COMMUNITY BASED RISK MANAGEMENT AND GOVERNANCE OF CLIMATE SENSITIVE AQUACULTURE FARMING: A CASE OF VEMBANAD WETLAND, INDIA

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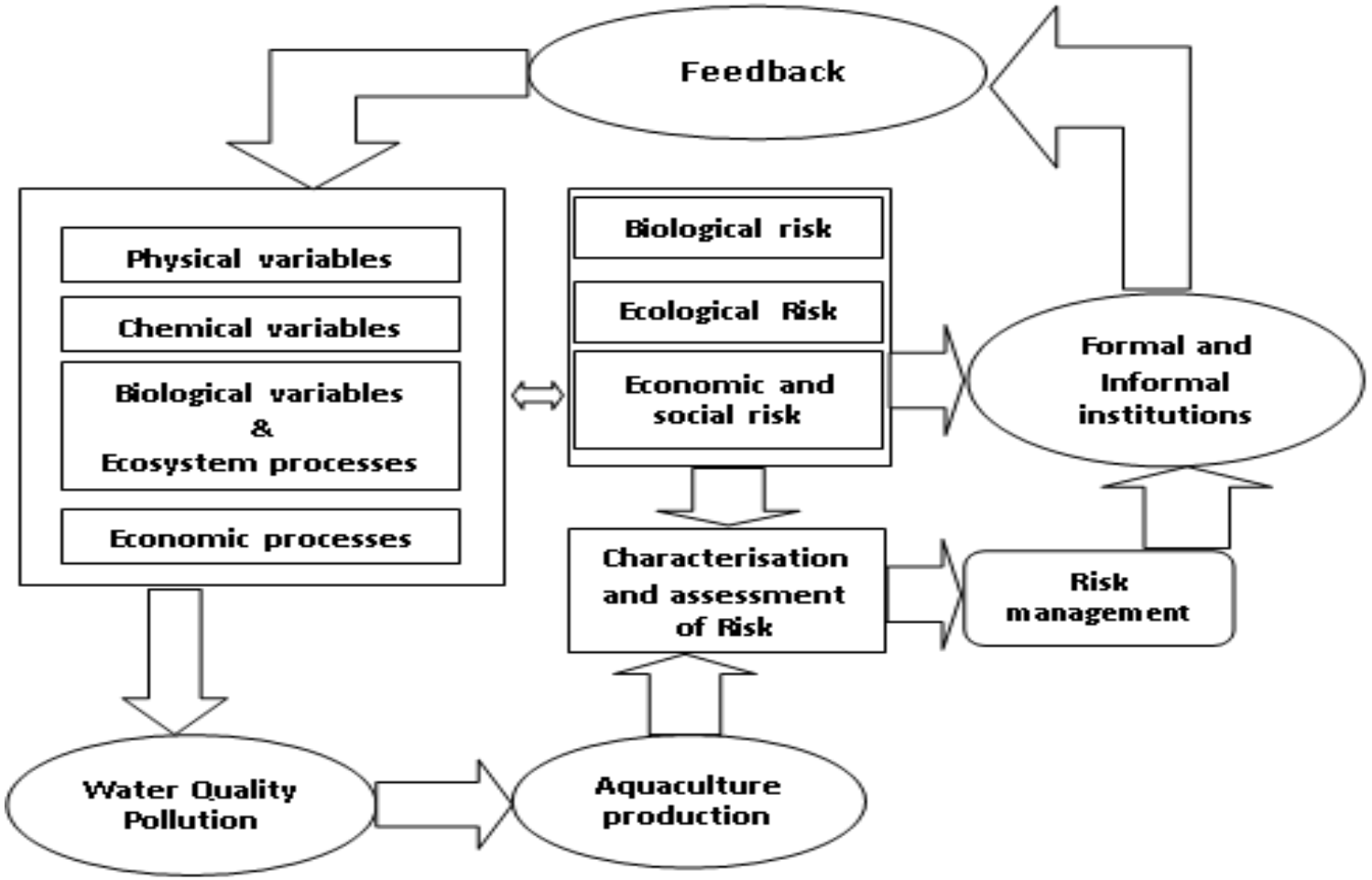
Introduction

- Efforts to combat climate variability,pollution,resource degradation and adapt to its effects is the major challenge human race is facing this century.
- The effect of these changes on food production is increasingly getting reported from worldwide.
- Though inadequate and decreasing food production is a reality, yet the cooperative initiatives by small and marginal farmer households from developing countries is under-represented in the sustainable development negotiations.

Objective

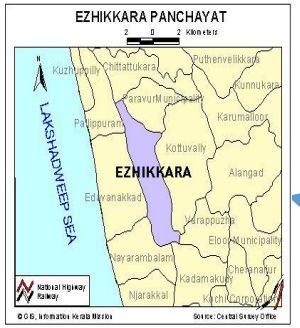
- The objective of this study is to assess the community based risk management strategies adopted by aquaculture farmers along Vembanad lake
- The pertinent institutional interaction in the risk management process

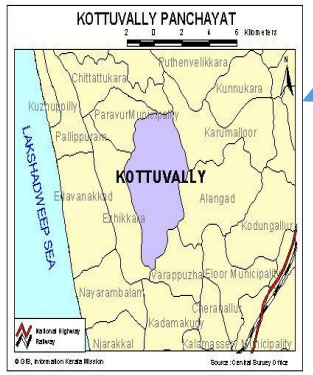
A conceptual framework: Linking Natural science and Social Science (Adaptation from IAD)

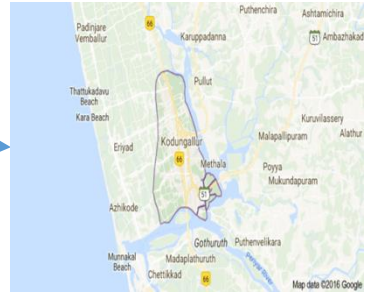


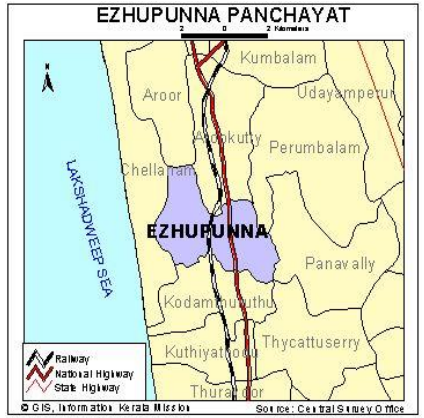
Materials and methods

Study Area- Vemband Kol Wetland









Type of Data-Secondary Data

- Vemband Lake water quality

  Source : Central Pollution Control Board for the period

  Data Type: Published Secondary data

- Vemband Lake Area Farm water quality

  Source : National Centre for Aquatic Animal Health, (extension program) –CUSAT

  Data Type :Un published Secondary data

Type of Data –Primary Data

- Study site selection: Sample aquaculture panchayat within 6 Kms from bar mouth
- Farm based sampling

  Water quality Estimation at farms along six study sites

  Base line survey 2013-2014

  Primary Data Collection: (2014-2015)

  Sample Frame :MPEDA List of Farms

Zone	Panchayat	Total culture area (Ha)	% of area farmed	No of farms sampled	Sample farms (Ha)	% of total cultured farm area
North	Vellangaloor	950	66.2	74	261.5	41.5
	Kodungalore					
Central	Ezhikkara	4852	71.9	73	598.2	17.2
	Kottuvally					
South	Ezhupunna	3447	26.1	75	535.8	59.7
	Thuravoor					

Water quality Variability –Background

Chapter Objective : Water quality variations in Aquaculture farms around Vembanad Lake area

Method of Study :

- Trend analysis for water quality variables Temperature,Salinity, p H,DO ,Ammonia and Nitrite between the period 2000-2012 at Ernakulam,Alappuzha and Thrissur district
- Descriptive statistics on Water quality variables Minimum,Maximum, Mean ,Standard Deviation and Coefficient of Variability
- *CV%= Standard deviation/Mean*100*
- Water Quality Index- Weighted arithmetic index method (Brown, M. N. J., Deininger, & Connor, 1972)

$$WQI = \frac{\sum_{i=1}^{n} Qi * Wi}{\sum_{i=1}^{n} Wi}$$

Research Method -WQI

- *n* represents the total number of parameters,
- Q*i* is the value assigned to parameter *i* after normalization,
- *Wi* is the weight of the parameter (an indicator of its' relative importance for aquatic life/human water use).

WQI	Rating	grading	Color coding
Above- 100	Excellent	A	
76-100	Good	B	
51-75	Poor	C	
26-50	Very poor	D	
0-25	Un suitable	E	

WQI- Vembanad Lake (Aquaculture Farms)

Year	OCT	NOV	DEC	JAN	FEB	MAR	ARL	SEASONAL
2000-2001	74.92	78.12	65.20	69.33	85.12	83.02	97.56	79.34
2001-2002	82.39	86.07	48.62	72.60	86.73	83.23	97.25	79.29
2002-2003	82.55	85.36	47.54	76.72	83.56	77.44	87.03	77.37
2003-2004	61.61	69.75	73.53	78.92	93.03	124.80	104.25	88.48
2004-2005	74.93	70.77	62.53	70.43	85.76	104.40	105.93	81.95
2005-2006	76.95	80.55	78.91	83.93	95.33	122.65	123.59	94.58
2006-2007	81.97	59.29	56.75	84.23	100.52	95.67	111.98	84.49
2007-2008	59.90	54.78	48.51	72.55	86.78	106.75	98.43	75.40
2008-2009	72.92	64.18	62.23	50.38	103.85	91.80	113.98	80.05
2009-2010	60.18	69.48	61.24	80.49	94.49	108.69	109.13	83.48
2010-2011	56.56	57.16	50.81	43.98	81.47	101.57	89.47	68.92
2011-2012	69.57	61.23	57.69	75.89	80.24	109.98	102.09	79.56

WQI- Study Period

Panchayat	WQI	Colour coding
Vellangaloor	75.57	Good
Kodungalore	94.93	Good
Ezhikkara	62.30	Poor
Kottuvally	55.92	Poor
Ezhupunna	45.29	Very Poor
Turavur	49.65	Very Poor

Water quality Hazard

Hazard Effected -Production

Risk Management

To understand the risk management strategies and institutional choices in aquaculture farms

Method of Study :

- Risk management strategies classified based on Holzmann and Jorgensen (2000) and analysed using Mini-Max Indexing Method

$$I_{qc}^{t} = \frac{x_{qc}^{t} - min_{c}(x_{q}^{t})}{max_{c}(x_{q}^{t}) - min_{c}(x_{q}^{t})}$$

- Institutional Choices- Classified following North(1990) and analysed using IAD

Individual risk management strategies to reduce risk

Individual RM Strategy-Reduce Risk	North Zone	Central Zone	South Zone
Pond preparation	0.89	0.53	0.41
PCR tested seeds	0.94	0.94	0.96
Use of medicines & probiotics and chemicals	0.73	0.33	0.41
Construction of water treatment Ponds and Shelter homes for juveniles	0.61	0.55	0.66
Migration	0.27	0.55	0.57
More secure Income source	0.89	0.04	0.44

Individual risk management strategies to Mitigate risk

Individual RM Strategy-Mitigating Risk	North Zone	Central Zone	South Zone
Species diversification	0.34	0.73	0.55
Species distribution	0.87	0.19	0.37
Rapid Removal of diseased species	0.47	0.37	0.59
Diversification in terms of Culture method	0.45	0.04	0.44
Rotational rice-shrimp farming	0.22	0.87	0.67
Rotational fish-shrimp farming	0.00	0.15	0.82
Additional Labor other than house hold labor	0.48	0.75	0.72
Physical structures like Feed trays, aerators, pump sets etc.	0.45	0.44	0.87
Insurance-Tenancy	0.645	0.74	0.595

Individual risk management strategies to Cope with/adapt to risk

Individual RM Strategy-Coping/Adapting Risk	North Zone	Central Zone	South Zone
Sale of assets	0.43	0.94	0.90
Longer Farming Cycle	0.54	0.00	0.69
Early seeding to avoid disease period	0.68	0.86	0.41
Increase access to domestic market	0.23	0.44	0.67

Group Based Risk Management Strategy

Group based RM Strategy-Risk Reducing	North Zone	Central Zone	South Zone
Collective action: Padashekarasamithi	0.41	0.62	0.51
Common property resource management:	0.63	0.63	0.58
Average	0.39	0.62	0.54
Group based RM Strategy-Risk Mitigation			
Aqua club	0.78	0.54	0.57
KAFF	0.54	0.69	0.54
Rotational savings and credit association	0.88	0.21	0.61
Average	0.71	0.45	0.58
Group based RM Strategy-Risk Coping/Adaptation			
Transfers from network of mutual support	0.40	0.51	0.44
Pooling of Water quality Test	0.43	0.66	0.44
Disease surveillance and Reporting	0.54	0.73	0.56
Average	0.49	0.69	0.50

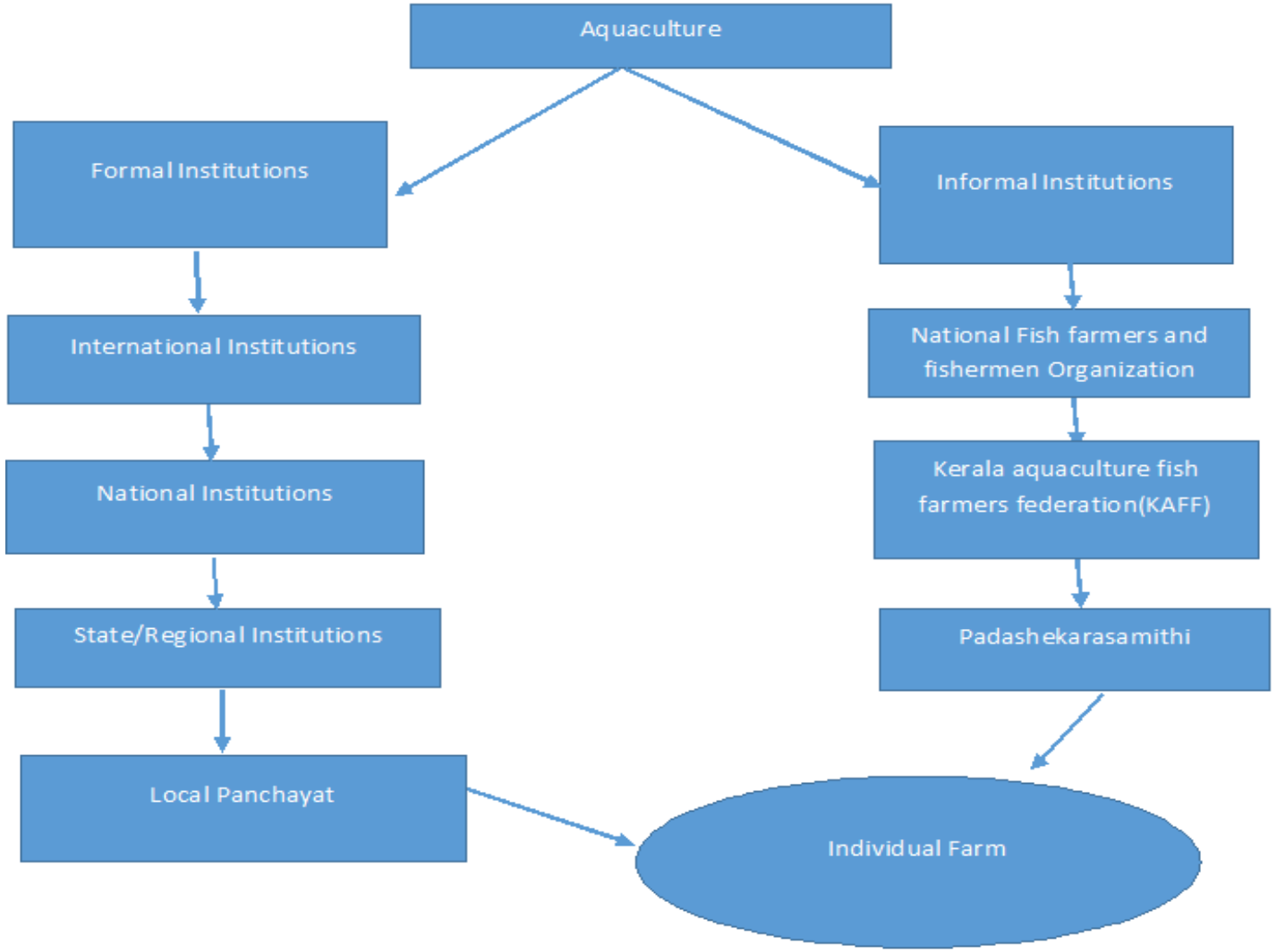
Market Based Risk Management Strategy

Market based RM Strategy-Risk Reducing	North Zone	Central Zone	South Zone
Hatchery driven Intensification	0.63	0.62	0.60
Increased no water/soil quality testing centers	0.60	0.41	0.36
Future auction of produce	0.62	0.39	0.29
Average	0.61	0.47	0.41
Market based RM Strategy-Risk Mitigation			
Micro finance	0.25	0.41	0.50
Market based accident/health insurance	0.41	0.25	0.51
Average	0.28	0.38	0.47
Market based RM Strategy-Risk Coping/Adaptation			
Loan from financial institutions	0.52	0.26	0.19
Technological changes	0.45	0.48	0.69
Average	0.36	0.37	0.42

Publically provided Risk Management Strategy

Publically provided risk reduction strategy	North Zone	Central Zone	South Zone
Environmental Policy	0.34	0.71	0.65
State-sponsored education and training programs	0.49	0.19	0.47
Better access to public road	0.51	0.34	0.40
Average	0.44	0.41	0.50
Publically provided risk mitigation strategy			
Aquaculture extension	0.25	0.58	0.57
Liberalized trade	0.39	0.32	0.62
Average	0.32	0.45	0.59
Publically provided risk coping / adaptation strategy			
Malsya Kerala Padhathi	0.51	0.79	0.62
Publically provided insurance	0.29	0.30	0.44
Social assistance for Dyke construction	0.38	0.46	0.54
Average	0.39	0.51	0.53

Institutional Choices for Risk Management



Institutional Analysis -Case

- Case 1 – Vellangalore Cheppu Chira Breaking(Aquaculture Vs Agriculture)
- Case 2- Fish Bund (Aquaculture Vs State)
- Case 3- Andakaranazhi Barrier(Aquaculture Vs Industry)

Institutional Position

Panchayath	State	Industry	Community
Vellangaloor	Remove Bunding	Scientific Farming	Demand Risk Communication
Kodungalore	No Action	Scientific Farming	Against Bunds
Ezhikkara	Subsidised Seed	Hatchery driven Production	Collective action
Kottuvally	Subsidised Seed	Hatchery driven Production	Collective action
Ezhupunna	Partial withdrawa	Sea Food Industry	Legal Case
Thuravoor	No Action	Sea Food Industry	Change Technology

Findings - role of institutions in risk management

- The most prominent Individual risk management strategy are PCR tested seeds ,usage of Feed trays , and early seeding to avoid disease period ,informal insurance .

- The most prominent group based risk management strategy adopted are collective action, aquaclub and pooling water quality tests

- The most prominent market based strategy adopted are hatchery driven intensification , future auction of produce

- The most prominent publically provided risk management strategy are education and training programs and Subsidy
- Institutional analysis shows Community is collectively strong or group strategy is strong in Ernakulam district while , Individual strategy is strong in Thrissur and industry is strong at Alappuzha

summary and conclusion

- The study recommends that the aquaculture policies should reorient the focus of institutional interventions and reforms by considering the risks in social production.
- The present system of enforcement is not delivering the required economic incentives to manage risks and uncertainties in aquaculture. Till then, the study cautions, that the social and environmental crisis generated by water quality deteriorations will continue to exist.
- Environmental policies should therefore focus on institutional reforms to transform aquaculture systems to sustainable pathways of development.

Please send your comments - rosewinejoy@yahoo.com/rosewinejoy@presidencyuniversity.in