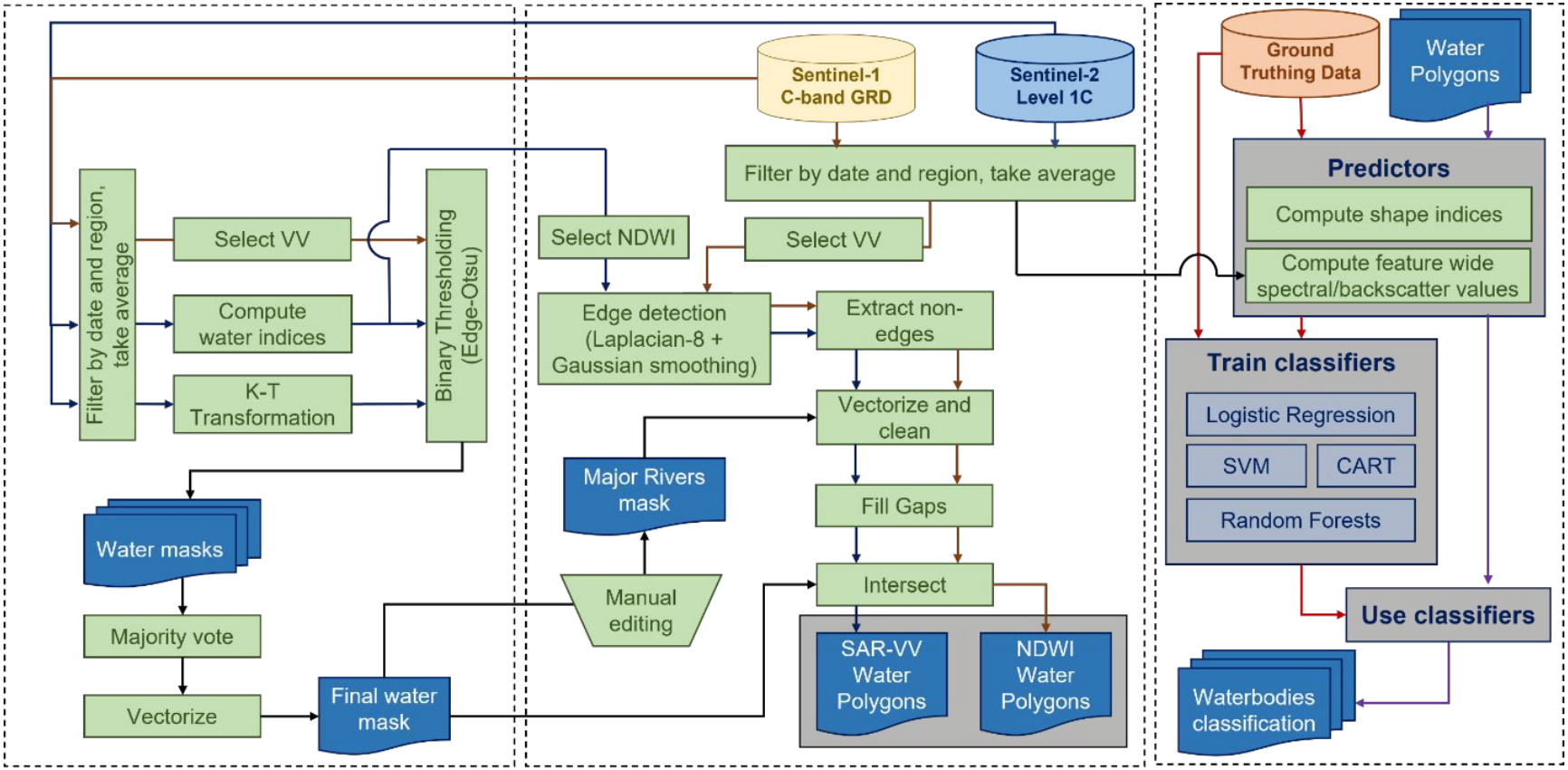
MACHINE LEARNING FRAMEWORK



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RESULTS

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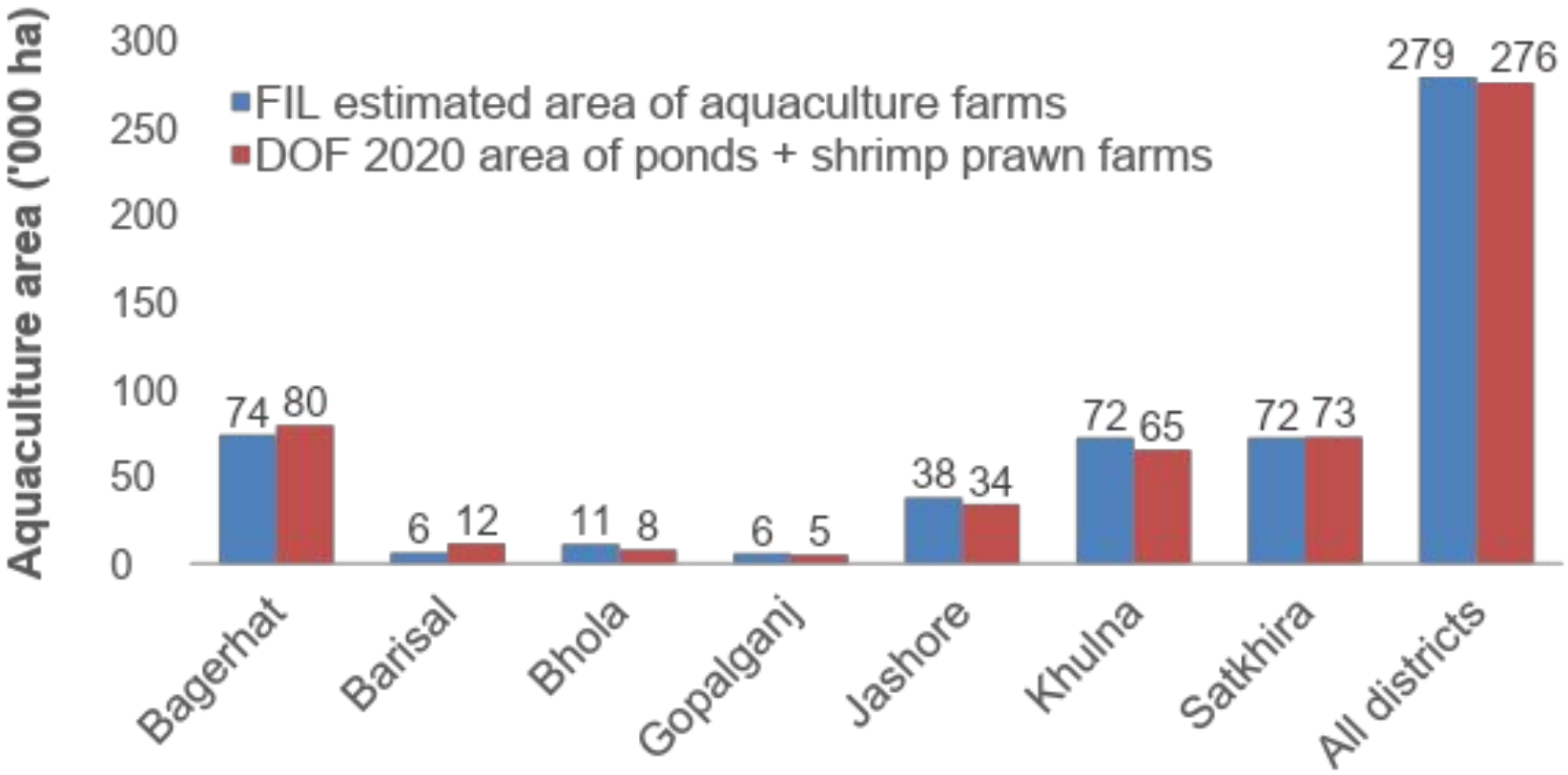
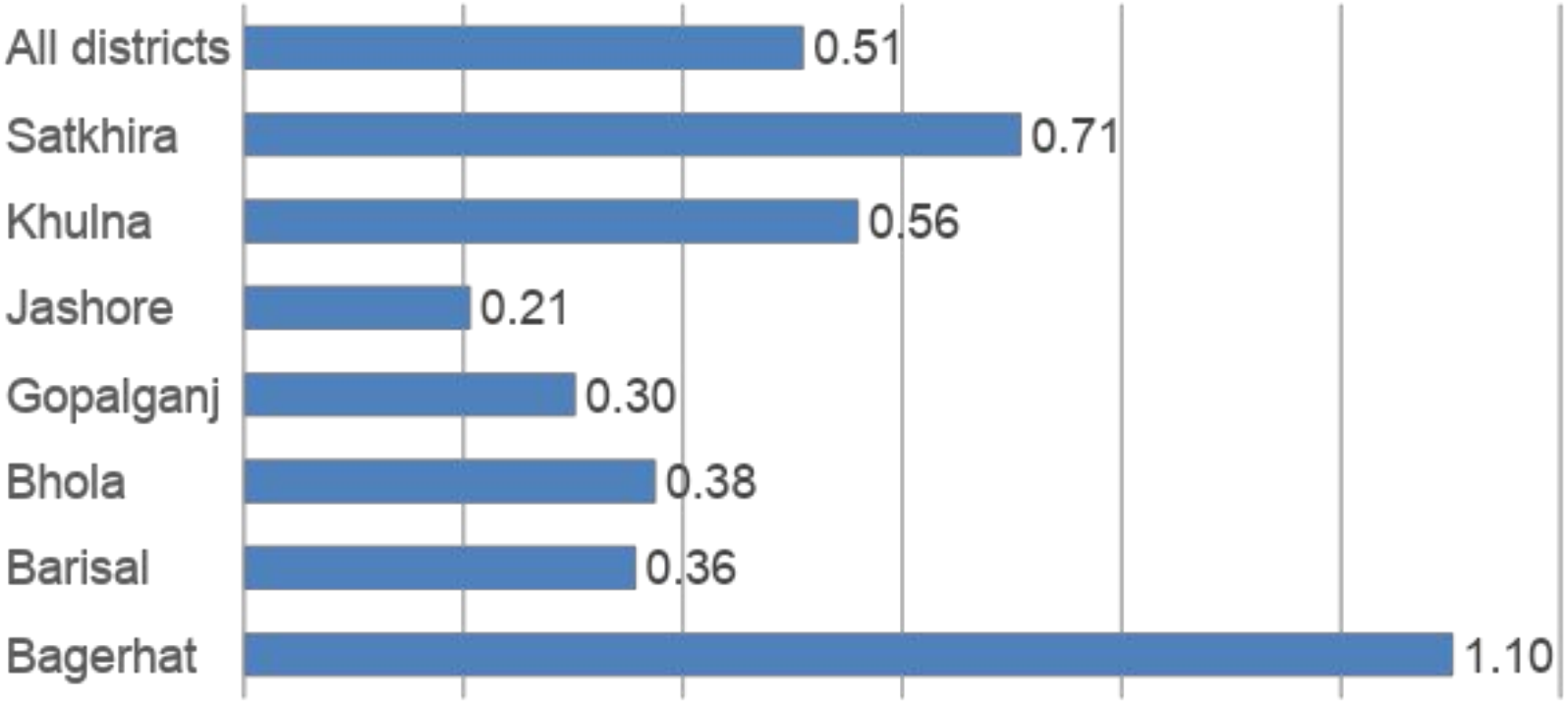
SIMILAR ESTIMATES OF FARM AREA FROM MACHINE LEARNING & DOF

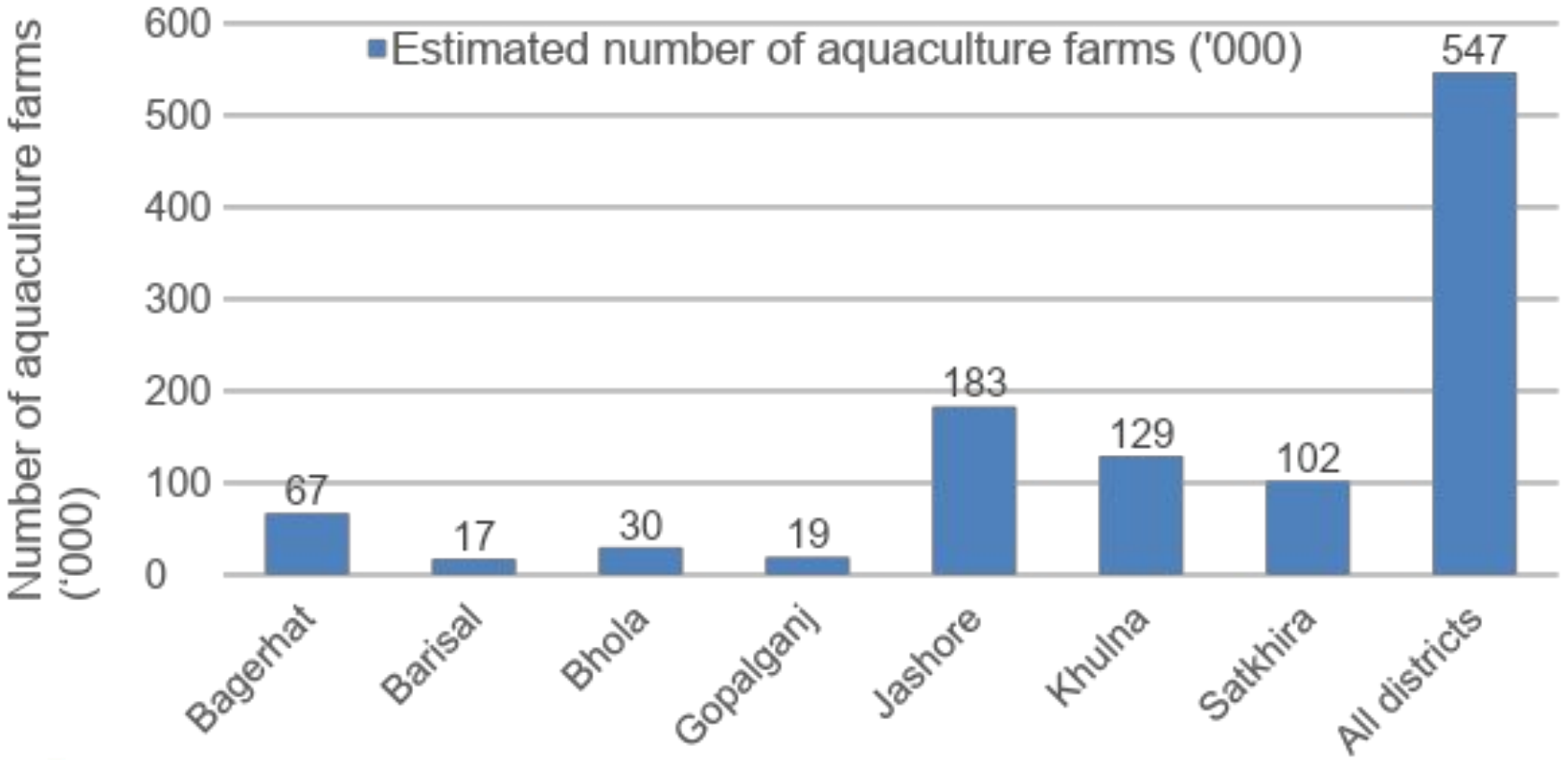


SMALL AVERAGE FARM SIZE

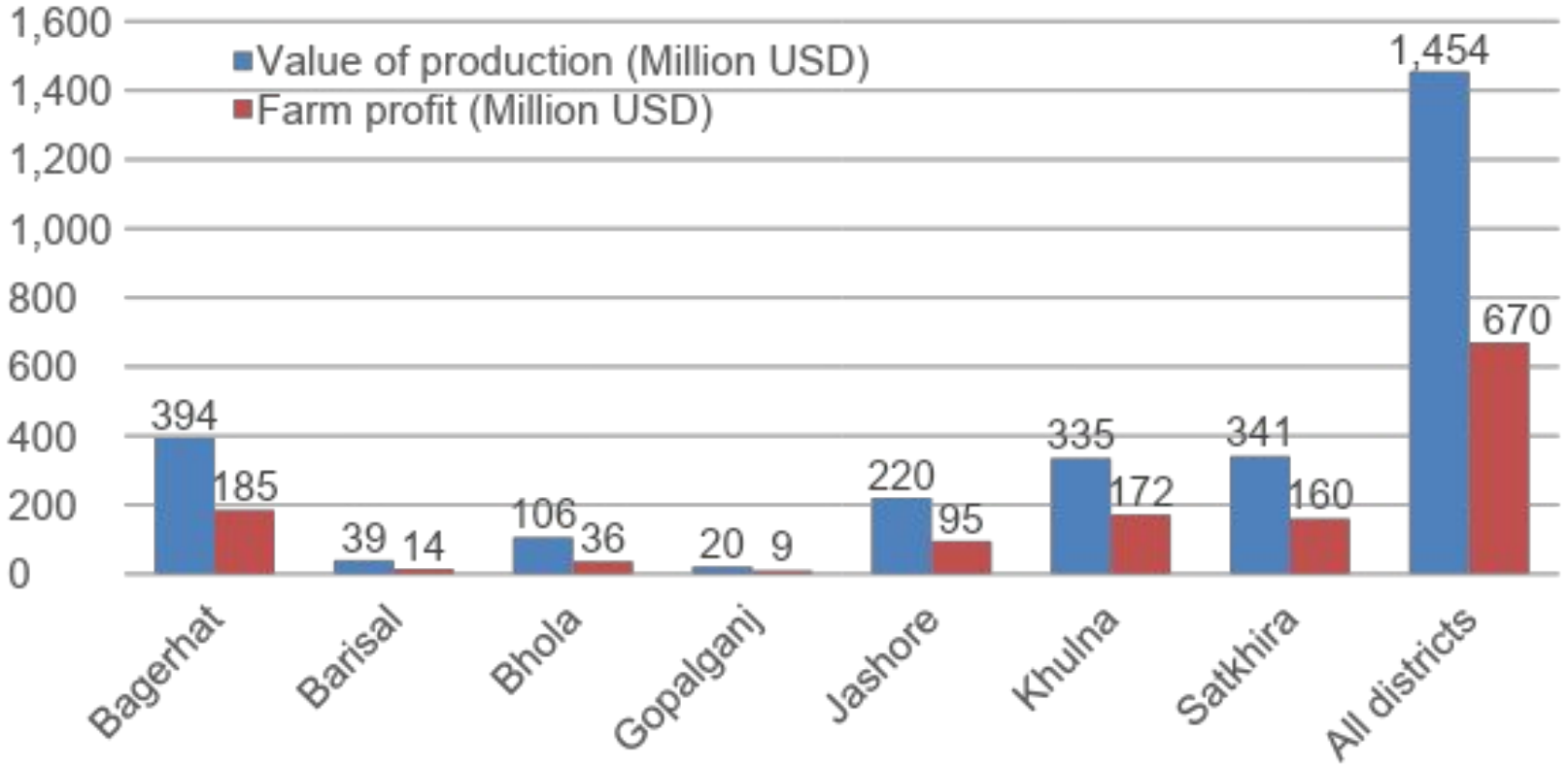


Average area of aquaculture waterbodies per farm (ha)

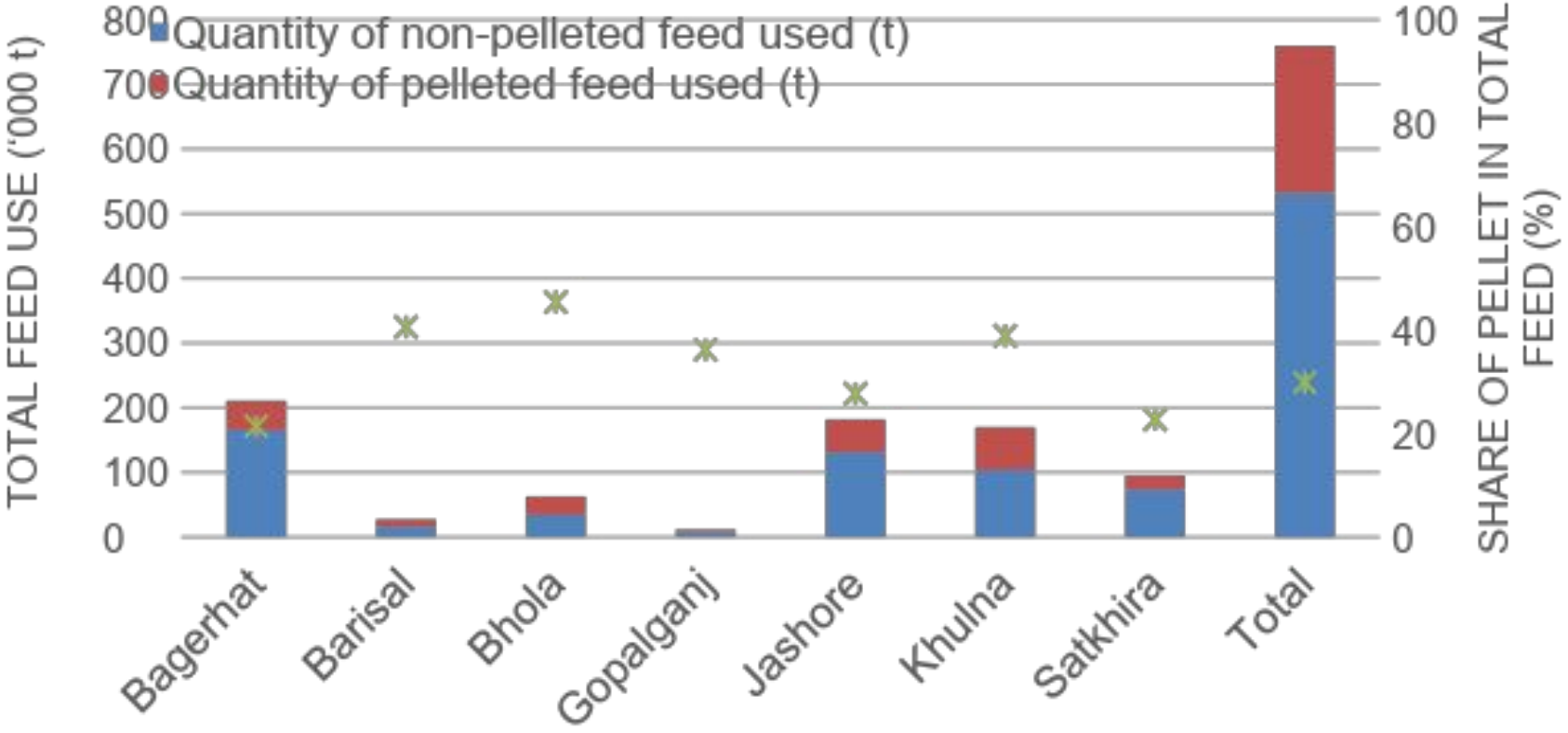
ESTIMATED NUMBER OF FARMS = 547,000



TOTAL VALUE OF PRODUCTION = 1.45 BILLION USD
TOTAL VALUE OF FARM PROFIT = 0.67 BILLION USD



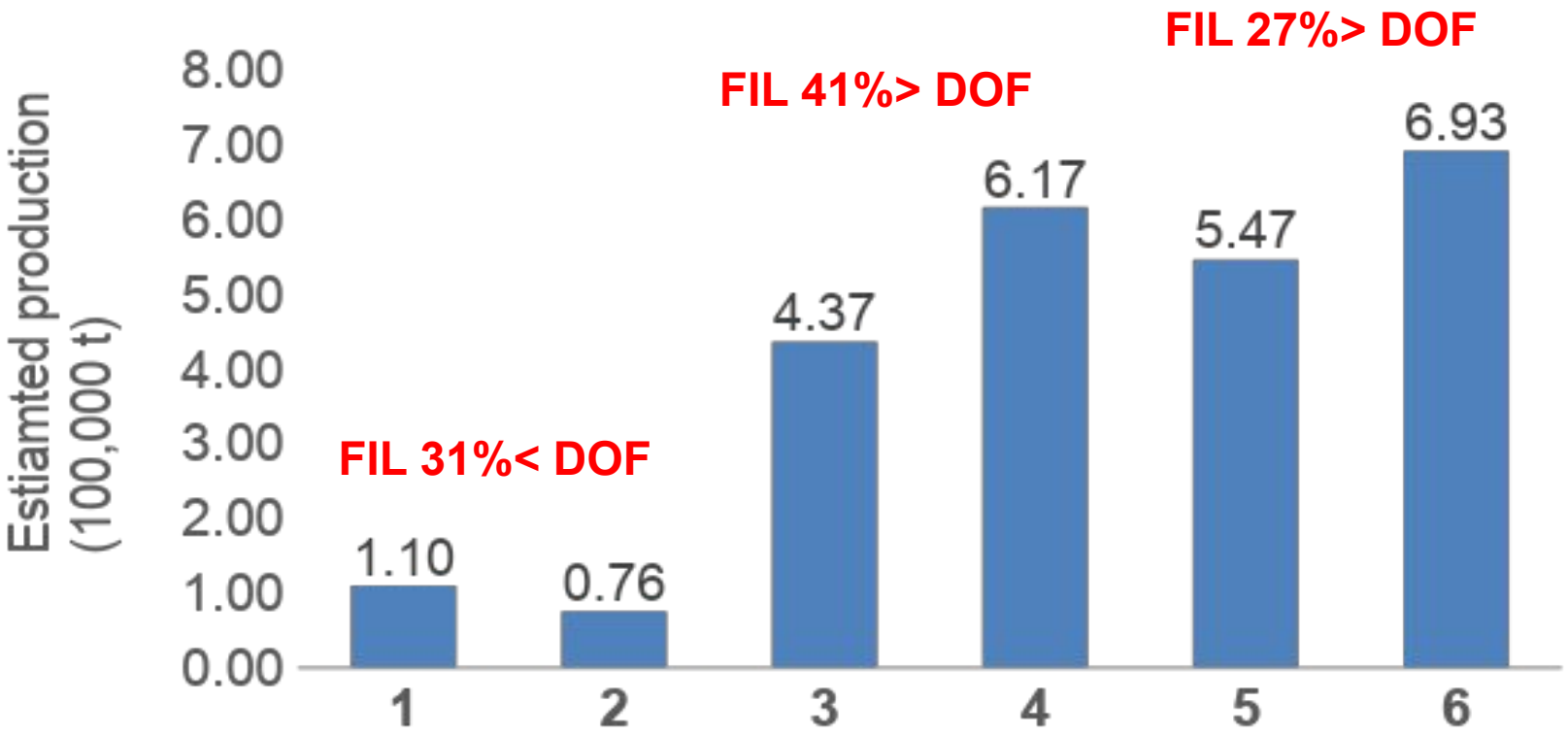
PELLETED FEED USE = 225,000 T (30%)
NON-PELLET FEED USE = 530,000 T (70%)



ON-FARM FULLTIME EQUIVALENT JOBS CREATED = 430,000

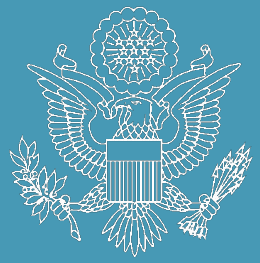
District	Male FTEs	Female FTEs	Total FTEs
Bagerhat	122,870	18,175	141,045
Barisal	6,916	2,725	9,641
Bhola	9,936	4,935	14,871
Gopalganj	2,580	964	3,544
Jashore	26,017	5,647	31,664
Khulna	66,993	17,748	84,741
Satkhira	129,984	16,004	145,988
All	365,297	66,198	431,495

DIFFERENCES IN FIL ESTIMATED & DOF REPORTED PRODUCTION



CONCLUSIONS

- Machine learning estimates of total farm area similar to DOF stats
- Massive contribution to GDP, farmer incomes, employment
- Lower estimates of shrimp + prawn production (31%) compared to DOF: reflects COVID effect (-25%)
- Much higher fish (41%) and total (27%) production estimates - shift from shrimp to fish + huge increase in pelleted feed.
- Potential for combining remote sensing & machine learning + representative surveys to estimate a wide range of statistics.
- Further work ongoing to estimate off-farm employment in aquaculture value chain and production of nutrients.
- Potential for expansion of approach to whole country/other countries.



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