

Theme 5: Counting and discounting: Men's and women's work in fisheries and aquaculture

TS 531: Gendered Efficiency and Profitability in the Dry Fish Sector: A Comparative Analysis of Women and Men Processors in Coastal Tamil Nadu

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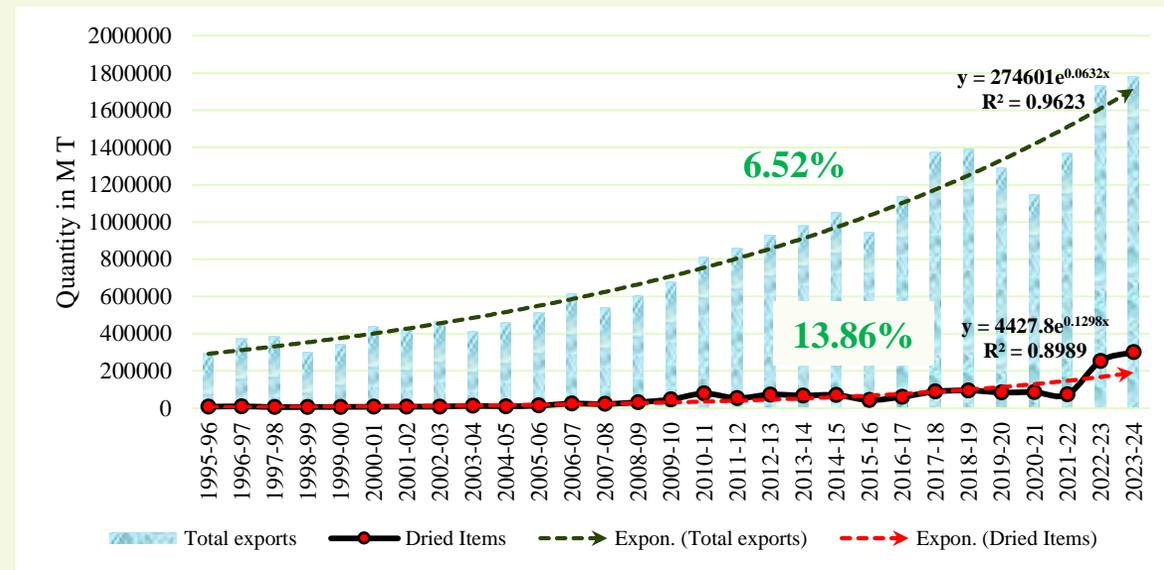
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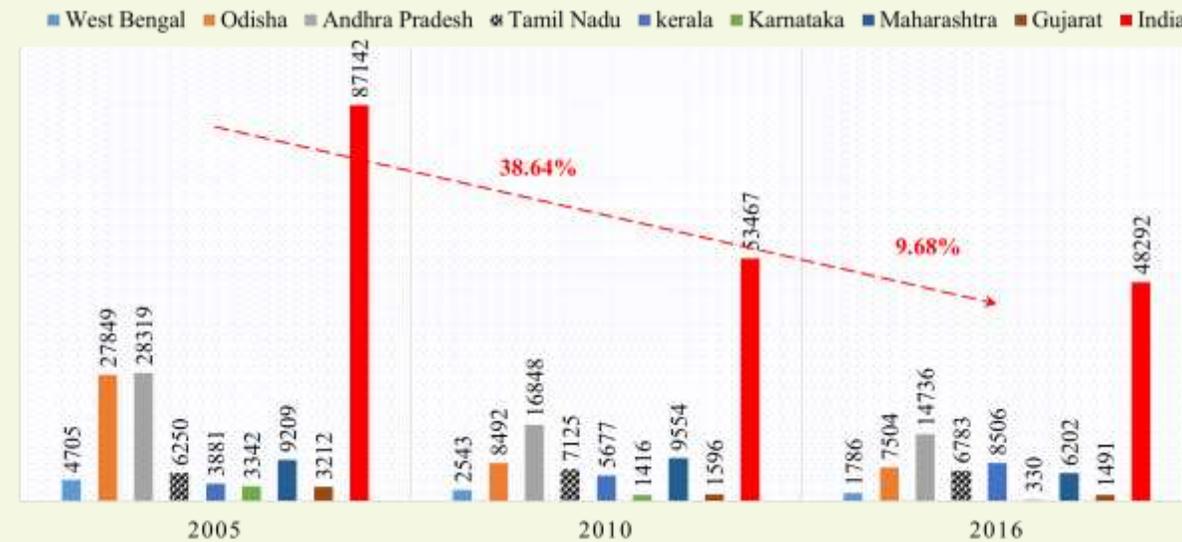


Background

- ❖ Traditional, cheapest & culturally rooted
- ❖ India has exported **3,00,966 MT (\$ 496.21 million)** of dry fish during 2023-2024
- ❖ Average share of dry fish to total exports is **5.38 %**
- ❖ India is the *2nd largest fish producer globally & 17% of the total catch is used for drying*, which is higher than the *global average of 12%*
- ❖ **Employment** for millions of people, particularly women, and attracts greater demand during the **ban/lean period**
- ❖ In the bustling dry fish sector, **women are omnipresent**, hauling, drying, sorting, and selling, yet their contributions often go unrecognised

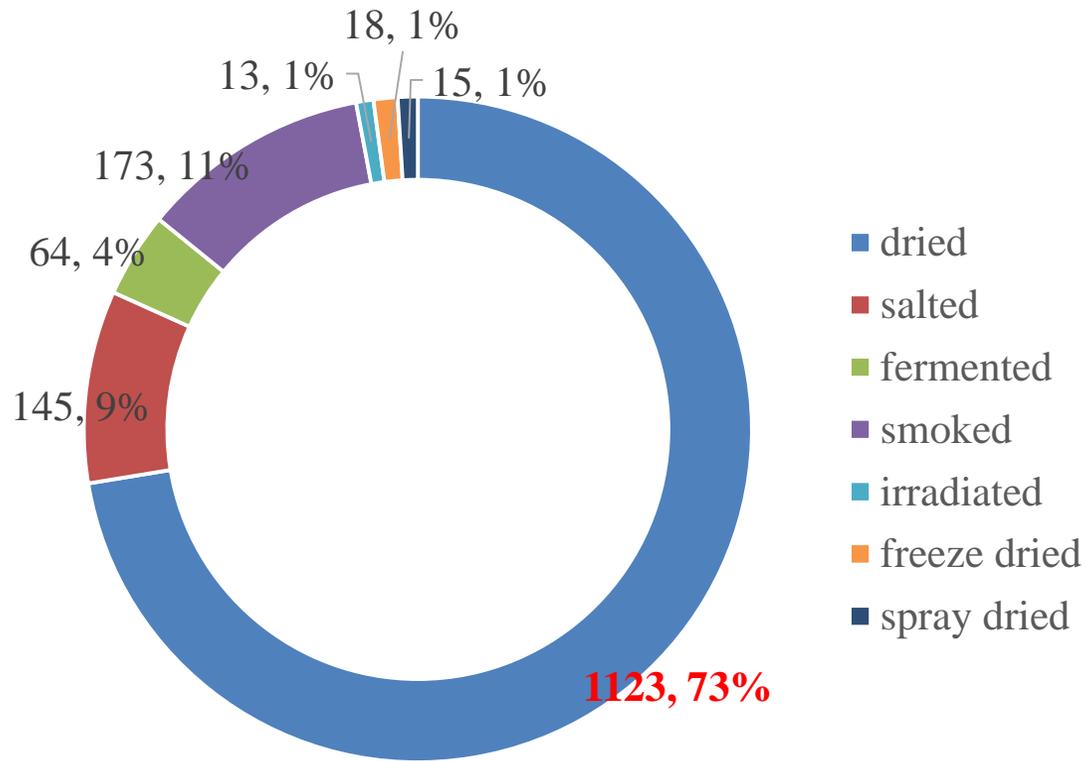


Export of dry fish and total exports from India



DFP population from 2005 to 2016

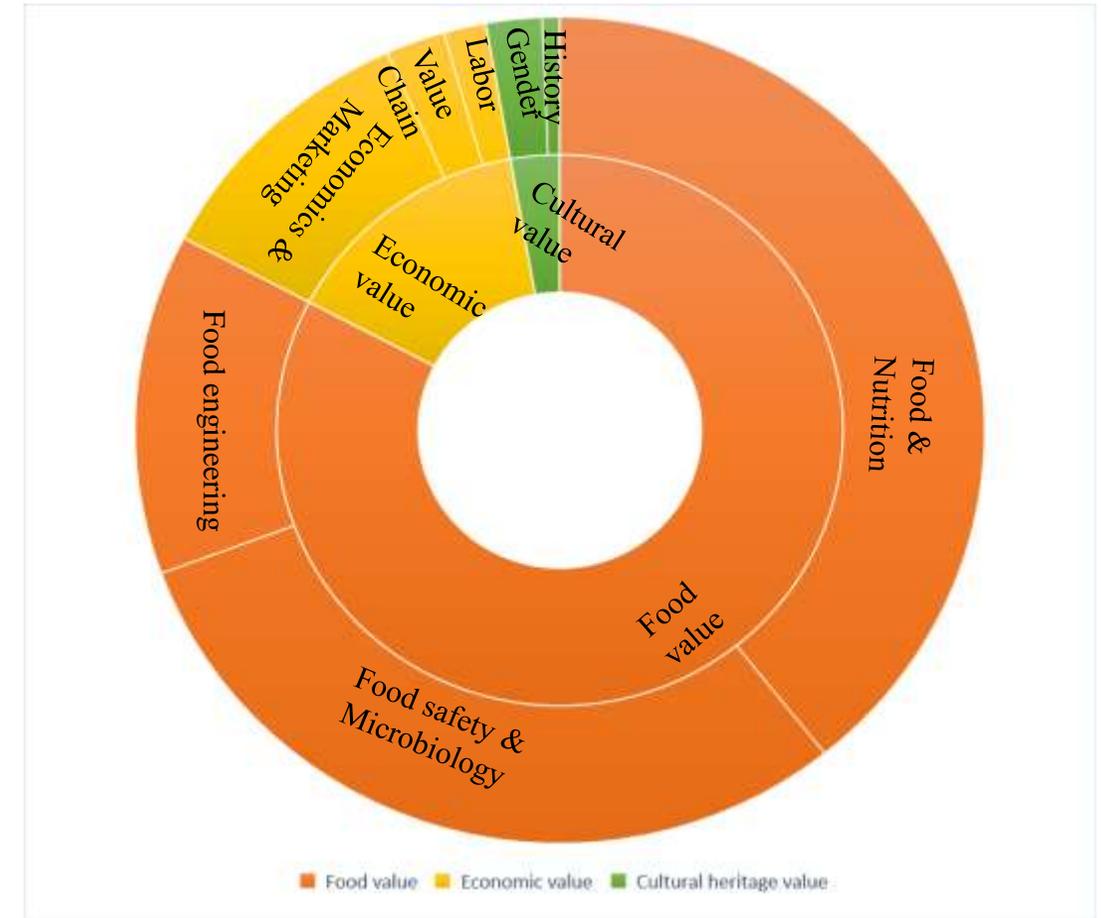
Review of Literature



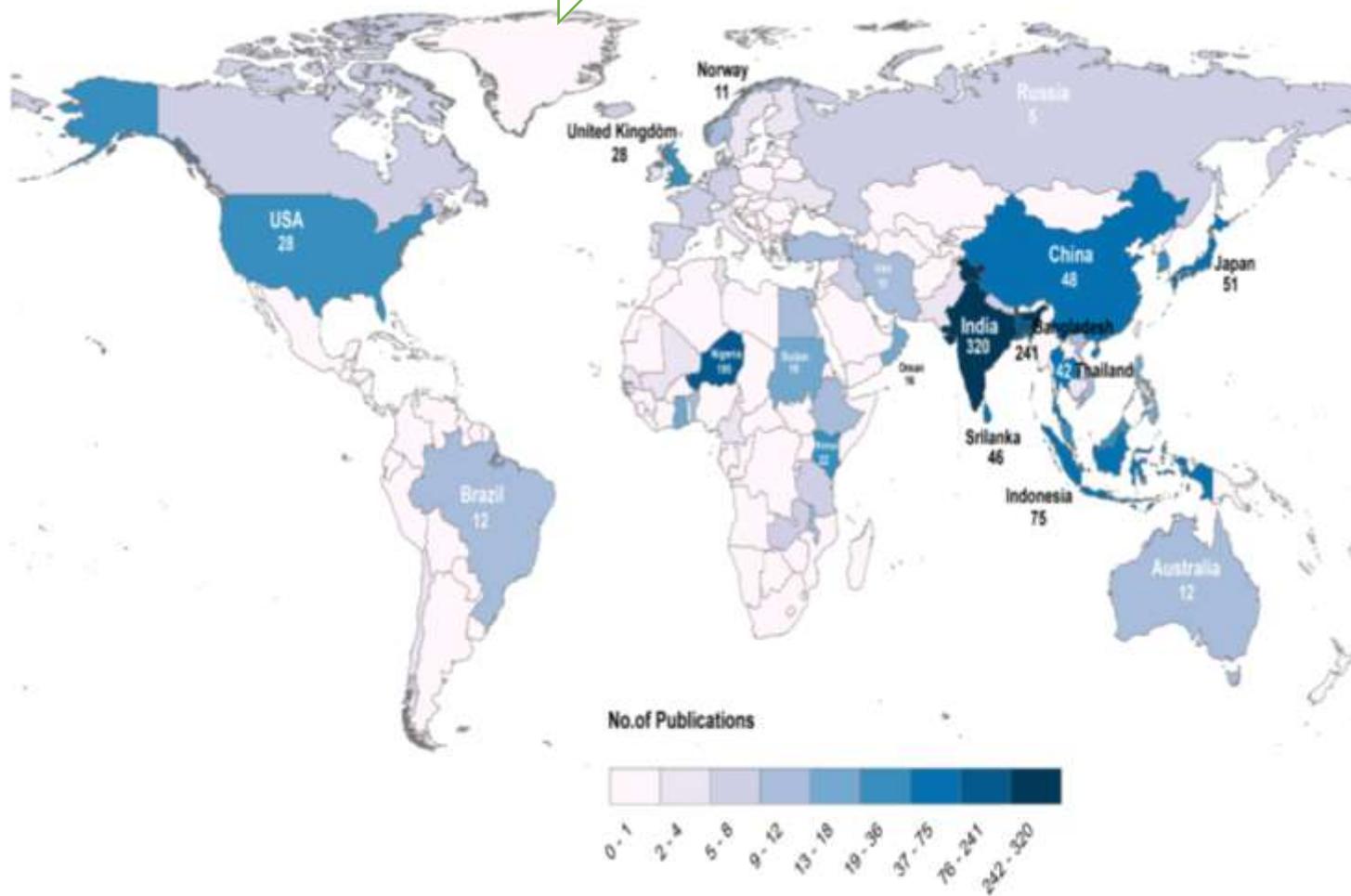
- **Food value** with 1242 (83%), economic 218 (14%) and cultural heritage value 42 (3%)
- **Food and Nutrition** has the highest number of articles (590 - 39.28%)
- Food safety and microbiology has 452 articles (30.09%)
- Food engineering has 200 articles, (13.32%)

Thematic areas within “Dry fish” from 1990 to 2022

n= 1502

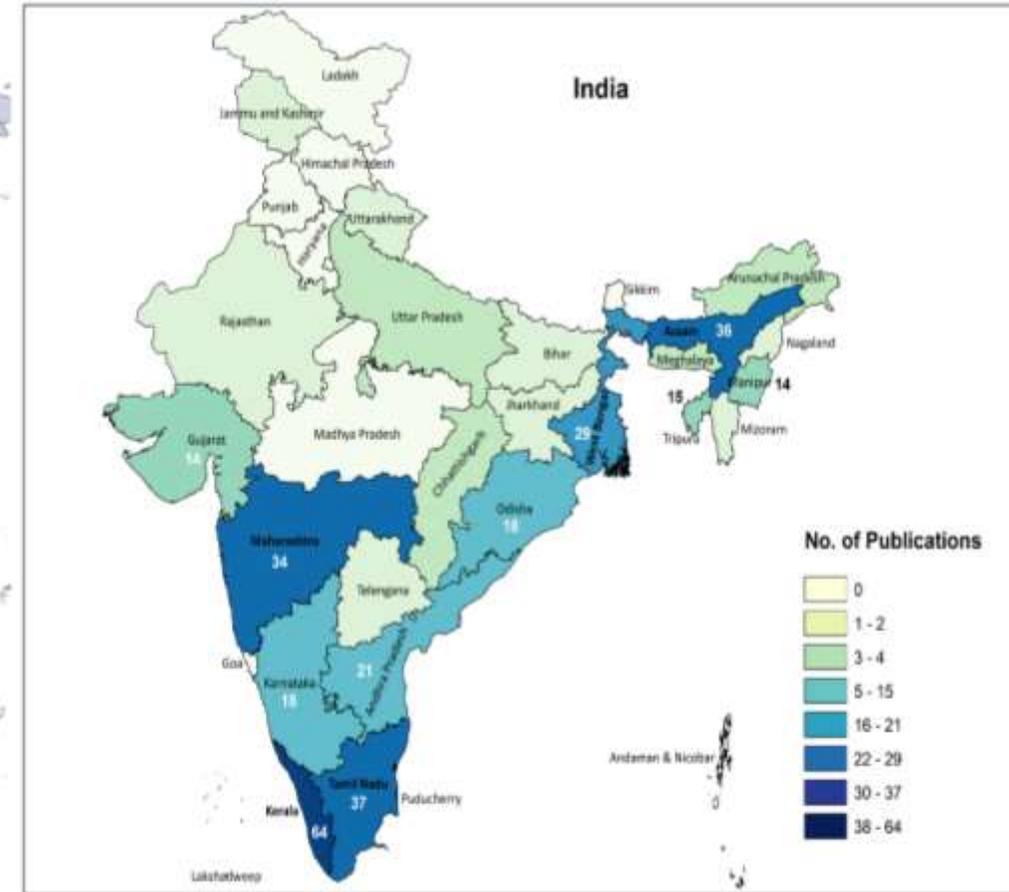


Country-specific articles



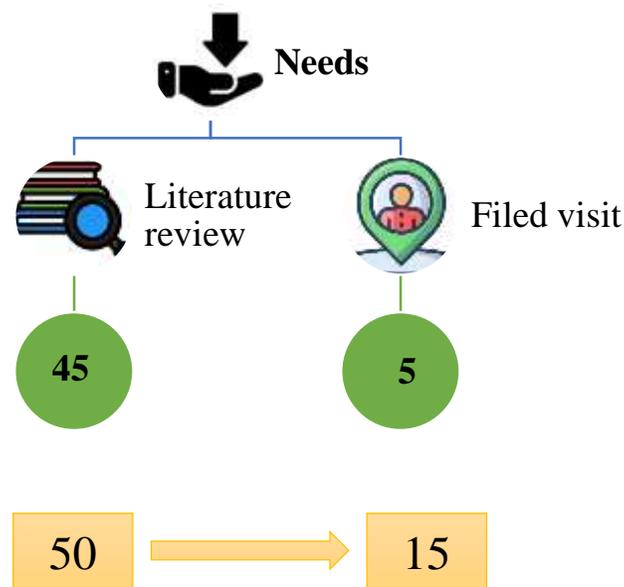
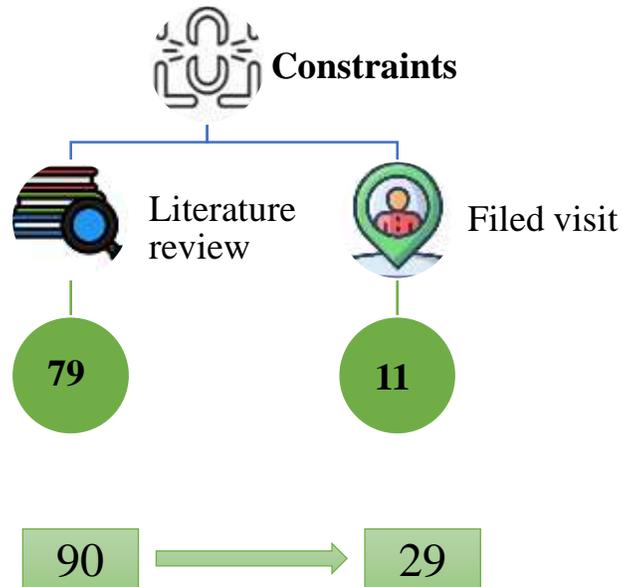
- ✓ **India** 21.75% (320 articles), **Bangladesh** 16.38% (241 articles) and **Nigeria** 13.26% (195 articles)
- ✓ **South Asian countries**, India, Bangladesh, and Sri Lanka

State-specific articles



Kerala has the highest number of articles (20% - 64), followed by **Tamil Nadu** (37 - 11.5%) and **Assam** (36 - 11%).

Objectives	Aspects studied	Tools used	Methods used
To assess the profitability and efficiency of men and women dry fish processors	Socio-economics, cost & returns, production & efficiency	Primary data collection	Descriptive analysis, Gini, Lorenz curve, Benefit-cost analysis, and Stochastic frontier analysis, t test
To identify and assess the constraints faced by dry fish processors and suggest suitable policy measures	Economic; Environmental; Infrastructural; Marketing; Social; Technical	Literature review, Expert validation, Primary data collection	NRPI (Normalised Response Priority Index), Dunn test, PCA, Cronbach alpha test and t test
	Information; Resource; Training		

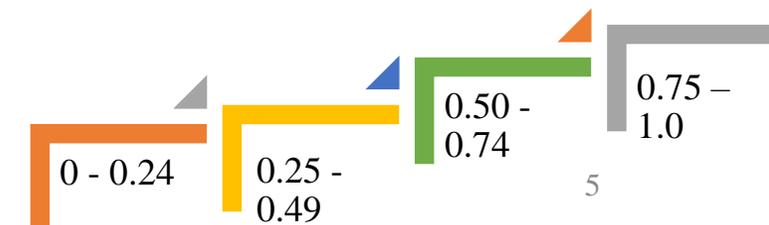


Developed a **NRPI**

5-point Likert scale

$$(RPI)_i = \frac{\sum_{j=1}^k f_{ij} \cdot X_{[(k+1)-j]}}{n}$$

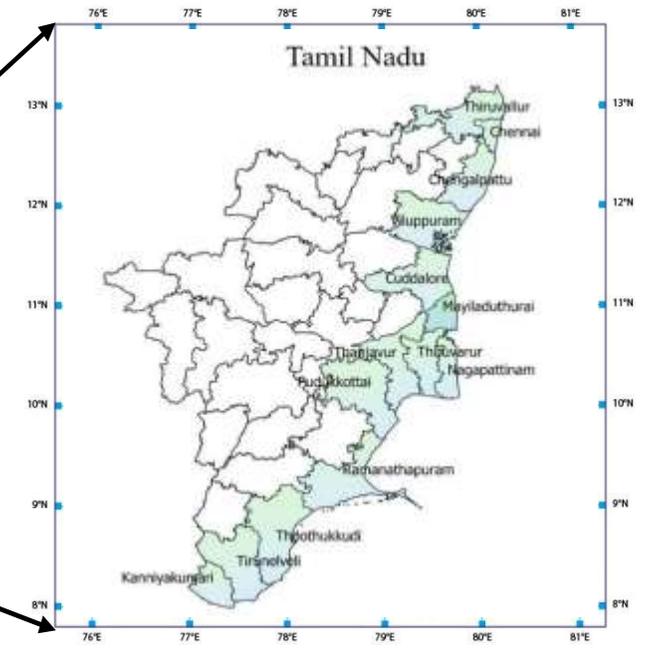
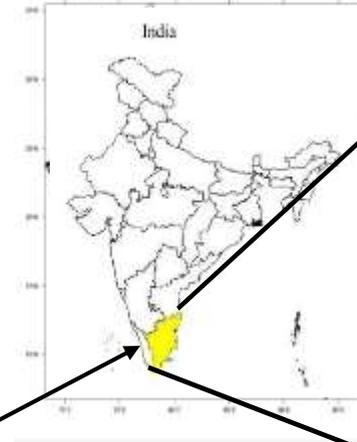
$$Z_i = \frac{X_i - X_{min}}{X_{max} - X_{min}}$$



Study Area & Sampling

Why Tamil Nadu?

- 👤 Coastal length - 1069 km (13.18%)
- 👤 Marine Fishing Villages – 608 (18.49%)
- 👤 Landing centers – 349 (25.61%)
- 👤 Active fishermen – 2,18,694 (23.59%)
- 👤 Marine fish production – 5.97 lakh tons (16%) 2022-23



DFM research teams

The Dried Fish Matters project has 12 Research Teams in six countries.



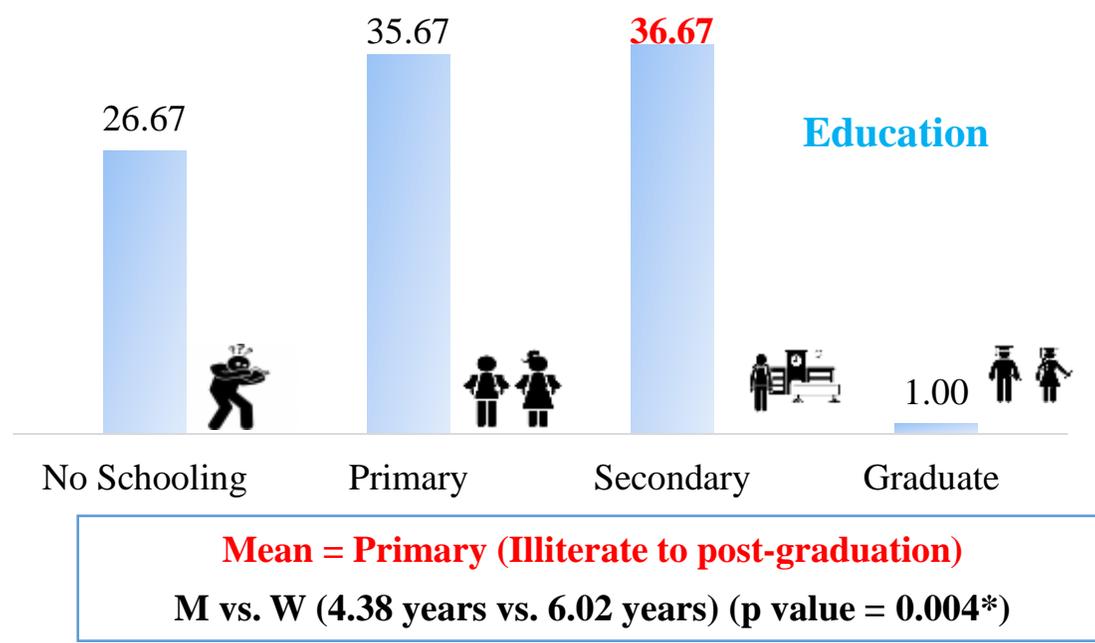
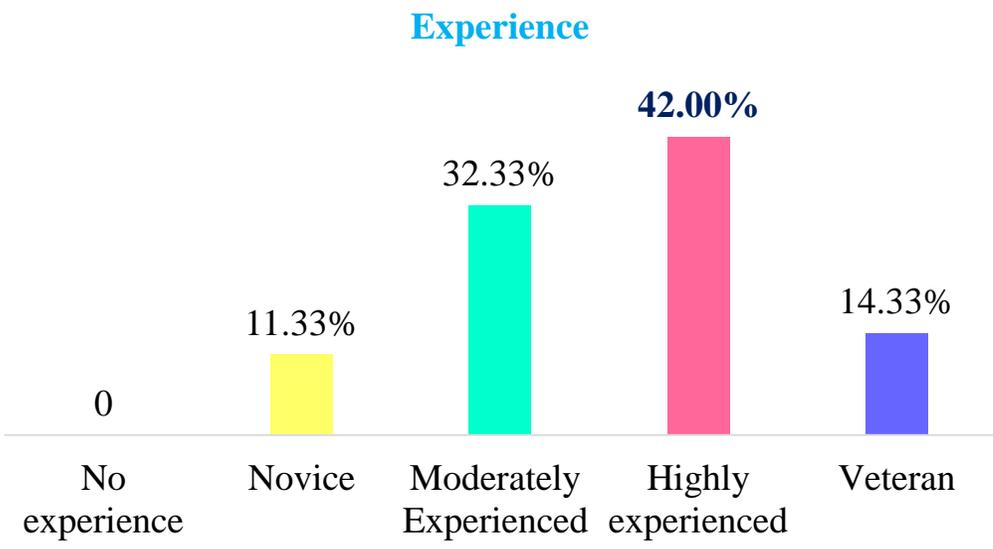
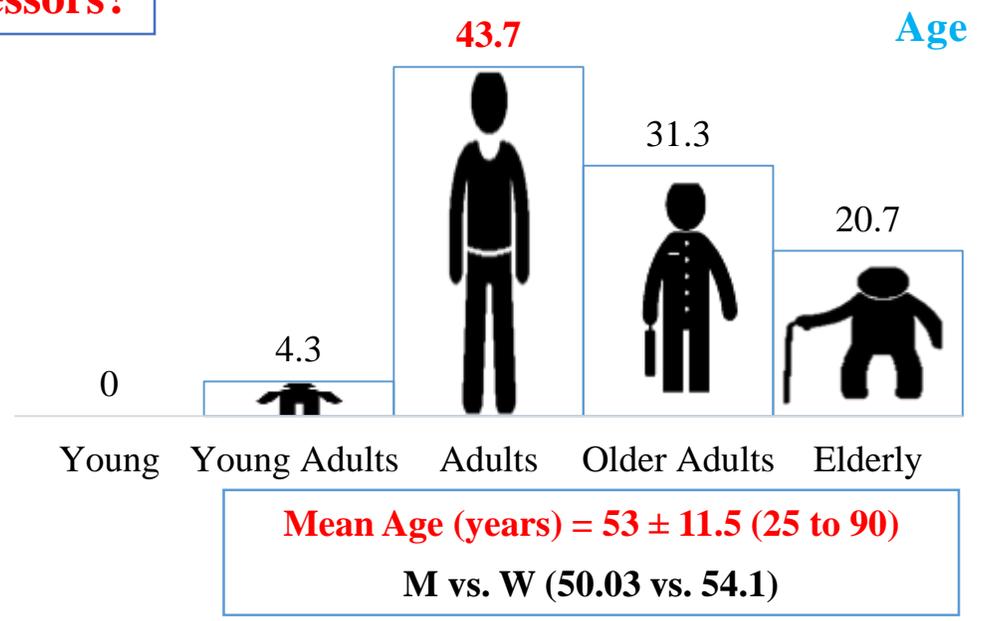
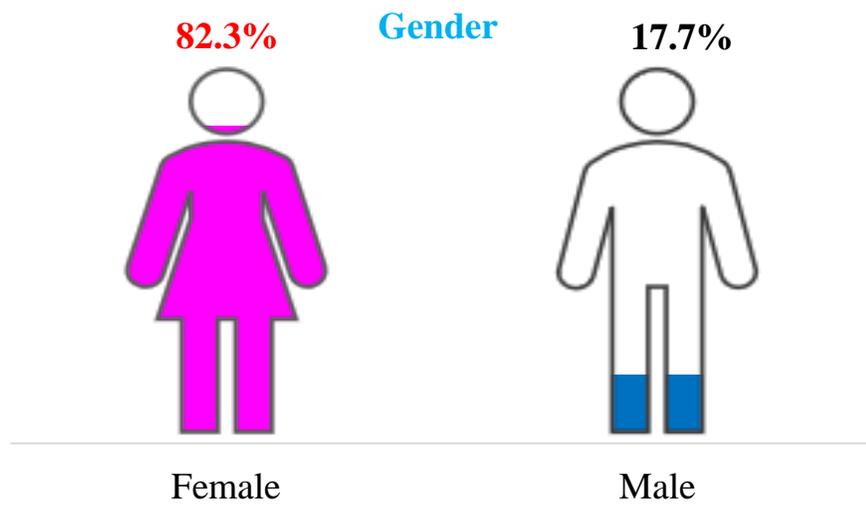
DFM is an International project dedicated to working for the dry fish sector in Asia

Stratified random sampling

- ★ Dry fish processor population
- ★ Fish production
- ★ Fishing fleet
- ★ Consultation with DoF

Sample size n= 300

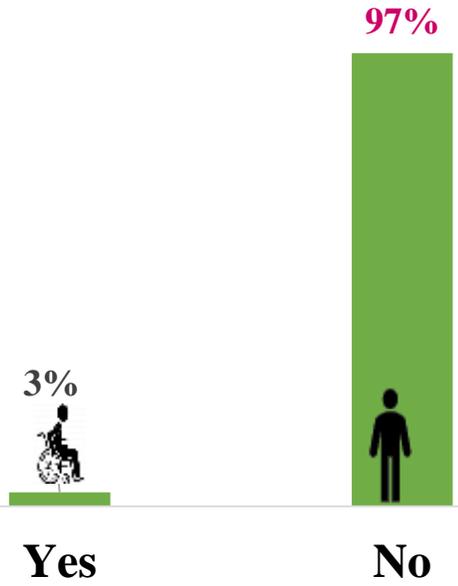
Who are dry fish processors?



Mean experience (years) = 19.72 ± 11.18 (3 to 60)
M vs. W (17.49 vs. 20.19 years)



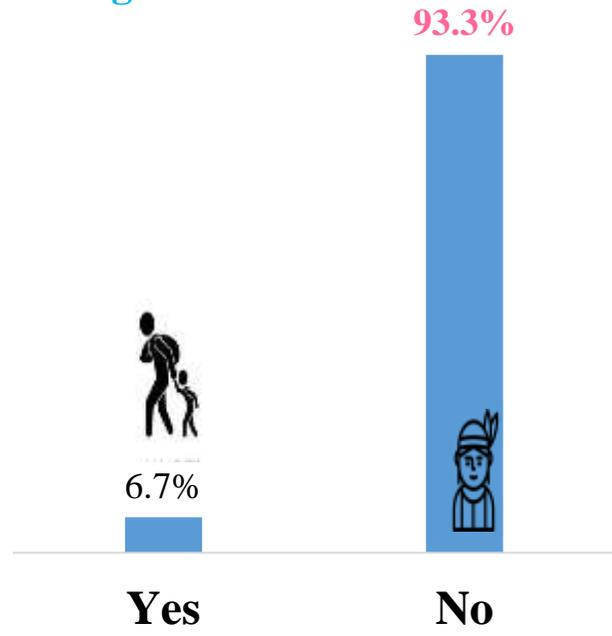
Person with disability



- Noticed some disabilities are natural (*Deaf, and Polio*), and fishing accidents

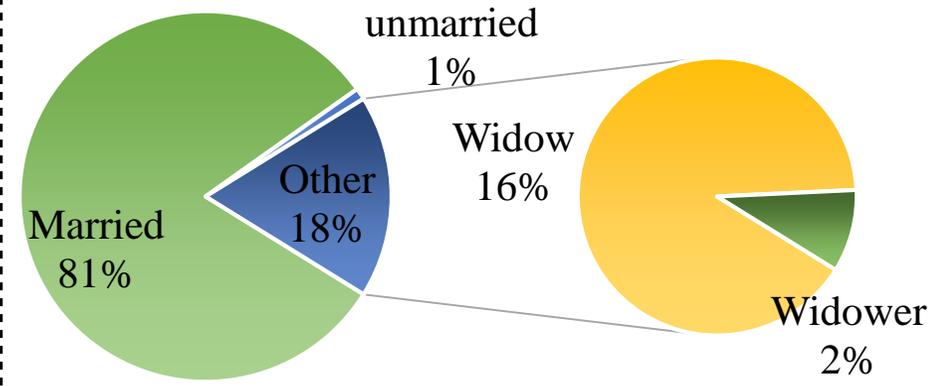


Migration



- Chennai, Nagapattinam, Pudukottai and Ramanathapuram
- Permanent migrants**

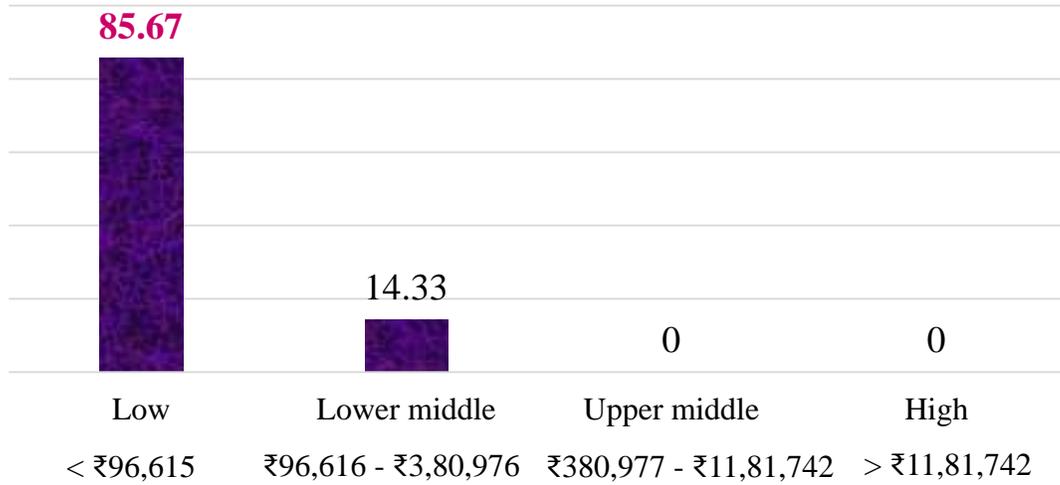
Marital status



- 18% of the DFP are *widows/widowers*

The dry fish sector/ business is a better source of *livelihood for PWD, Migrants and Widows*

Monthly income (%)



World bank, 2023

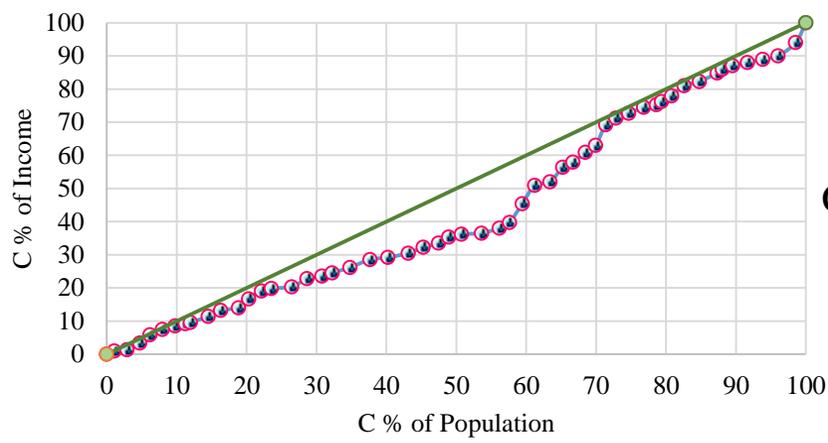
Mean monthly income = ₹59,301 ± ₹ 47,205 (₹ 5,344 - ₹ 4,28,050) ~\$669
 Women (₹56003.31 ± ₹2992.5 or ~\$650 ± \$35)
 Men (66093.52 ± 6534.4 or ~\$766 ± 76)

Mean annual income = ₹ 4,62,006 ± ₹ 377638
 (₹ 42752 - ₹ 34,24,400) ~\$5210

Per capita income (2023-24): TN = ₹3,15,220;
 India = ₹1,84,205

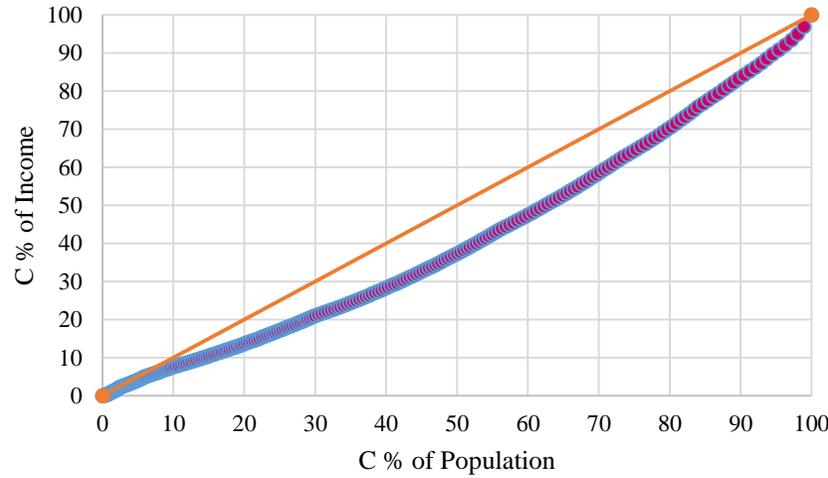
Dry fishing is usually **8 month** avenue

Lorenz Curve – Men



Gini coefficient - **0.368**

Lorenz Curve - Women



Gini coefficient - **0.393**

↑ Income disparity

Men: More equitable profit distribution → focus on scaling & market integration.

Women: Less equitable distribution → focus on reducing intra-gender disparities & enhancing access.

Economics and Production

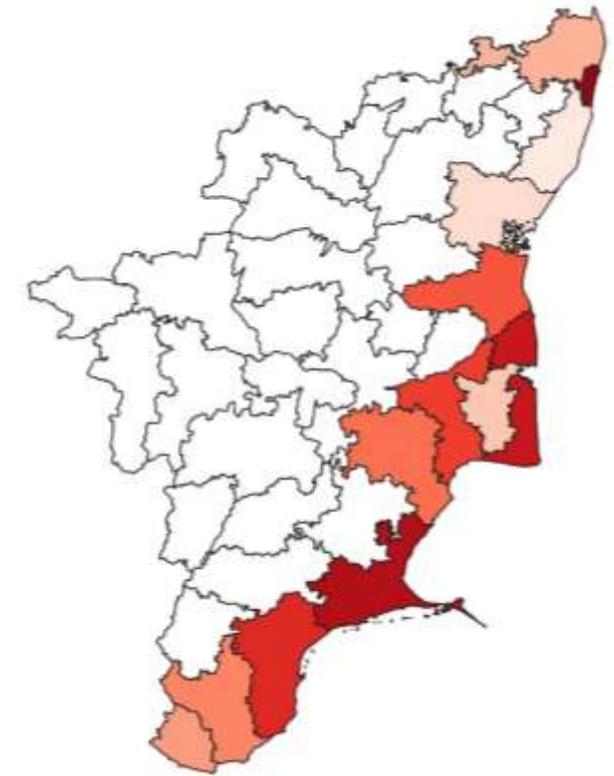
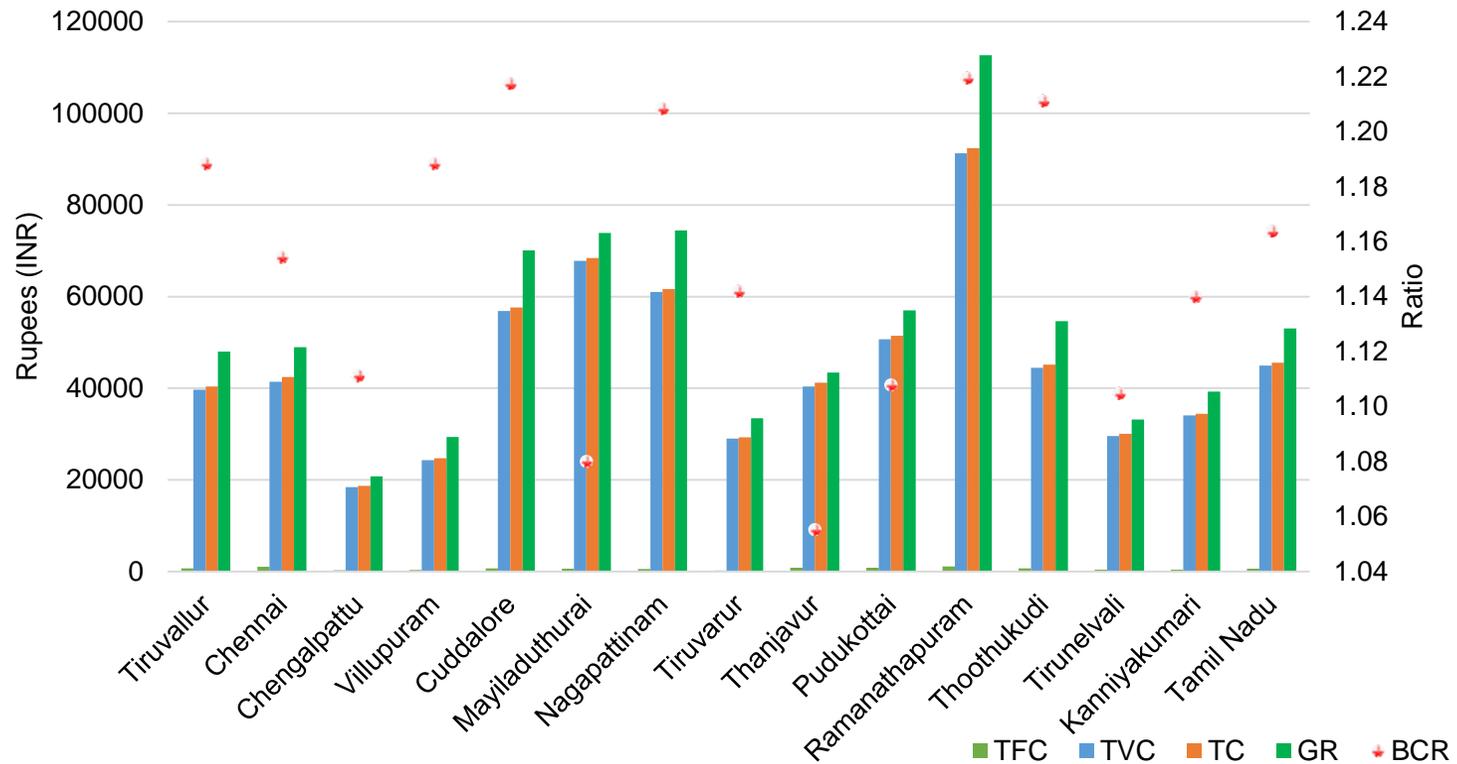


Fig. District-wise production

👤 Dry fish production (Kg.)/ month = **533.68 ± 486.62** (79.31 to 5818.97)

👤 Women = **599.1 kg** and profits (**₹15,007.10** or **~\$177**) remain lower than men (**841.7 kg**; **₹16,303.43** or **~\$192**) (*p value = 0.007**)

👤 The BCR of DFP of Tamil Nadu was **1.16±0.05**, **1.41 ± 0.27** for men vs. **1.37 ± 0.25** for women) (*p value = 0.088***)

Dry fishing is profitable = Salim et al., 2016; Upadhyay et al., 2017; Vipinkumar et al., 2017; Madan et al., 2018; Malick et al., 2018; Sahu et al., 2018; Upadhyay et al., 2021; Geeji (Genderaquafish)

Variables	Parameters	Estimate
Efficiency function		
Intercept	β_1	0.368***
Raw fish (Kgs.)	β_2	0.96***
Salt (Kgs.)	β_3	0.089***
Labour (Nos.)	β_4	-0.010
Drying area (Cents)	β_5	-0.011
Drying duration (Hrs.)	β_6	-0.013
Inefficiency function		
Gender	δ_1	0.0006
Age	δ_2	-0.0004
Experience	δ_3	-0.0001
Education	δ_4	-0.0003
Family size	δ_5	0.0000
Technology adoption	δ_6	0.0011
Ownership	δ_7	-0.0124
Active participation	δ_8	0.0184
Primary occupation	δ_9	0.0043
Risk	δ_{10}	0.0003
Training	δ_{11}	-0.0005
Debt	δ_{12}	0.0053
Sigma ²	σ^2	0.013***
Gamma	γ	0.884***

Technical Efficiency (TE)

- TE- Getting the **maximum output from given inputs**. (using inputs without waste)
- Main drivers - **raw fish & salt (+)**
- Low technology- and input-driven** (raw fish quantity and salt) rather than being shaped by socio-economics
- Homogeneity** of processors
- Processing is **skill-based, not education-based**

Log likelihood: 356.34
Mean efficiency: 0.92 (92%)

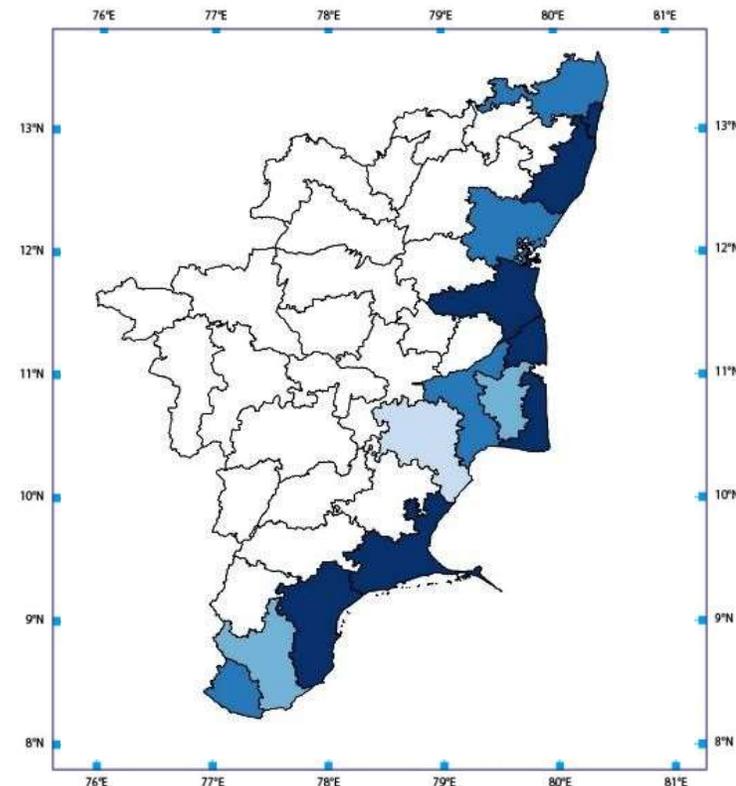


Fig. District-wise TE in Tamil Nadu DFP

Statistics	Women	Men	P value	Decision
Independent t test	0.921 ± 0.00	0.918 ± 0.01	0.708	No difference

Variables	Parameters	Estimate
Efficiency function		
Intercept	β_1	0.326 **
Raw fish (Rs.)	β_2	0.769 ***
Salt cost (Rs.)	β_3	0.186***
labour cost (Rs.)	β_4	0.059 ***
Drying area (Rs.)	β_5	0.053
Drying duration (Hrs.)	β_6	0.093
Inefficiency function		
Gender	δ_1	-0.001
Age	δ_2	0.0004
Experience	δ_3	-0.002
Education	δ_4	0.003
Family size	δ_5	-0.002
Technology adoption	δ_6	0.061
Ownership	δ_7	0.022
Active participation	δ_8	0.019
Drying as primary	δ_9	0.046
Risk	δ_{10}	-0.014
Training	δ_{11}	-0.008
Debt	δ_{12}	0.005
Sigma^2	σ^2	0.028***
Gamma	γ	0.782 ***

Economic Efficiency (EE)

- 😊 EE → producing maximum output at minimum cost (TE+AE)
- 😊 Main drivers - costs of **raw fish, salt, and labor** (+)
- 😊 Depends more on **input prices and cost management** rather than who the processor is
- 😊 **Reducing raw material costs, improving access to cheaper inputs and labour efficiency, and providing infrastructure support**

Log likelihood value: 216.05
 Mean efficiency: 0.85 (85%)

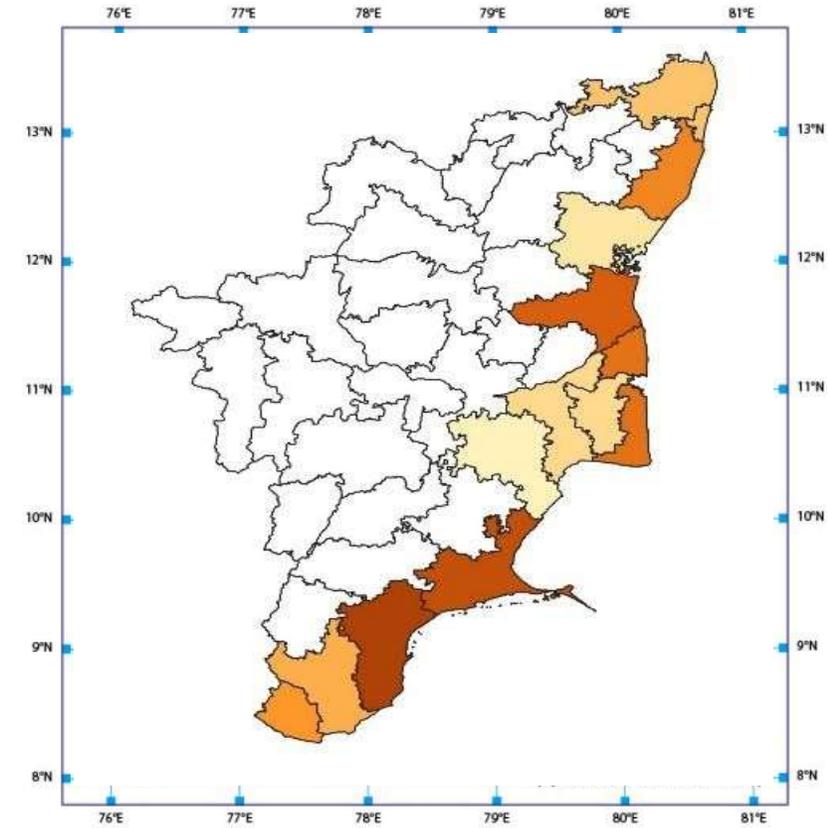


Fig. District-wise EE in Tamil Nadu DFP

Statistics	Women	Men	P value	Decision
Independent t test	0.854 ± 0.00	0.853 ± 0.01	0.975	No difference

Allocative efficiency (AE)

$AE = EE / TE = 0.92$ (92%)

Using the right mix of inputs at the right prices (choosing the most cost-effective combination)

Statistics	Women	Men	P value	Decision
Independent t test	0.927 ± 0.00	0.930 ± 0.01	0.778	No difference

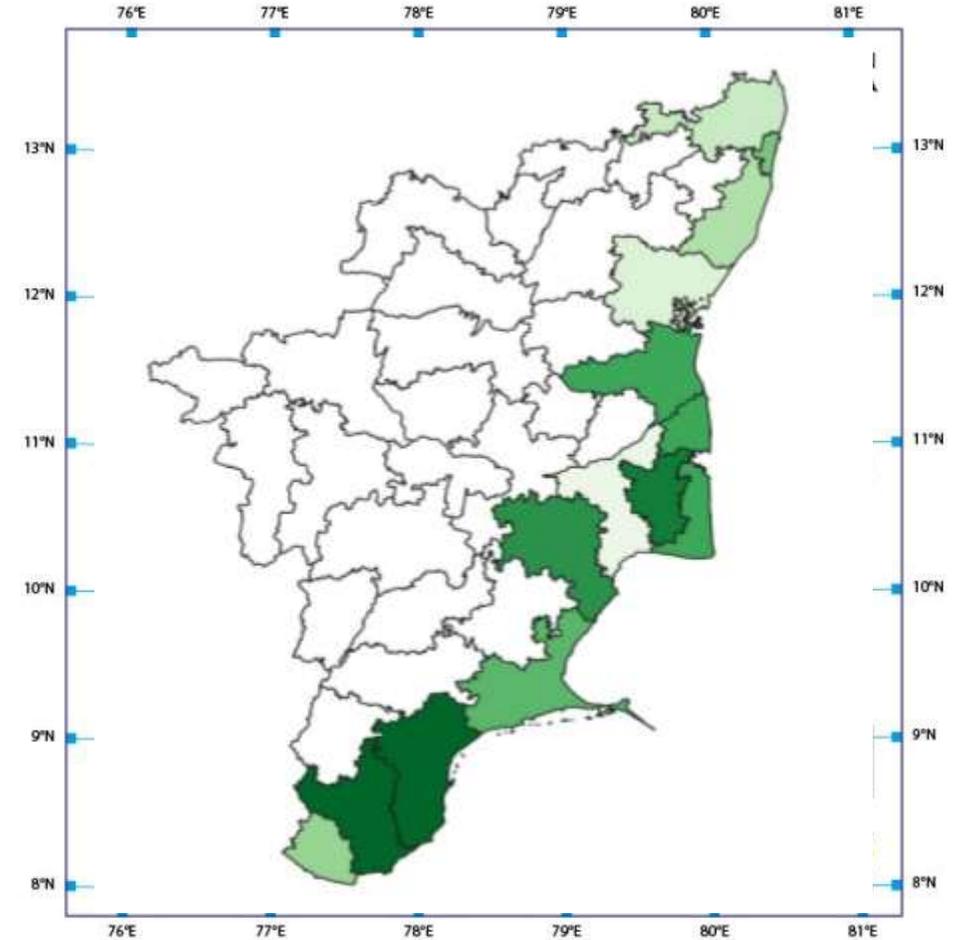
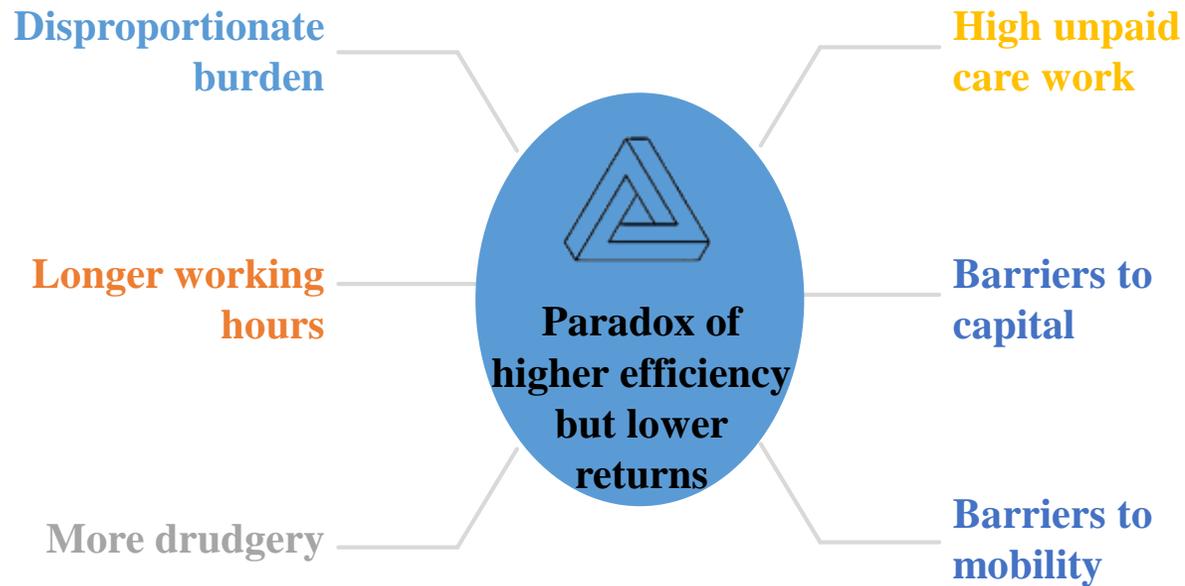
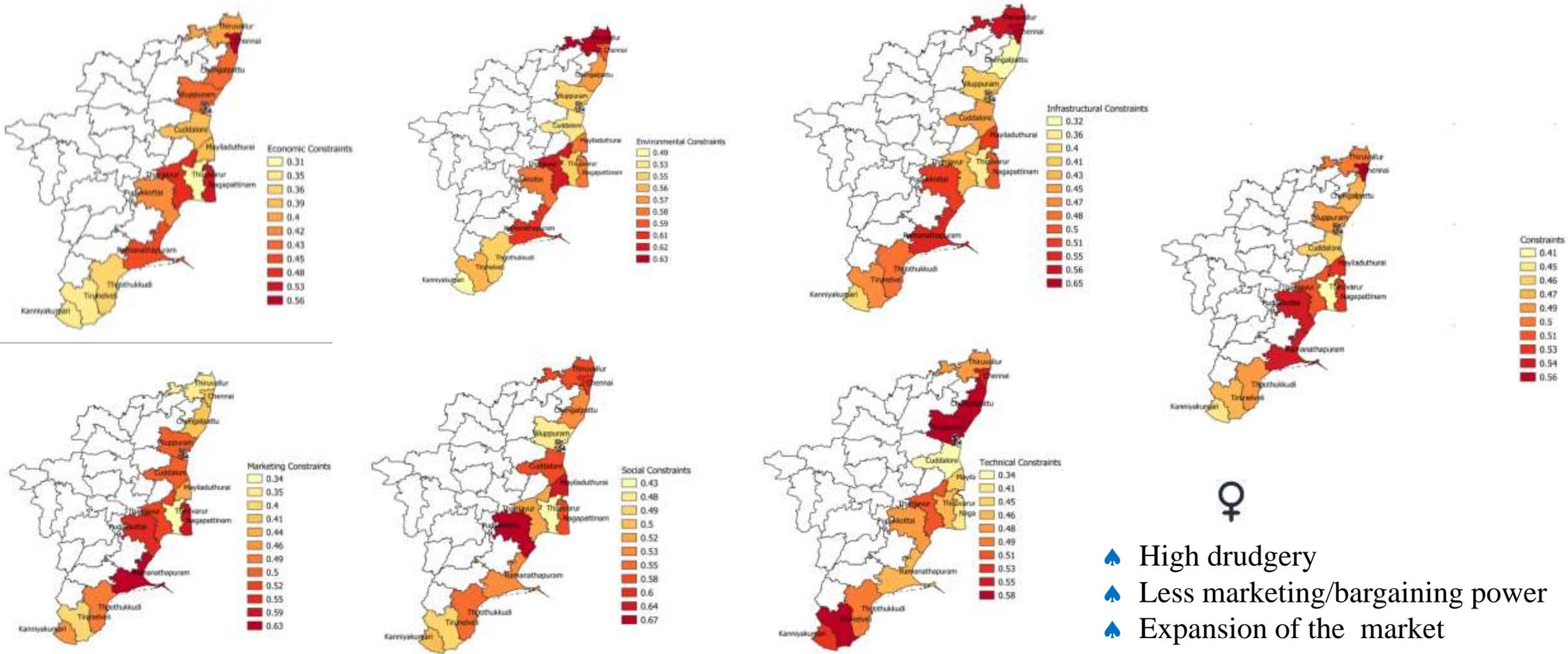


Fig. District-wise AE in Tamil Nadu DFP

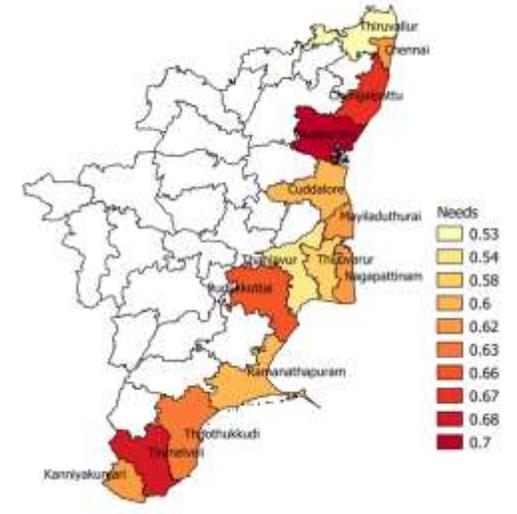
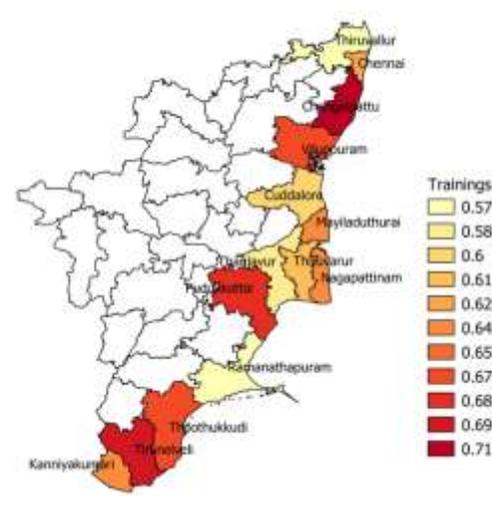
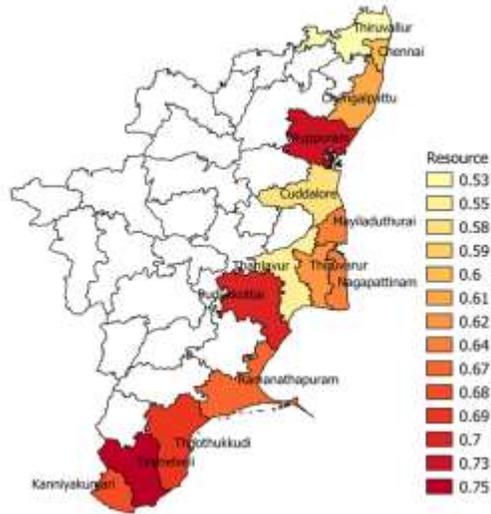
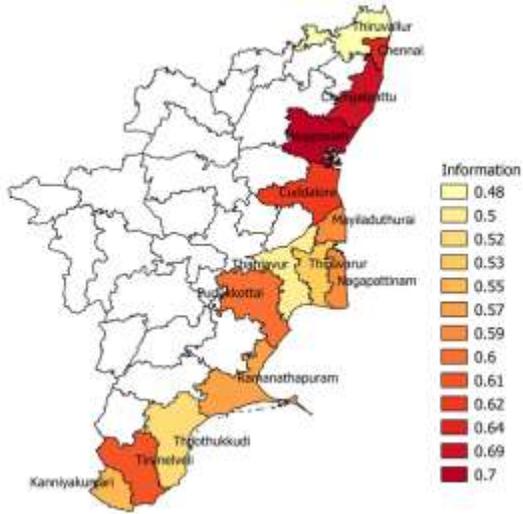
District-level mapping of constraints score



- ♠ High drudgery
- ♠ Less marketing/bargaining power
- ♠ Expansion of the market

Variable	Women	Men	p value	Decision
Constraints Index	0.585 ± 0.01	0.501 ± 0.01	0.059	Difference

District-level mapping of needs score



Variable	Women	Men	p value	Decision
Needs Index	0.636 ± 0.01	0.607 ± 0.01	0.048	Difference



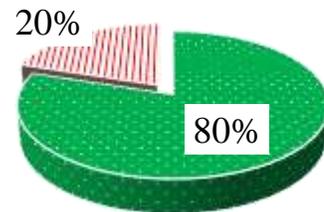
Subsidised solar dryer

Trainings

Credit

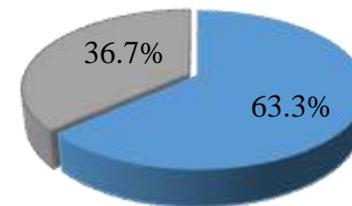
Infrastructure

Adoption of solar dryer



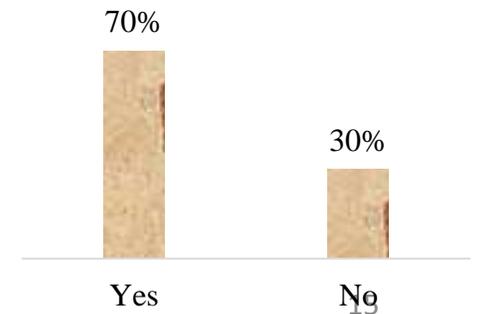
■ Yes
▨ No

Difficulty in access to drying yard



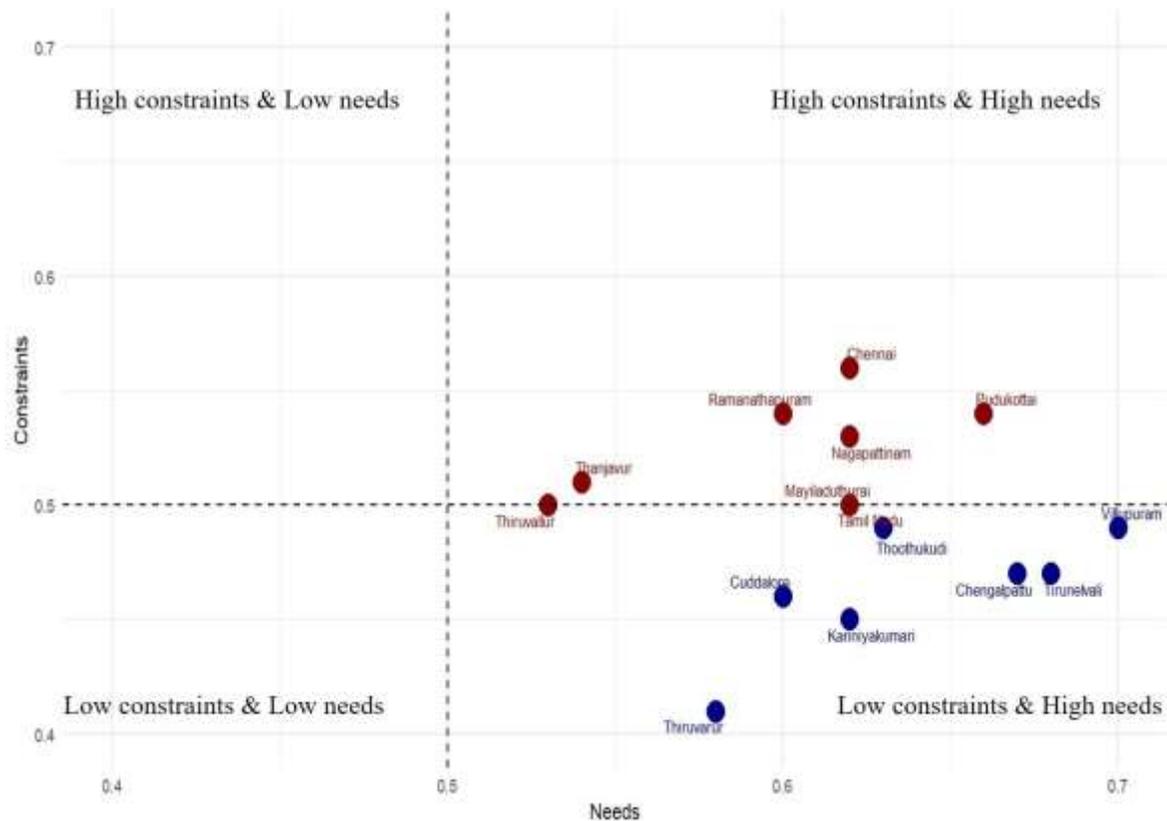
■ Yes
■ No

Willing to attend training



Decision matrix b/w the constraints and needs

Prioritize **high needs and constraints** districts

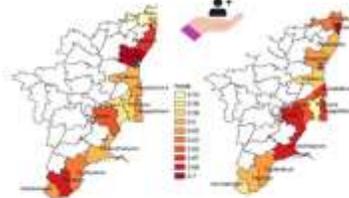
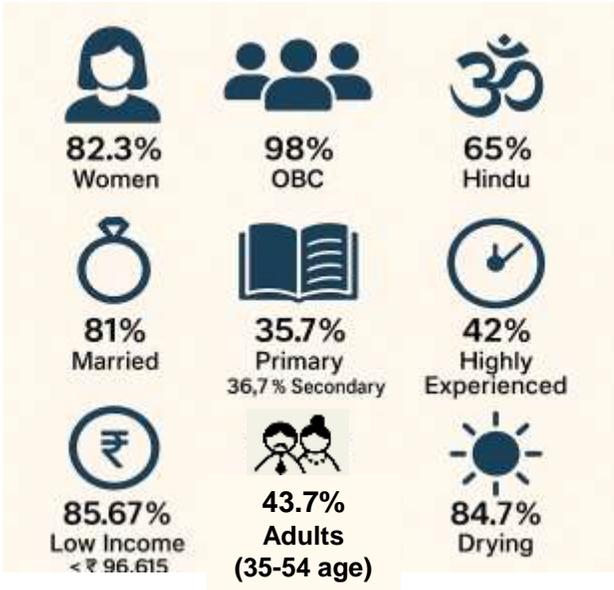


PCA - Data reduction & Pattern identification

- ★ **Constraints - 10 components**, cumulative variance of **60.61%**
- ★ **Technical** and **environmental**, - *theft issues (0.56)*, *lack of sanitation (0.60)*, *shortages of essential daily needs (0.58)*, *middlemen (0.56)*, *high competition (0.56)*, and *conflicts (0.56)*
- ★ **Needs = 5 components**, cumulative variance - **60.1%**
- ★ **Financial** and **infrastructure**, such as *credit and subsidies (0.67)*, *schemes and training (0.57)*, *financial support (0.59)*, *drying yards (0.666)*, and *storage (0.51)*

Cronbach's Alpha - internal consistency or reliability

- ◆ **Constraints $\alpha = 0.70$**
 - ◆ **Needs $\alpha = 0.71$**
- } **good internal consistency**

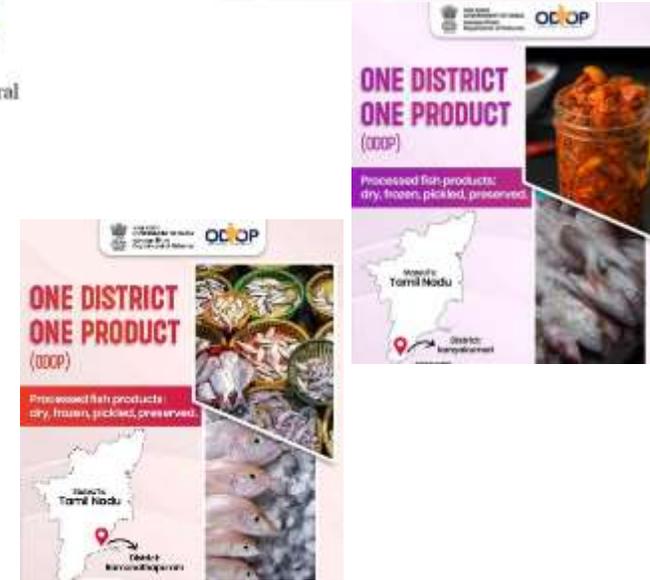


Literature
Key informant interviews

Response priority index
Cronbach alpha;
PCA, KWT & DT



CONCLUSION

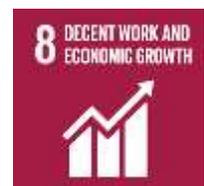


Dry Fish: Going Beyond Smell

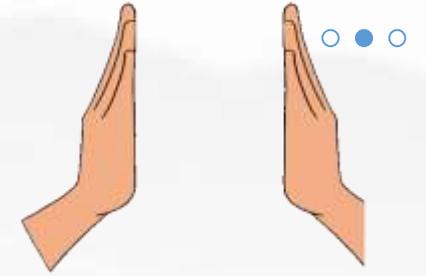
Paradox of higher efficiency but lower returns

Drudgery
High unpaid care work
Barriers to capital & mobility

- Access to training & resources (Gender specific)
- Financial (Short-term credit & collectives)
- Infrastructural support (Drying yards & Solar dryer)
- Recognition of work & Awareness



Acknowledgement



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🙏 All the dry fish processors

🙏 Department of Fisheries, Tamil Nadu





Thank You

