

Impacts of shrimp and prawn farming on local environments and livelihoods in south west coastal part of Bangladesh

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Introduction

Shrimp farming has been started at early of 1980s and prawn farming at early of 1990s

Rapid expansion took place due suitable agro-climatic condition and availability resources

Occupied major economic activity in the south-west coastal part of Bangladesh

Most of farms are constructed by transforming prime agricultural land

Number of shrimp farmers: 538,000
Number of prawn farmer: 295,000

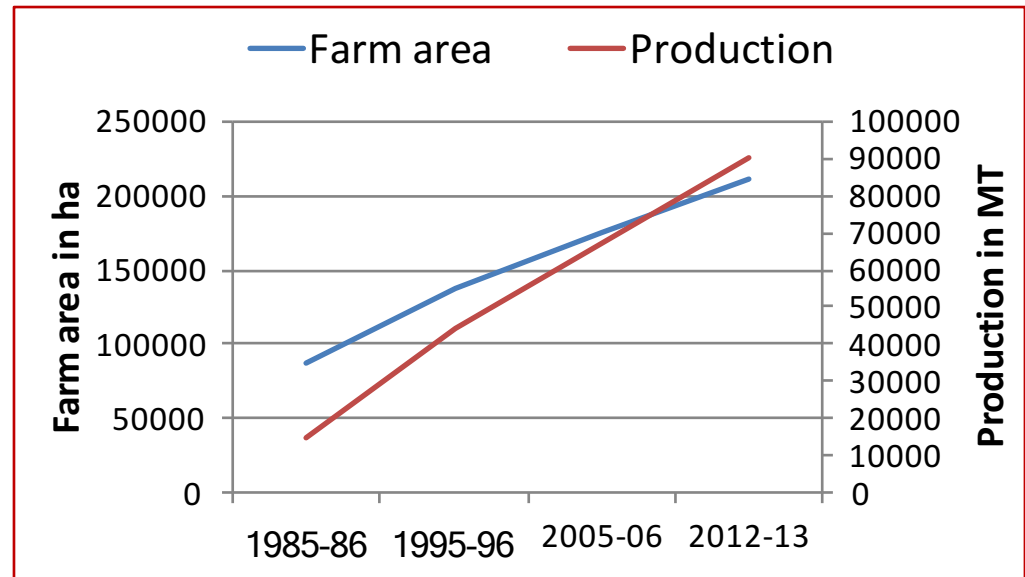


Fig. 1: Trend of increasing farming area and production of **shrimp**

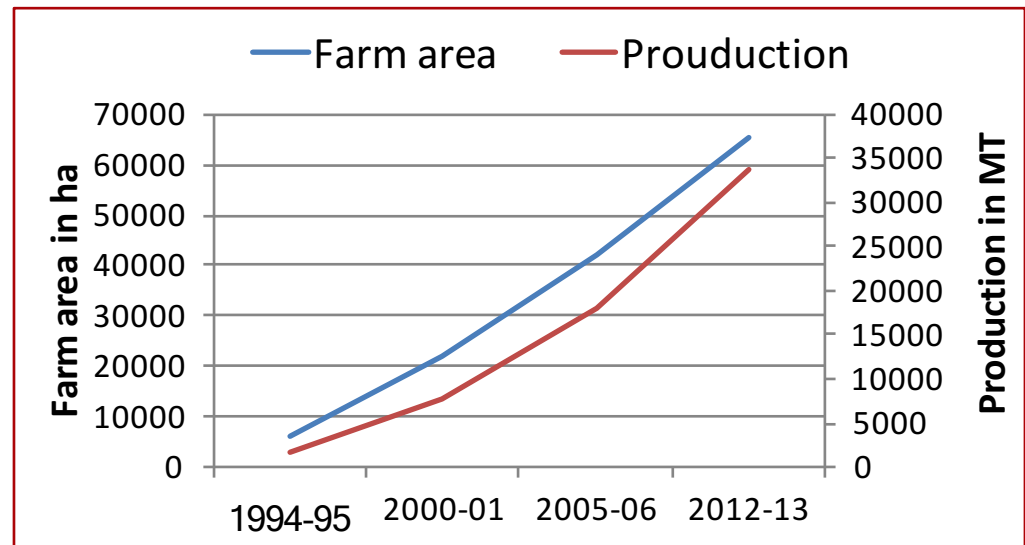


Fig. 2: Trend of increasing farming area and production of **Prawn**

(Source: DoF, 2002, 2014)

Culture Environment

Saline water

Shrimp

Saline water



Shrimp farm in wet season



Shrimp farm in dry season

Freshwater

Prawn

Freshwater



Prawn-rice farm in wet season



Prawn-rice farm in dry season

Production Cycle:

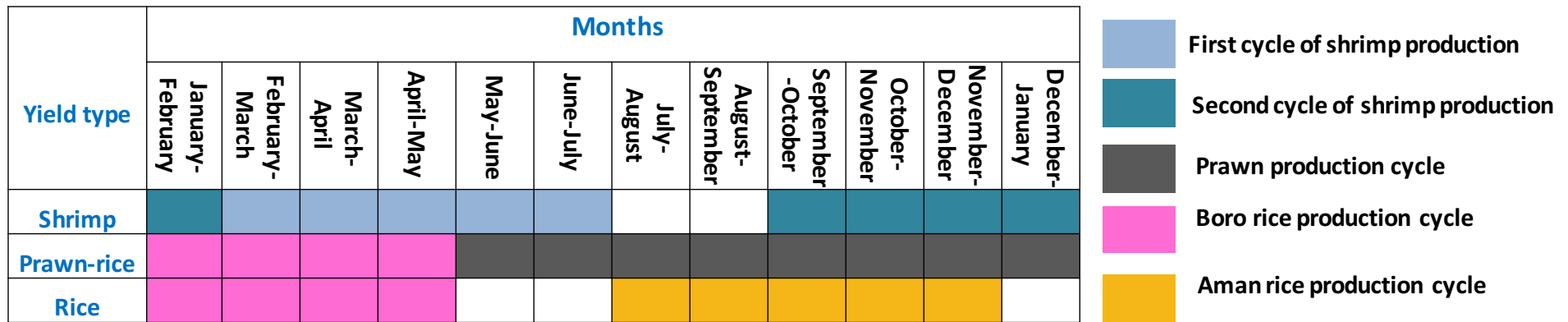


Fig. 3: Production cycle of different crops (Source: Field survey, 2014)

Product Flow:

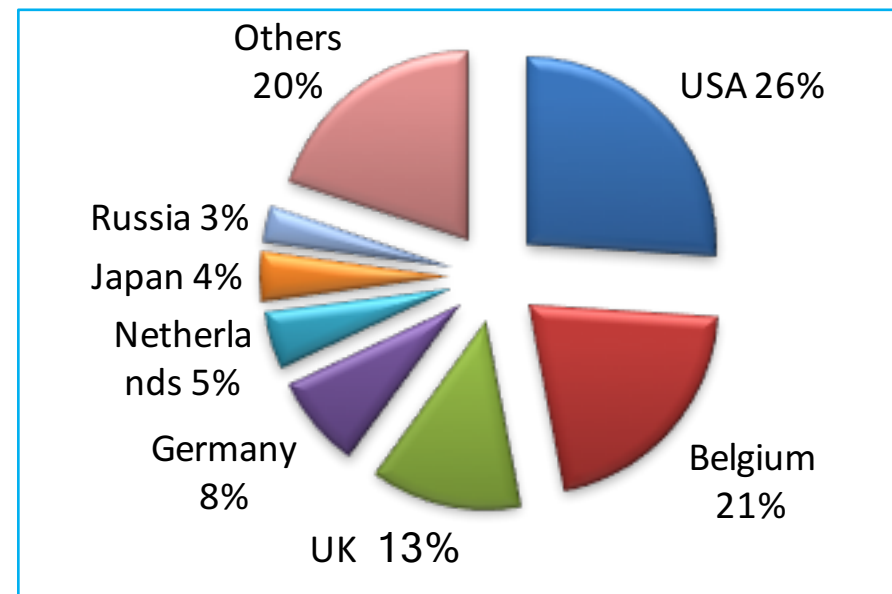
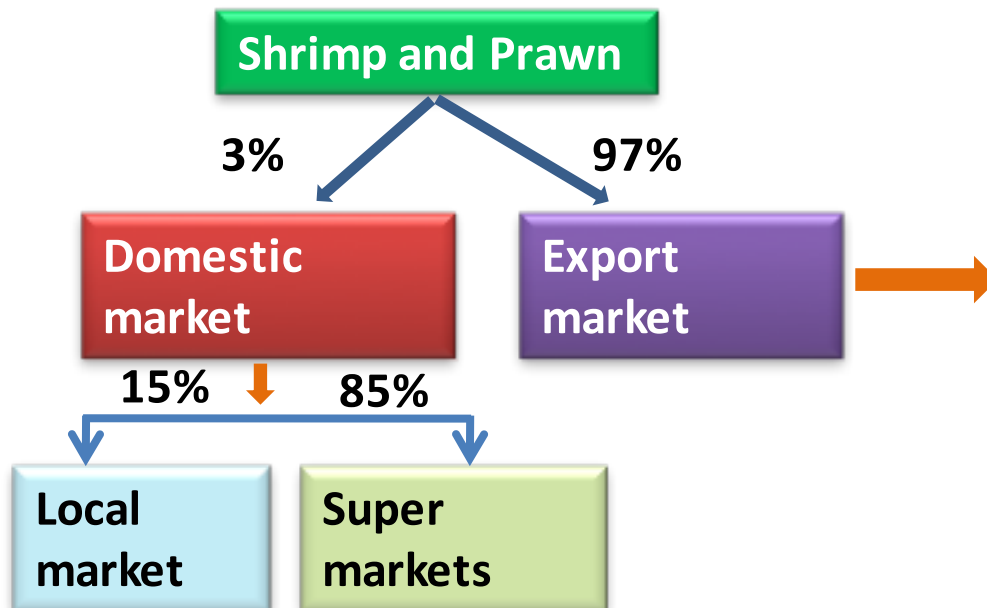


Fig. 4: Major Export destination in 2012-2013 FY

(Source: BFFEA, 2014)

Study area objectives of the present study

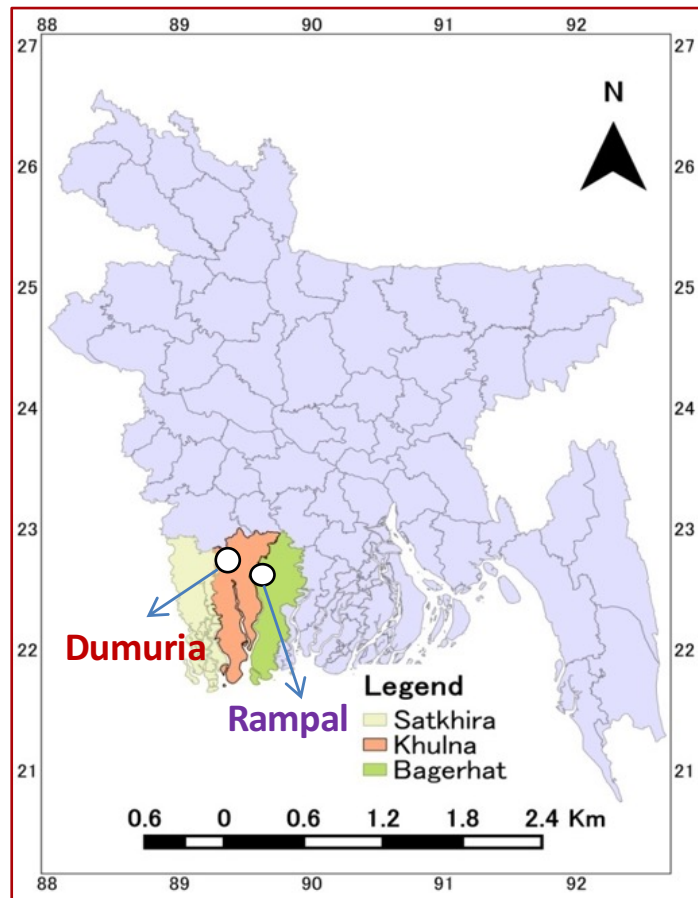


Fig. 5: Shrimp and prawn farming zone in southwest coastal part

*white marks indicate present study areas

Study area: Rampal and Dumuria Sub-district in southwest coastal part of Bangladesh

Objectives:

1. Assess the impact of shrimp farming and prawn-rice farming on local environments and livelihoods
2. A comparative study between Rampal sub-district and Dumuria sub-district to Justify the impact of shrimp and prawn rice farming
3. Cost-benefit study of three major crops i.e., shrimp farming, prawn-rice farming and rice farming to find their economic suitability as well as to find a conclusion of the study

Data collection and data source

Both primary and Secondary data were collected

Data types	Specific fields	Data source	
		Primary Data	Secondary Data
Environmental	Soil salinity	Laboratory analysis (240)	Soil Resource and Development Institute
Economic	Crop production		Department of Agriculture Extension
	Livestock		Department of Livestock
	Shrimp and prawn farms		Department of Fisheries
	Cost-benefit (different farming types)	Questionnaire survey (90)	
Social	Livelihoods and Income	Questionnaire survey (50)	
	Homestead forest		Statistics Department
	Social facilities (education, sanitation, recreation etc.)	Questionnaire survey (50)	

* Parentheses indicates the sample numbers

Major findings

Study area 1: Rampal Sub-district (*Shrimp farming zone*)



Fig. 6: Map of Rampal Sub-district with union boundaries

Total Upazila area: 27,644 ha

Total cultivable land: 20,718 ha

Present shrimp farm area: 14,877 ha

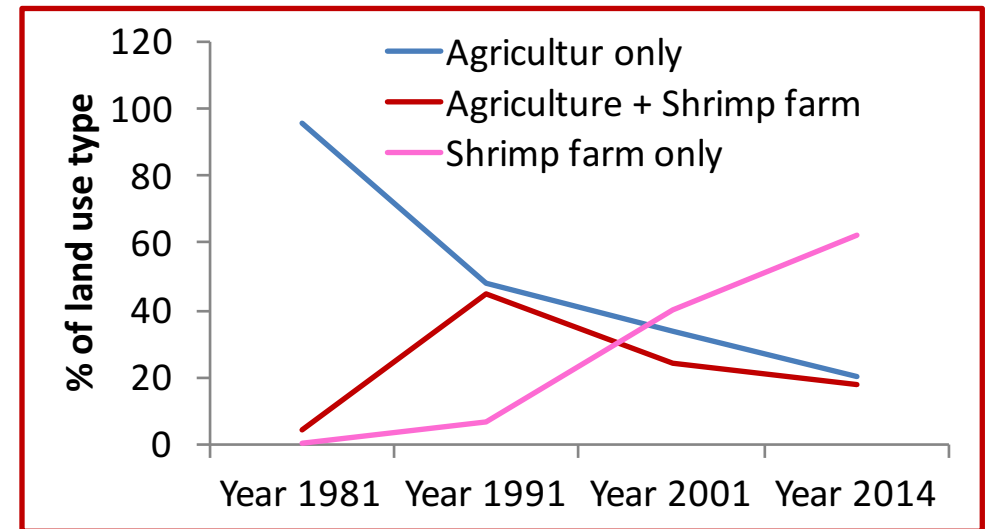


Fig. 7: Changes of land use pattern in **Rampal** over last three decades

(Source: DAE & DoF, Rampal , 2014)

Salinity intrusion in Rampal Sub-district

- From 1980, Shrimp farming gradually increasing soil salinity
- Recent laboratory analysis confirmed that, Soil salinity is still increasing
- Land are becoming unsuitable for crop production at all

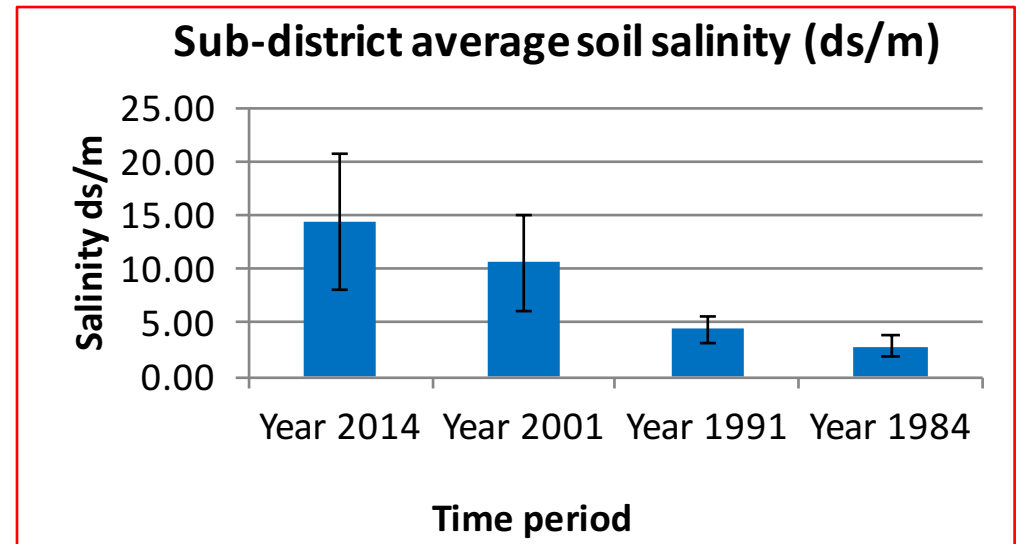


Fig. 8: Trend of increasing sub-district average soil salinity over time

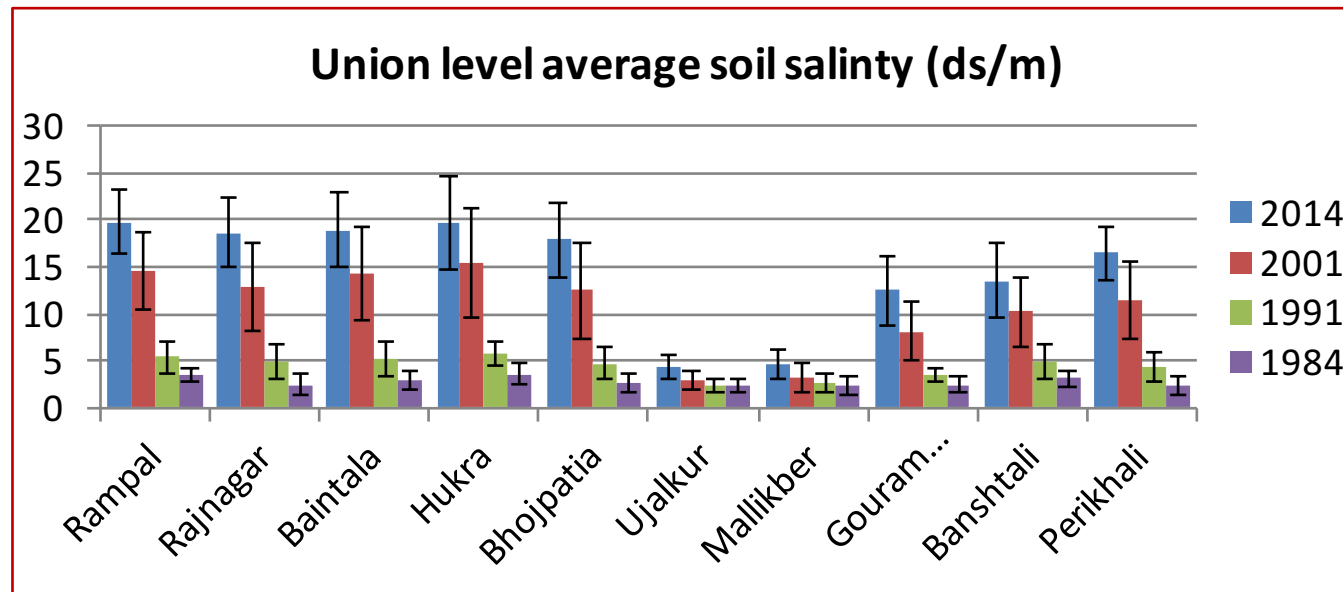


Fig. 9: Union level average soil salinity at different time periods

Study area 2: Dumuria Sub-district (*Agriculture and freshwater prawn farming zone*)

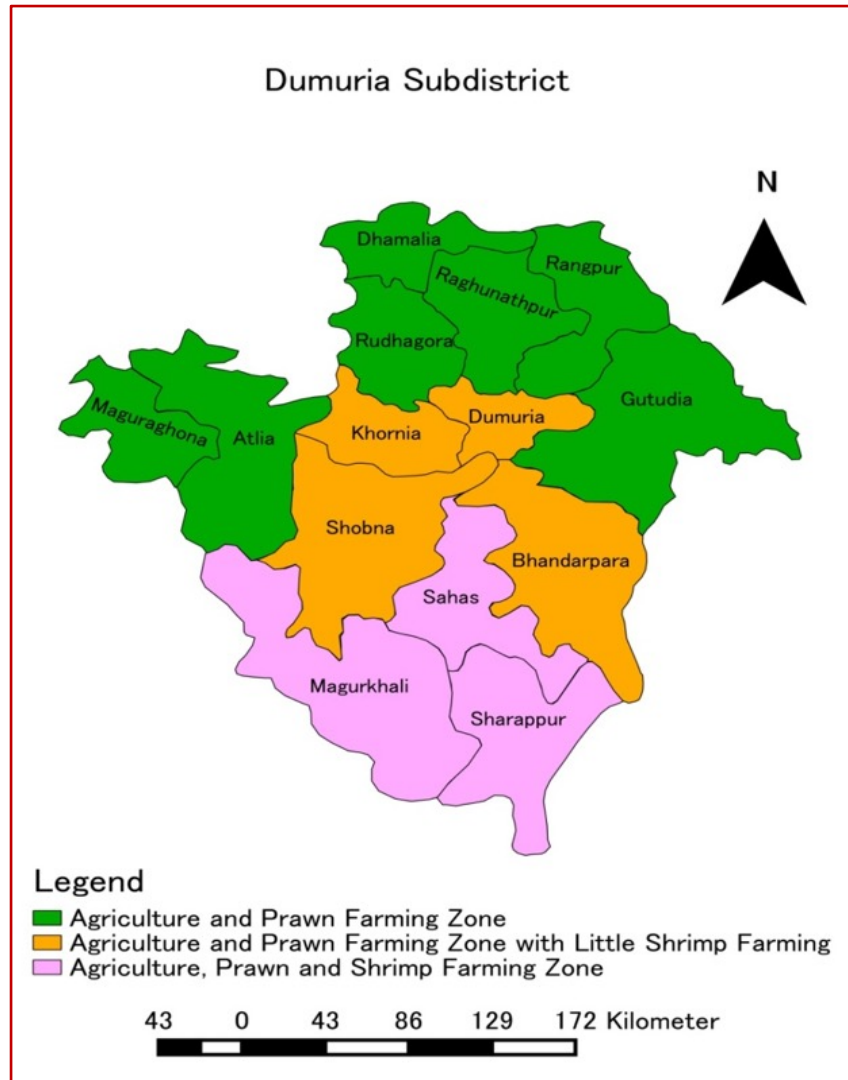


Fig. 10: Map of Dumuria Sub-district with union boundaries

Total Upazila area: 44,797 ha

Total cultivable land: 34,873 ha

Prawn farming area: 8,226 ha

Shrimp farming area: 5,855 ha

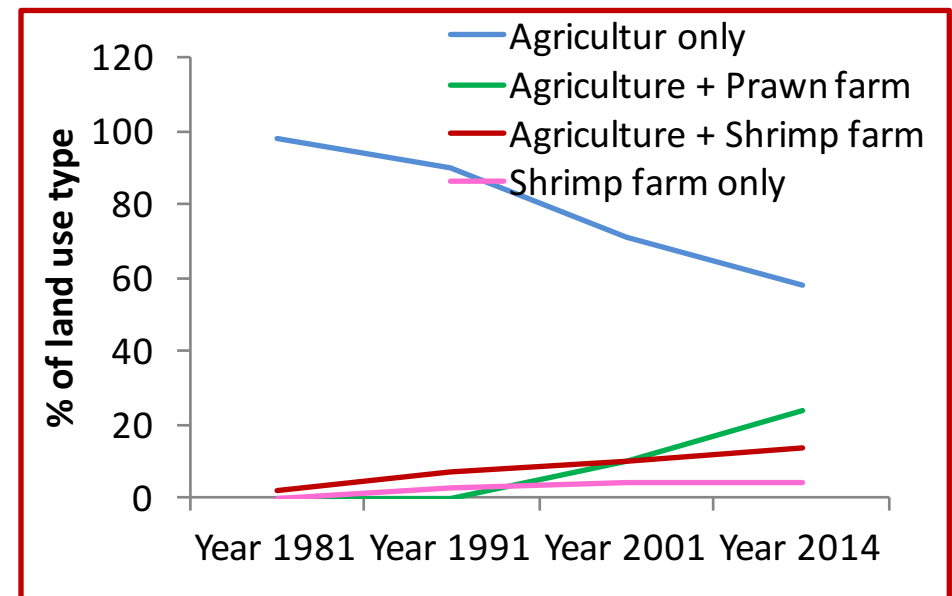


Fig. 11: Changes of land use pattern in Dumuria over last three decades

(Source: DAE & DoF, Dumuria, 2014)

Soil Salinity in Dumuria sub-district

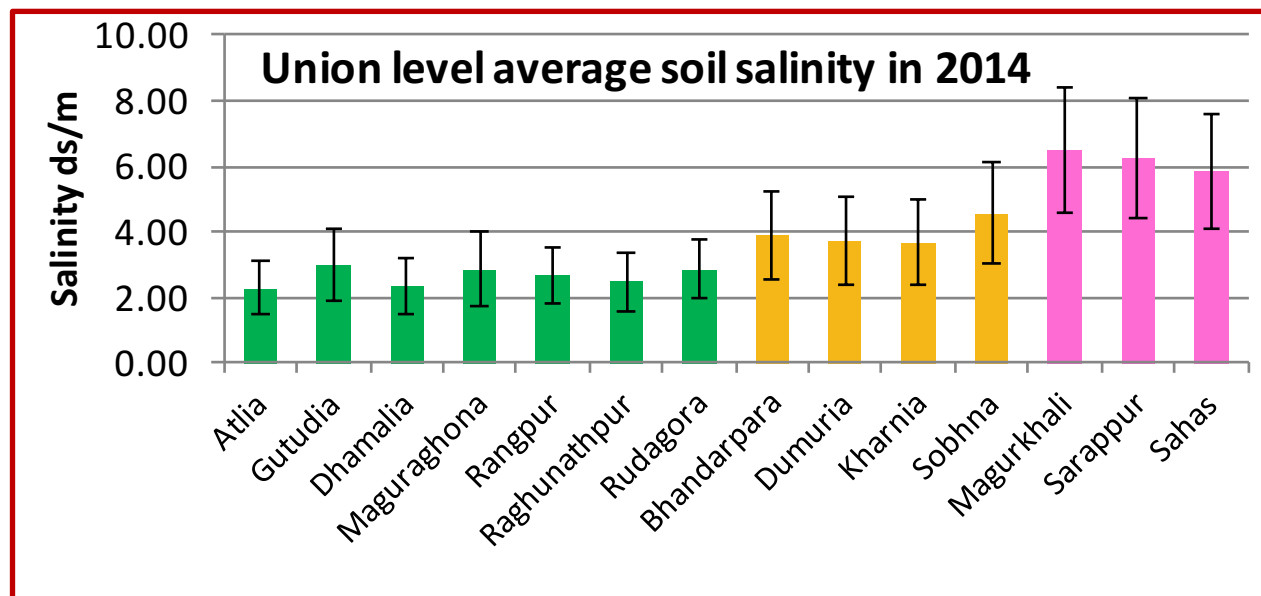


Fig. 12: Union level average soil salinity in Dumuria sub-district (Source: Field survey 2014)

10 unions (Soil salinity <math>< 4</math> ds/m)

- at acceptable limit for all types of crops production

4 unions (Soil salinity <math>< 8</math> ds/m)

-salinity tolerant varieties grow well

In 1981: 34,360 ha

In 2014: 32,016 ha

Single crop land: 5,140 ha

Double crop land: 22,785 ha

Triple crop land: 4,092 ha

(Source: DAE, Dumuria, 2014)

Comparative study between two sub-district

A. Crops production

- Input material used:
 - Seed,
 - Fertilizer,
 - Pesticidewere found similar in both sub-districts

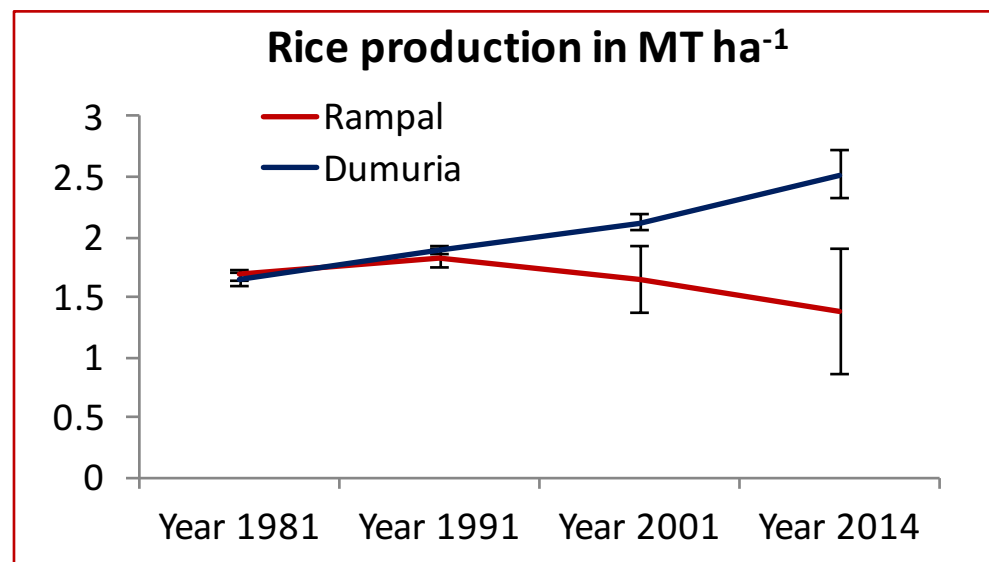


Fig. 13: Rice production trend over last three decades

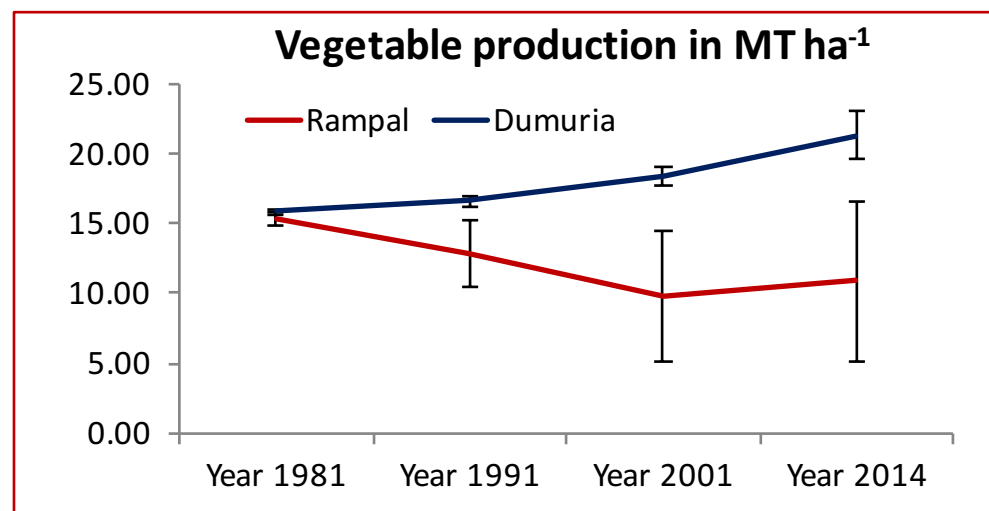


Fig. 14: Vegetables production trend over last three decades

(Source: DAE, Rampal and Dumuria, 2014, Field survey, 2014)

Relationship between soil salinity and rice production in 2013-14

Soil salinity > 8 ds/m significantly reduce rice production (DAE, Rampal, 2014)

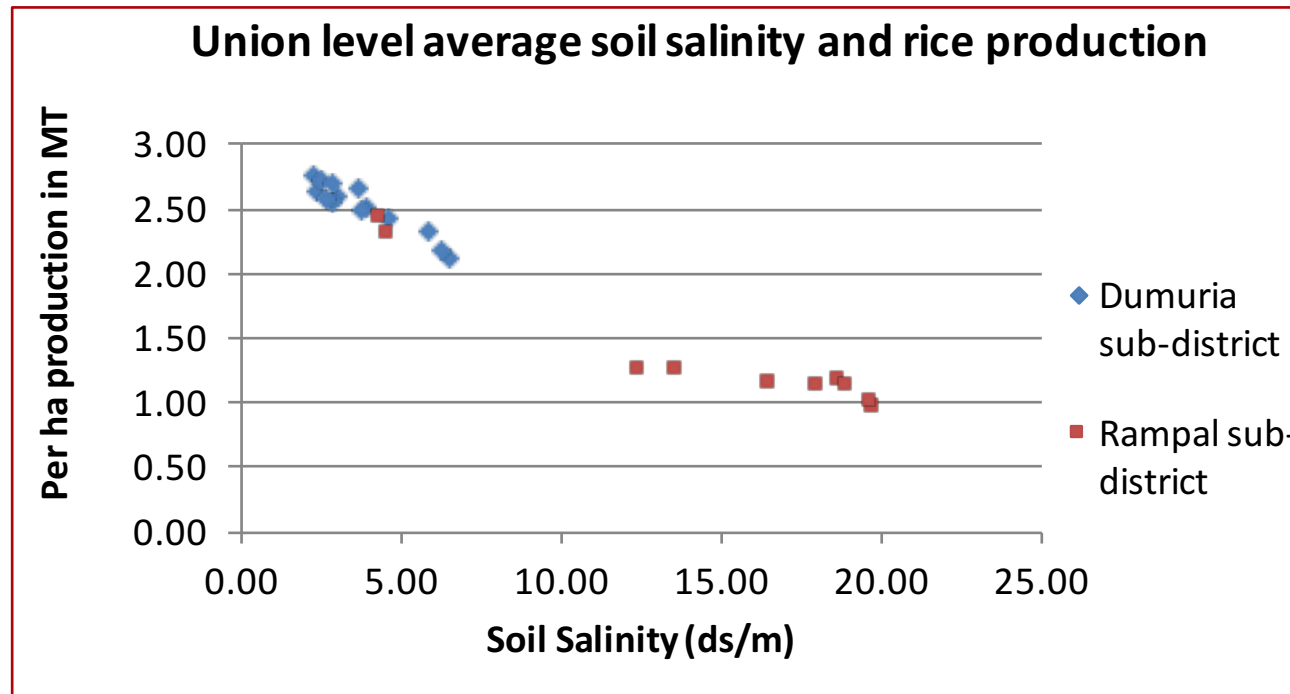


Fig. 15: Correlation between soil salinity and per ha rice production

(Source: DAE, Rampal and Dumuria, 2014, Field survey, 2014)

B. Livestock and poultry

Two major causes are:

- Reduction of grazing fields
- Scarcity of fodder (due to loss of agricultural crop production)

(Source: Department of Livestock, Rampal and Dumuria, 2014)

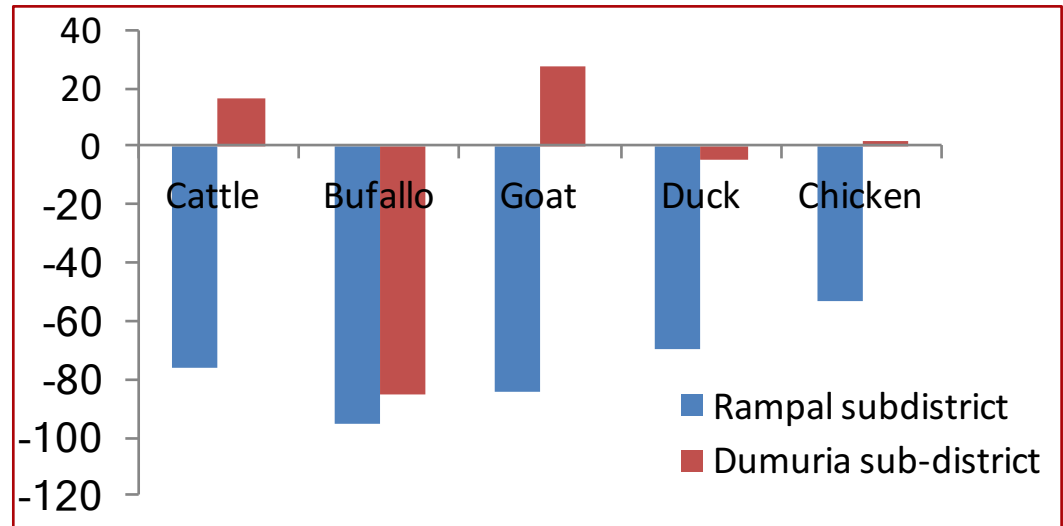


Fig. 16: Percentages of changes of livestock and poultry over last three decades in Rampal and Dumuria

C. Homestead forest with settlement area

Two major causes are:

- Dying due to salinity stress
- Conversion into shrimp farms

(Source: Department of statistics, Rampal and Dumuria, 2014; DAE, 2014)

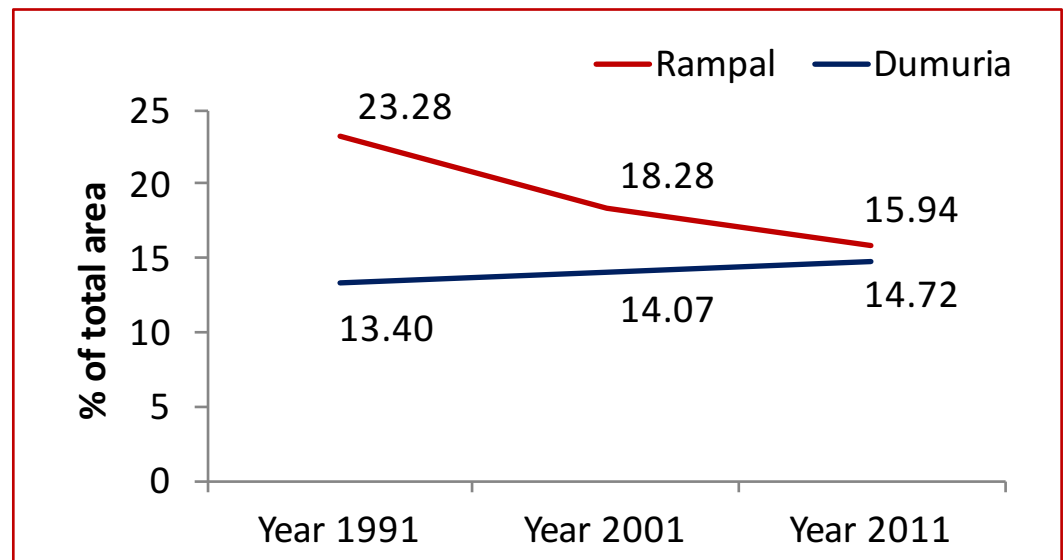
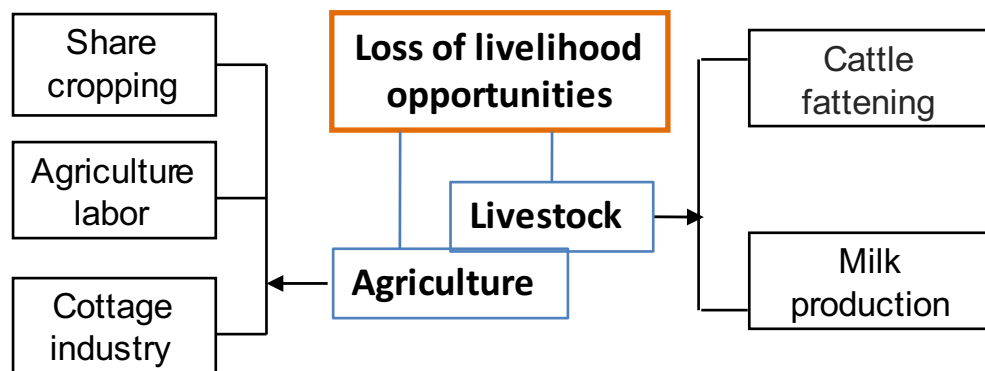


Fig. 17: Changes in homestead forest area over last two decades in two sub-districts

D. Impacts on livelihoods: marginal and landless farmers

In Rampal, shrimp farming ceased the livelihood options are:



New livelihood options:

Shrimp farming	16%
Collection of shrimp and prawn PL	20%
Seasonal labor force	12%
Rickshaw van pulling	24%
Others	20%

Lower grade and low paid

In Dumuria, besides traditional livelihoods, prawn-rice farming -- involved large number of marginal farmers in this sector:

Prawn-rice farming	20%
Labor in prawn farms	16%
Sharecropping	28%
Agriculture labor	12%
Cottage business	16%
Livestock rearing	8%

Diversity of income generation sources

Sub-districts	% of marginal household			
	More than 3	Triple	Double	Single
Rampal	0	12	32	56
Dumuria	28	60	12	0

(Source: Field survey 2014)

Household income and access to social facilities

Major income source of family members--

In Rampal:

- Larvae fishing
- Part time work at shrimp depot
- labor force at different sector

In Dumuria:

- livestock rearing
- cottage business
- agriculture labor
- labor at prawn farms and depots

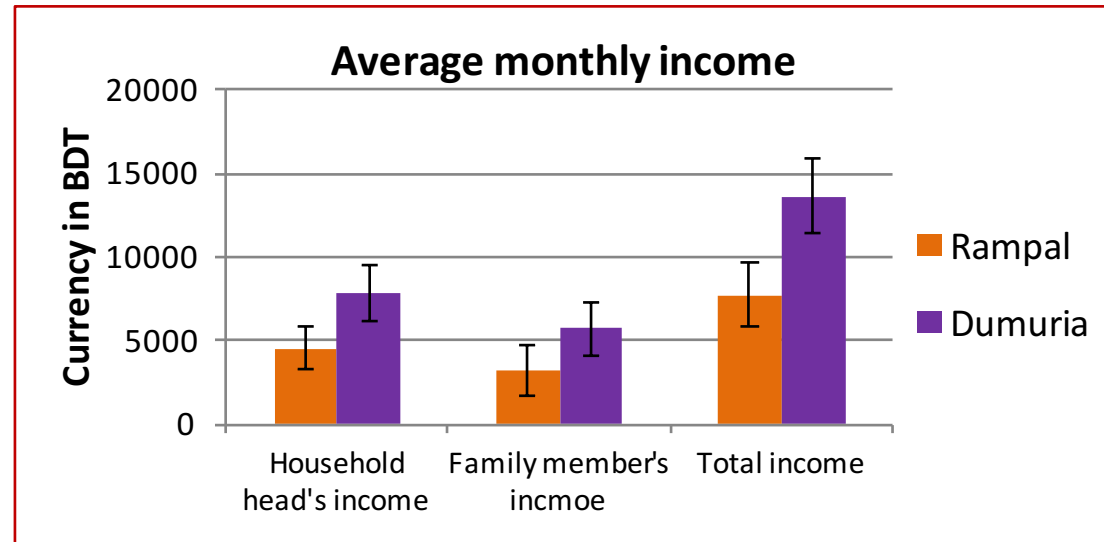


Fig. 18: Monthly average income of marginal and landless households in two sub-districts

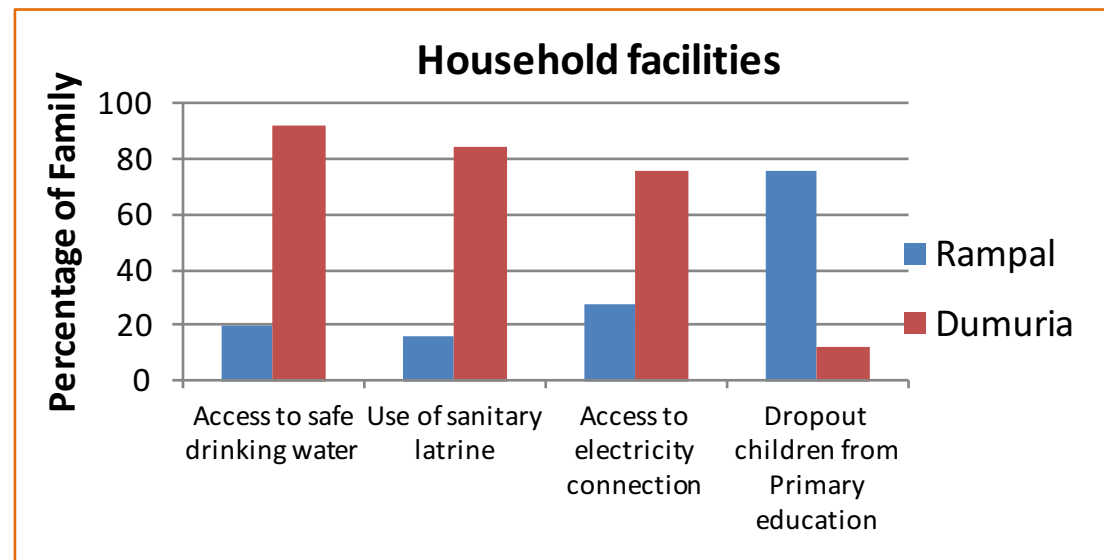


Fig. 19: Differences of availing social facilities by marginal household in two sub-districts

Cost-benefit analysis of three different crops

Farm size:

- Prawn farms are small, because:
 - Per unit production cost is high
 - mostly operated by small and medium scale farmers (84%)
 - convenience of management

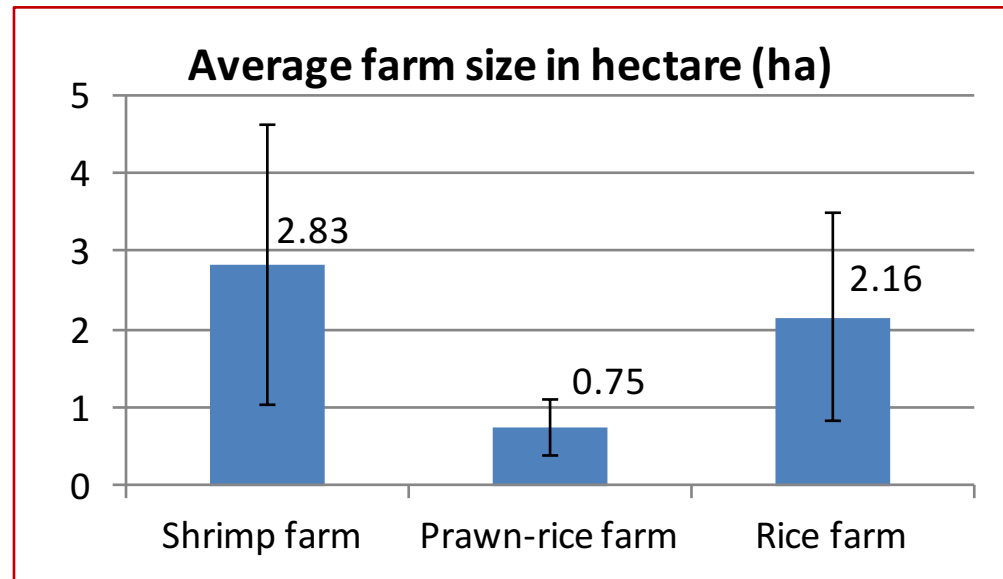


Fig. 20: Average farm size of different farming types

Production cost:

- Production cost of prawn farm is high:
 - very high price of prawn larvae
 - require supplementary feed
 - labor intensive

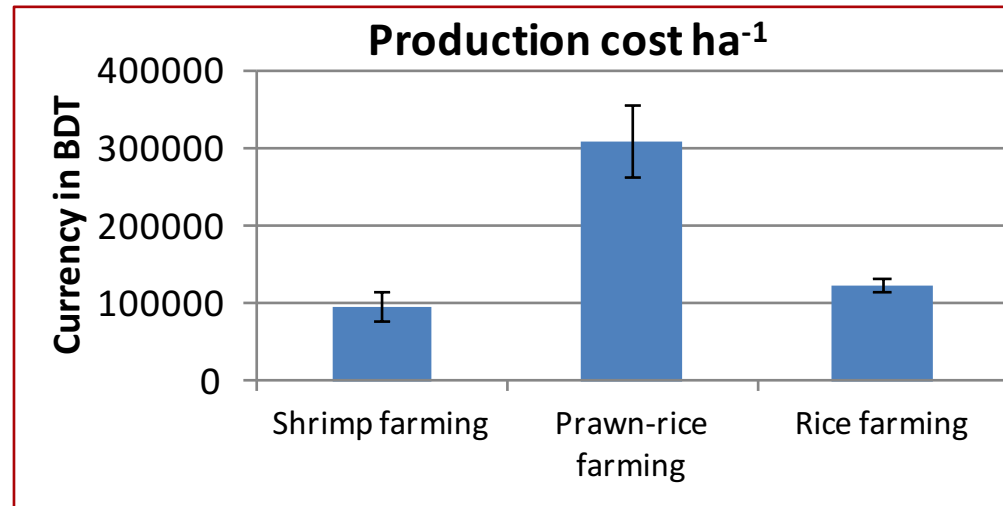


Fig. 21: Production cost of different farming types for one ha farm size

Percentages of breakdown cost

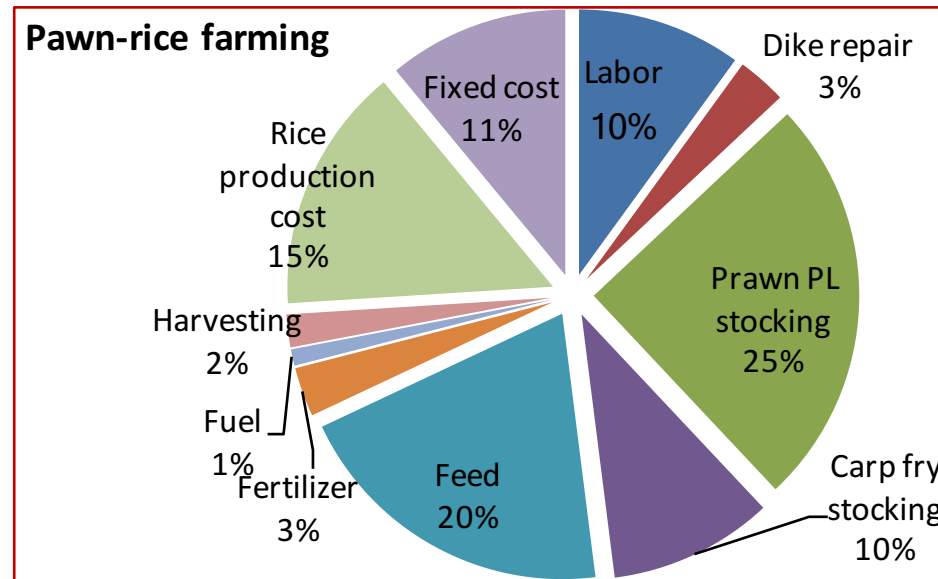


Fig. 22: Item-wise percentages of cost involved in prawn-rice farming

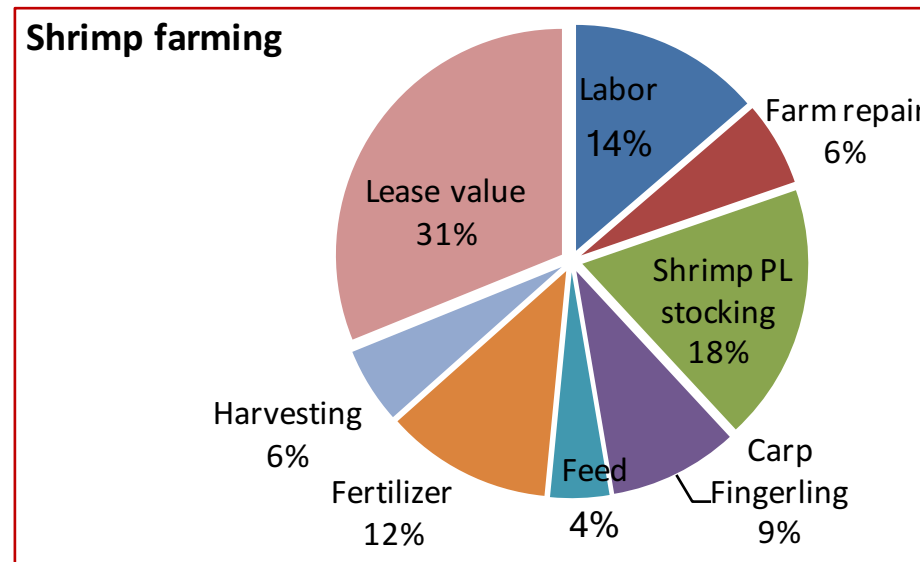


Fig. 23: Item-wise percentages of cost involved in shrimp farming

Correlation of different variables with Net Profit by farming types

Variables		Net profit		
		Shrimp farming	Prawn-rice farming	Rice farming
Farm area		-0.88	-0.56	0.22
Material cost	Shrimp/prawn PL number	0.93	0.85	
	Carp fingerling number	0.71	0.63	0.83
	Feed	0.82	0.86	
	Fertilizer	0.73	0.77	
Labor cost		0.54	0.92	0.56
Total production cost		0.94	0.87	0.80

In shrimp farming, minimum to maximum ratio

- for production cost, 2.06 and for net profit 1.96

In Prawn-rice farming, minimum to maximum ratio

- for production cost, 1.82 and for net profit 1.65

The negative correlation between farm size and net profit may be because of-

- Higher amount of input supply
- Intensive management
- operated by lease holders

Net Present Value and Benefit-Cost Ratio of different farming systems

For calculation of NPV

Time period considered: 10 years

Rate of interest considered: 10%

Initial establishment cost:

Rice farming system: BDT 0.00

Shrimp farming system: BDT 101,400

Prawn-rice farming system: BDT 126,750

Higher BCR in shrimp farming:

more profitable in terms of quantity of cost involved

But, Higher NPV in Prawn-rice farming

more profitable in terms of capacity of net earning from per unit area

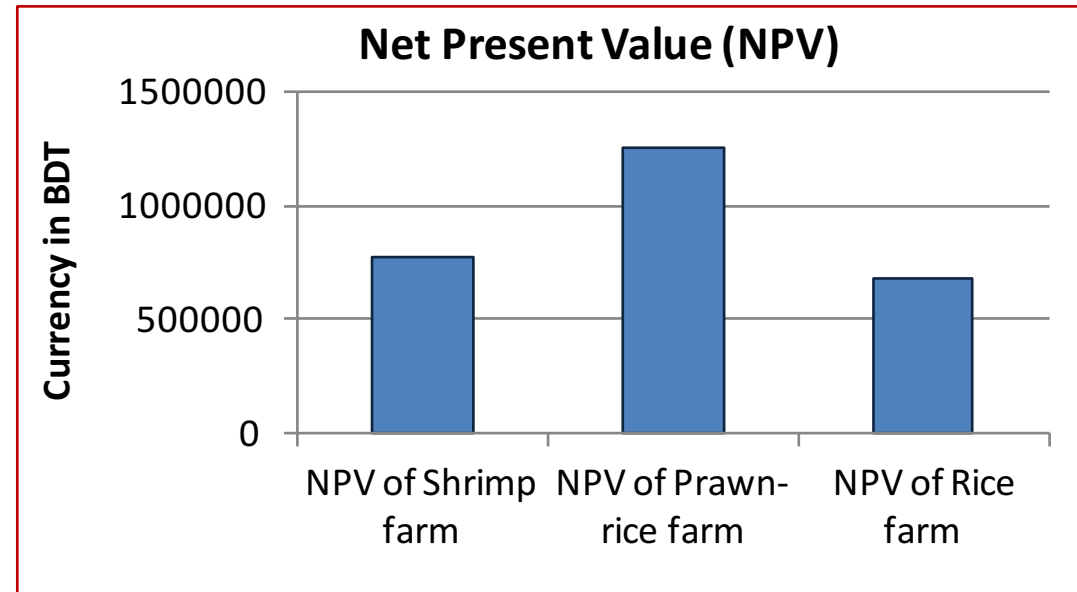


Fig . 24: NPV of different farming types

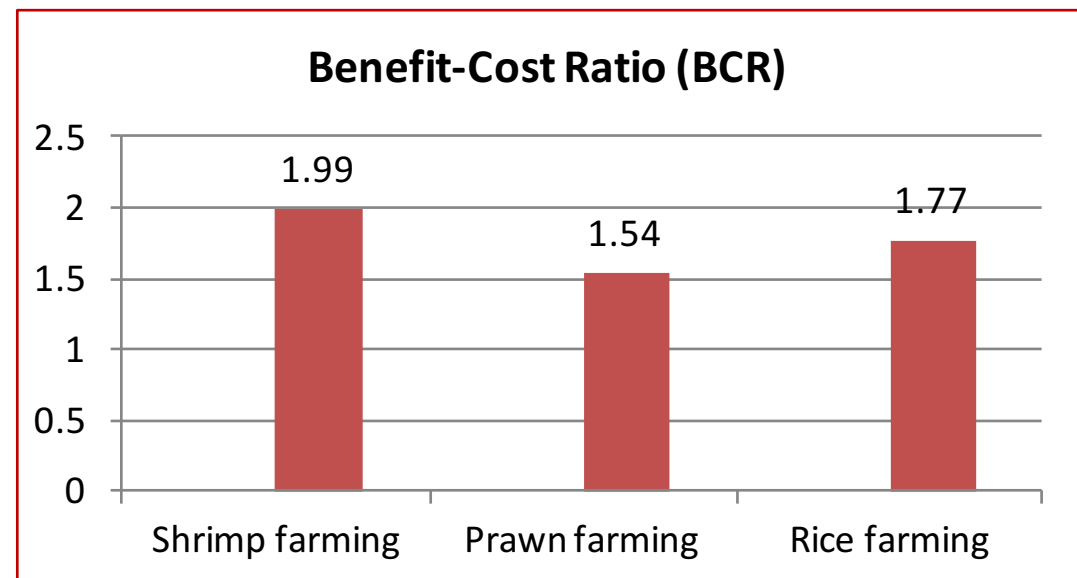
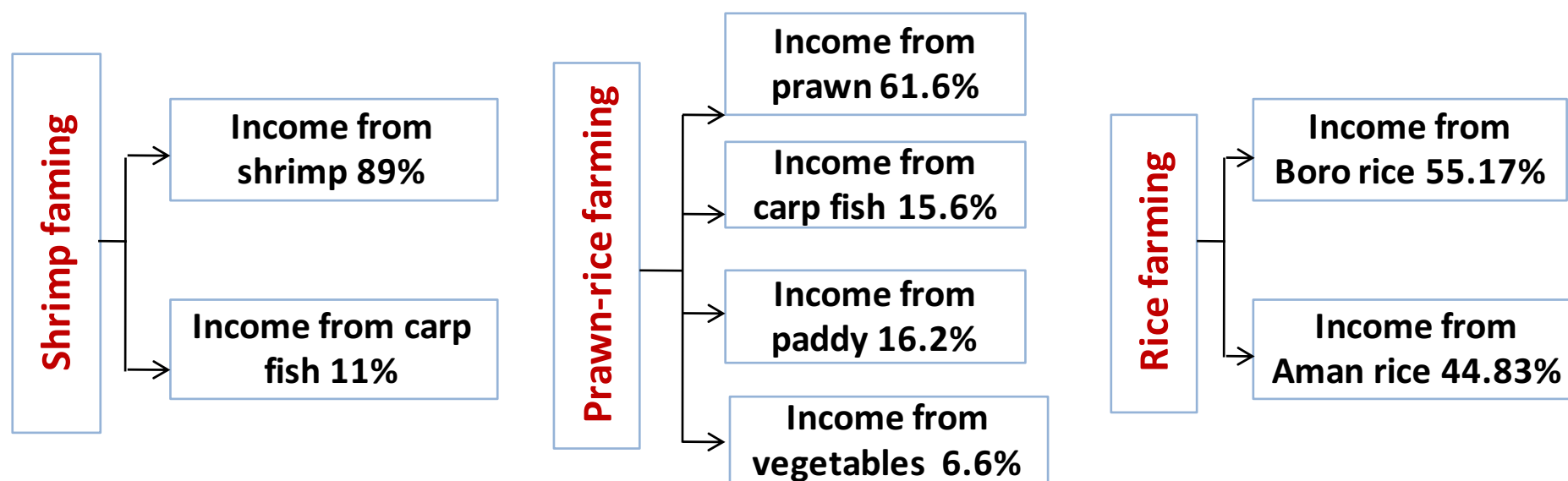


Fig . 25: Discounted BCR of different farming types

Risk avoidance opportunity

Two major type of risks are associated with shrimp, prawn and rice production

1. Casualty risk (disease, mortality, flood, heavy rainfall and drought, pest attack)
2. Price risk (production, stock, demand of product in national or foreign market)



In Bangladesh, there is no insurance policy in crop production sector

So it is important for farmers to have an opportunity to avoid the risk

Despite lot of positive approaches, expansion of prawn farming mainly hindered by:

**High
production cost**

Shrimp farming:

Total production cost BDT 94,811 ha⁻¹

Price of Post larvae BDT 500/thousand

No use of supplementary feed

Average labor count 53 man days

**Intensive
management**

Prawn-rice farming:

Total production cost BDT 307,816 ha⁻¹

Price of Post larvae BDT 4000/thousand

Require supplementary feed, 1750 kg ha⁻¹

Average labor count 152 man days

Action needed for promotion of prawn farming

Establishment of adequate hatchery

Production of low cost feed

Provision of soft loan for farmers

Transfer of technology by extension services

Demarcation of suitable shrimp farming areas by land zoning programs

Awareness building among the locals

Conclusion:

- **The findings clearly indicates that, shrimp farming is significantly increasing soil salinity and negatively impacting the local environments**
- **Shrimp farming is also resulting in loss of livelihoods of marginal famers, reducing their income level and capacity of availing fundamental social facilities.**
- **Prawn-rice farming on the other simply voids salinity related controversies and also creates larger livelihoods opportunities for marginal people.**
- **Cost-benefit study also proves prawn-rice farming as more profitable venture than other framings, but the prime draw back is high production cost**
- **Proper institutional arrangement (credit support, production of low cost feed and seed, extension services etc.) can inspired farmers to adopt prawn-rice farming instead of shrimp farming.**
- **More attention is needed in this sector not only to earn foreign exchange but also to create a healthy environment with elevated income level of the locals.**

Thank You