

# Dried fish in global perspective

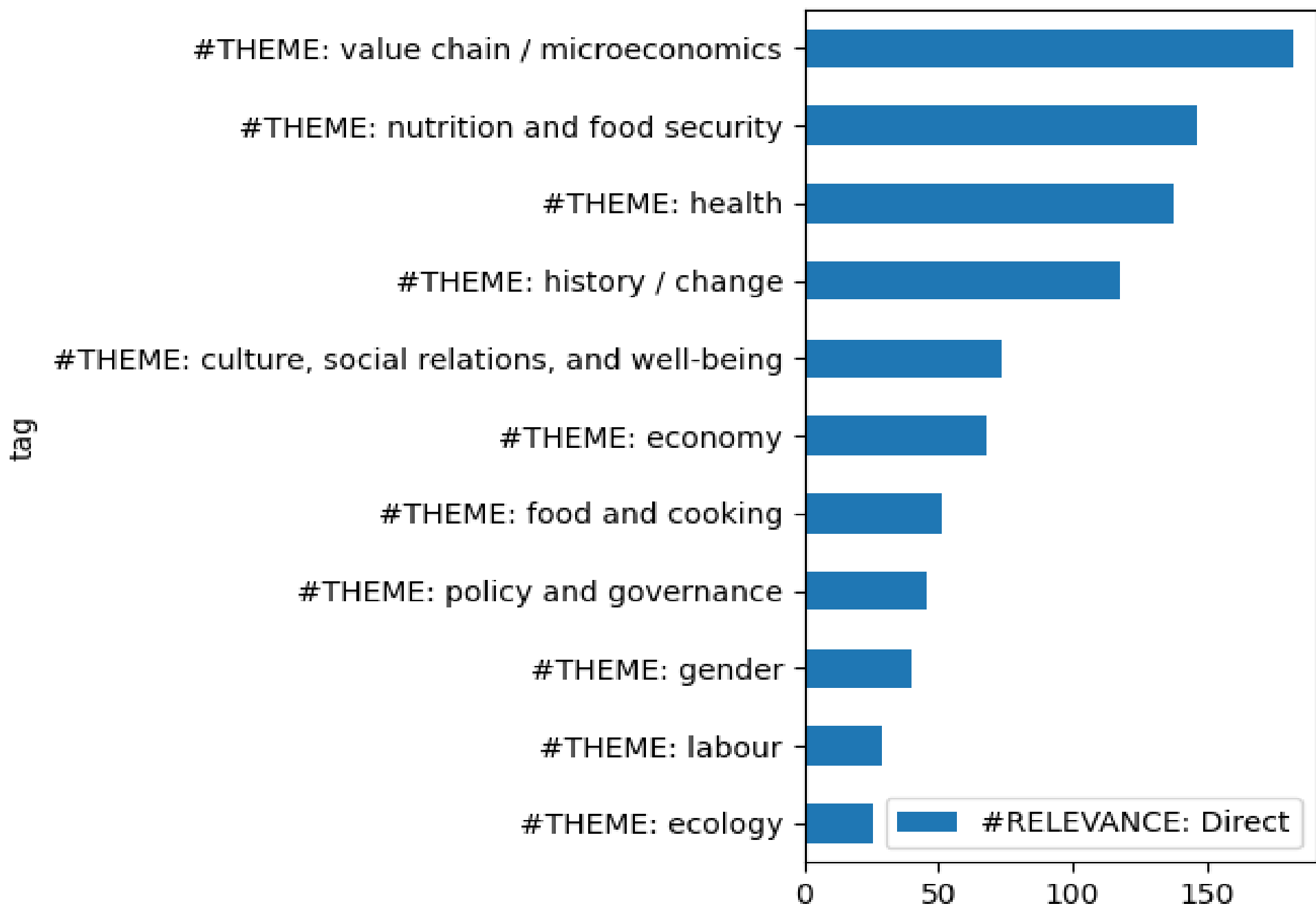
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December 9, 2020



**University  
of Manitoba**

# Introduction



# Presentation overview

- Social and ecological context
  - Ecology
  - History and change
  - Culture and social relations
- Applications
  - Nutrition, food security, health
  - Technical research
  - Value chains and economics
  - Policy and governance

**ecology**

# #THEME: Ecology

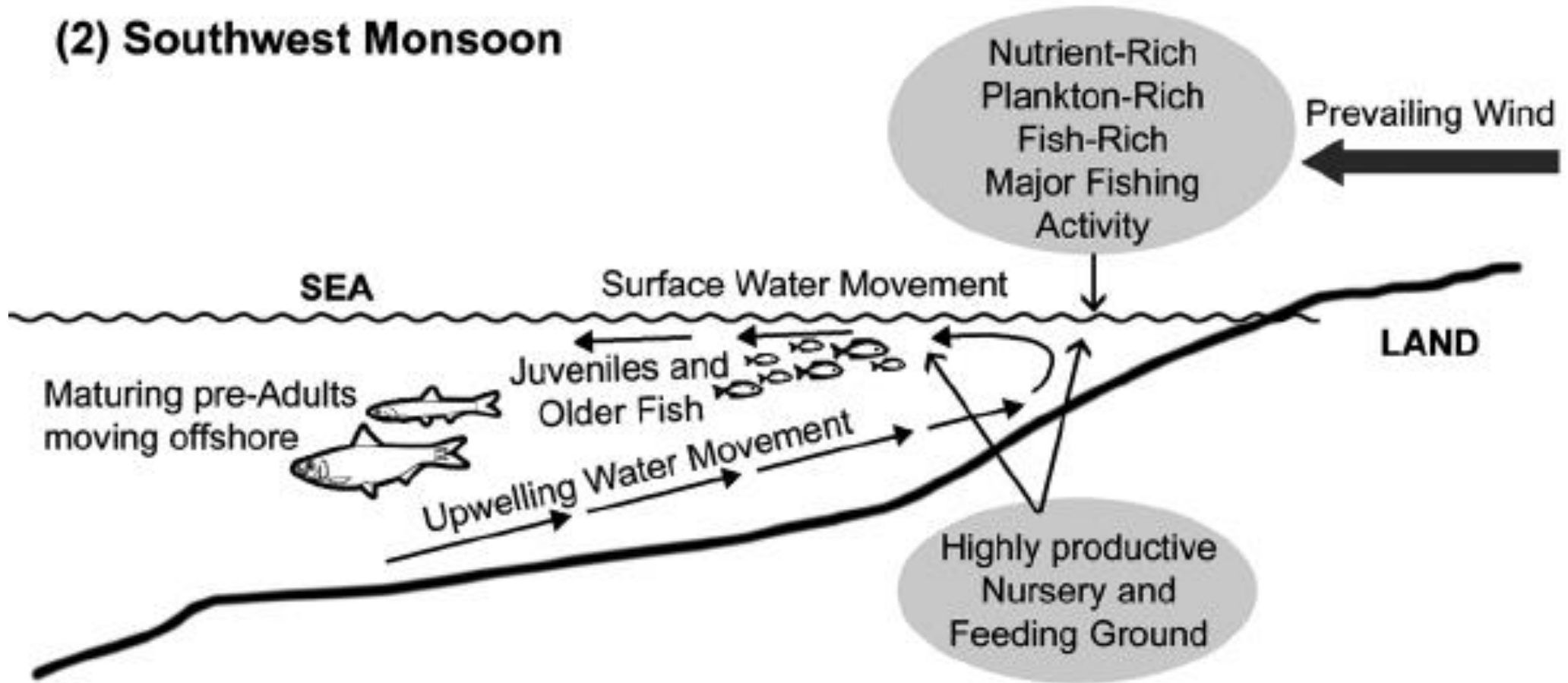
- Analyses of the place of dried fish within ecosystems and the environment

“#THEME: Ecology” tag in our Zotero library

#RELEVANCE: Direct #RELEVANCE: Indirect #THEME: history / change  
#THEME: economy #THEME: labour #THEME: technical  
#THEME: policy and governance  
#THEME: value chain / microeconomics  
#THEME: culture, social relations, and well-being ! ?geo @  
@2-technical @EDT \*\*AFRICA \*\*EAST-ASIA \*\*EUROPE \*\*FOCUS  
\*\*GLOBAL-NONE \*\*GLOBAL-SOUTH \*\*SOUTH-AMERICA  
\*\*SOUTH-ASIA \*\*SOUTH-EAST-ASIA \*Africa \*Bangladesh \*Cambodia  
\*China \*Côte d'Ivoire \*Europe \*Ghana \*Himalayas \*India  
\*Indonesia \*Malaysia \*Myanmar \*Namibia \*None \*Peru  
\*Philippines \*Senegal \*Southeast Asia \*Sudan \*Thailand \*Uganda  
\*Vietnam \*West Africa \*West Bengal \*Zambia #exclude  
#FISHERY: coastal #FISHERY: inland #SEGMENT: consumption  
#SEGMENT: processing #SEGMENT: production #SEGMENT: retail  
#SEGMENT: traders #THEME: ecology #THEME: food and cooking

# adaptive strategies

## (2) Southwest Monsoon



(Kenneth Ruddle)

# environmental change

a fishing method (locally known as “Sallacio”) that enables fishers to stay on water for prolonged periods of 2 to 3 weeks without landing has been introduced. ...

The catch is processed (salted and sun-dried) on the lake and collected by land-based business owners.

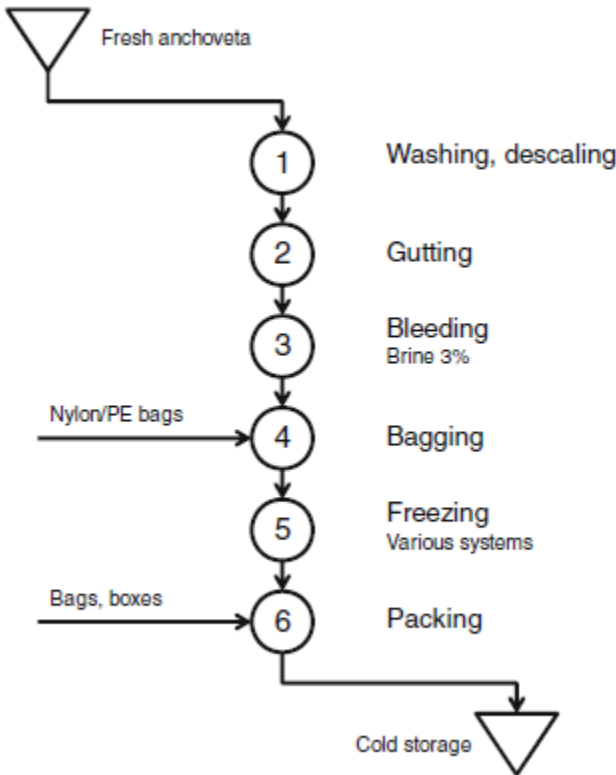
(Wandera and Balirwa 2010; Photo IISD 2015)



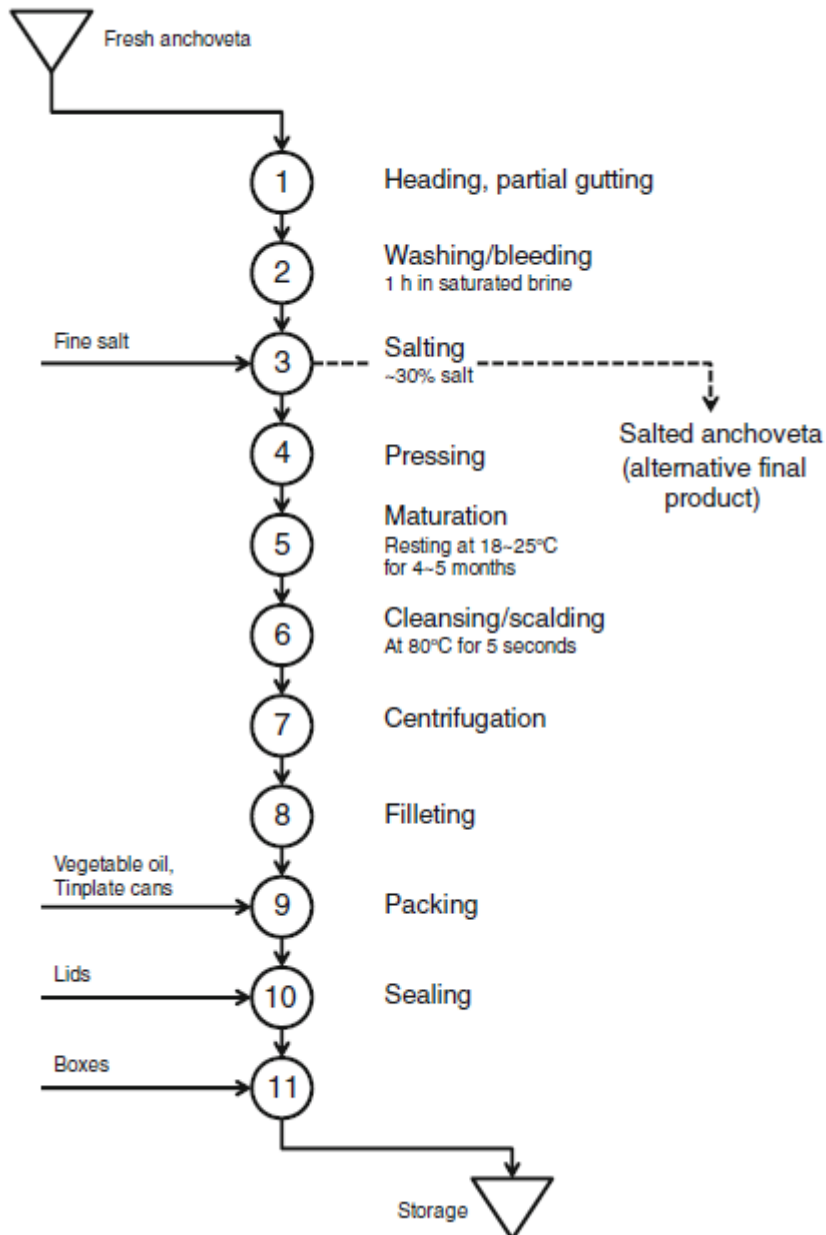


# environmental impacts

a) Frozen product

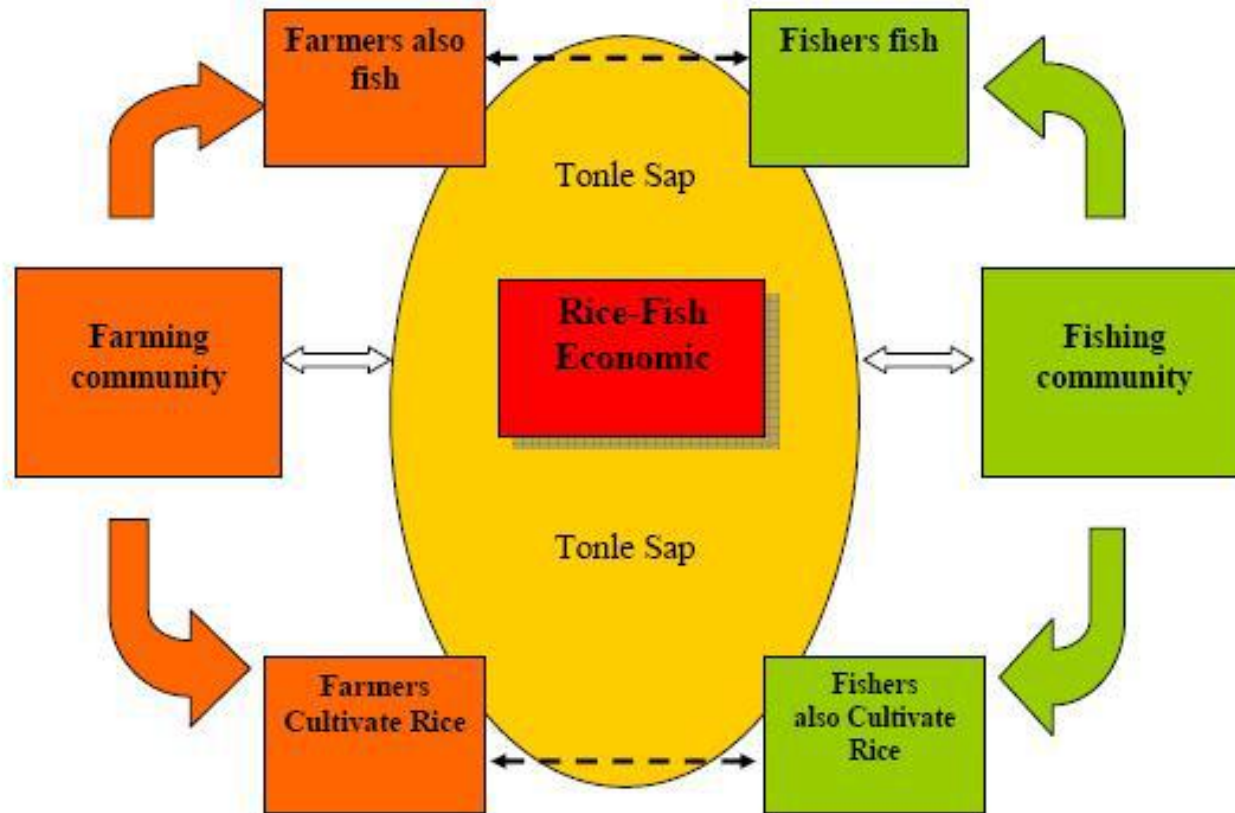


c) Cured product in vegetable oil



(Avadí, Fréon, and Quispe 2014)

# political ecology



(Mak Sithirith 2016)

**history &  
change**

# #THEME: History and change

- The history or evolution of the dried fish economy.
- Historical documents

# archaeology

Brick floor on which a fish bone concentration was found in a Byzantine temple excavation in Egypt (Neer et al. 2005)



Salt processing basins - Ban Don Phangat, Nakhon Rachasima Province, Thailand. Yankowski et al. (2015)



# colonialism and the state

**Table 3.1** Fish-Curing yards Madras presidency, 1885–1914: Number of fish curing yards. (Source: Govindan (comp.) 1916, pp. 7–9, 65–71)

Region	1885–1889	1890–1894	1895–1899	1900–1904	1905–1909	1910–1914	Notes
S. Canara	7	9	12	15	15	17	1 private
Malabar	20	24	26	32	32	32	
E. Coast	26	32	49	55	65	64	
North							
E. Coast	10	10	13	15	17	16	
South							
Total	63	75	100	117	129	129	

(Reeves et al. 2014)

# environmental history



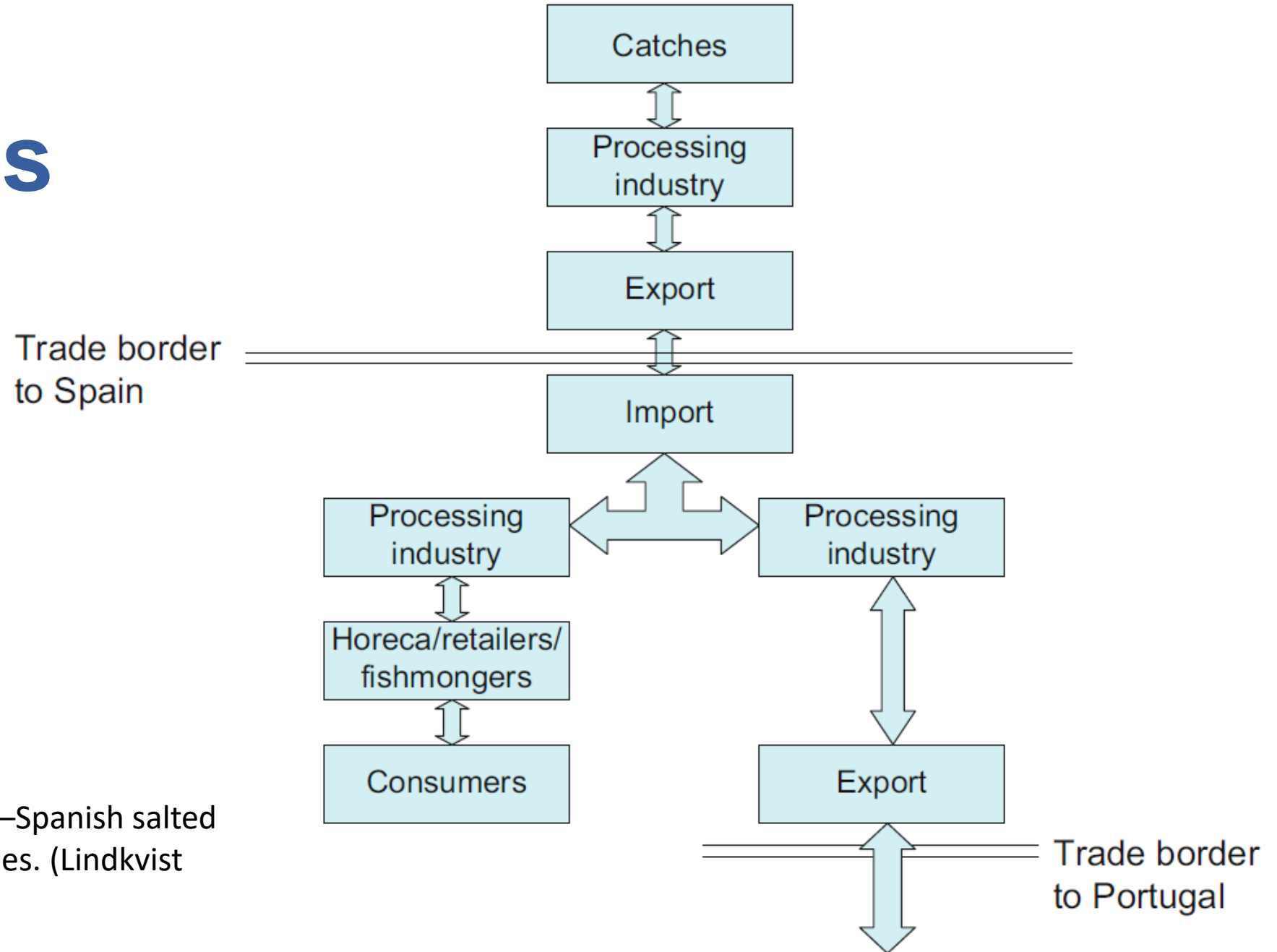
Vendors waiting to buy fish at Lake Liambezi.



Large truck with load of fresh fish for transport to Zambia.

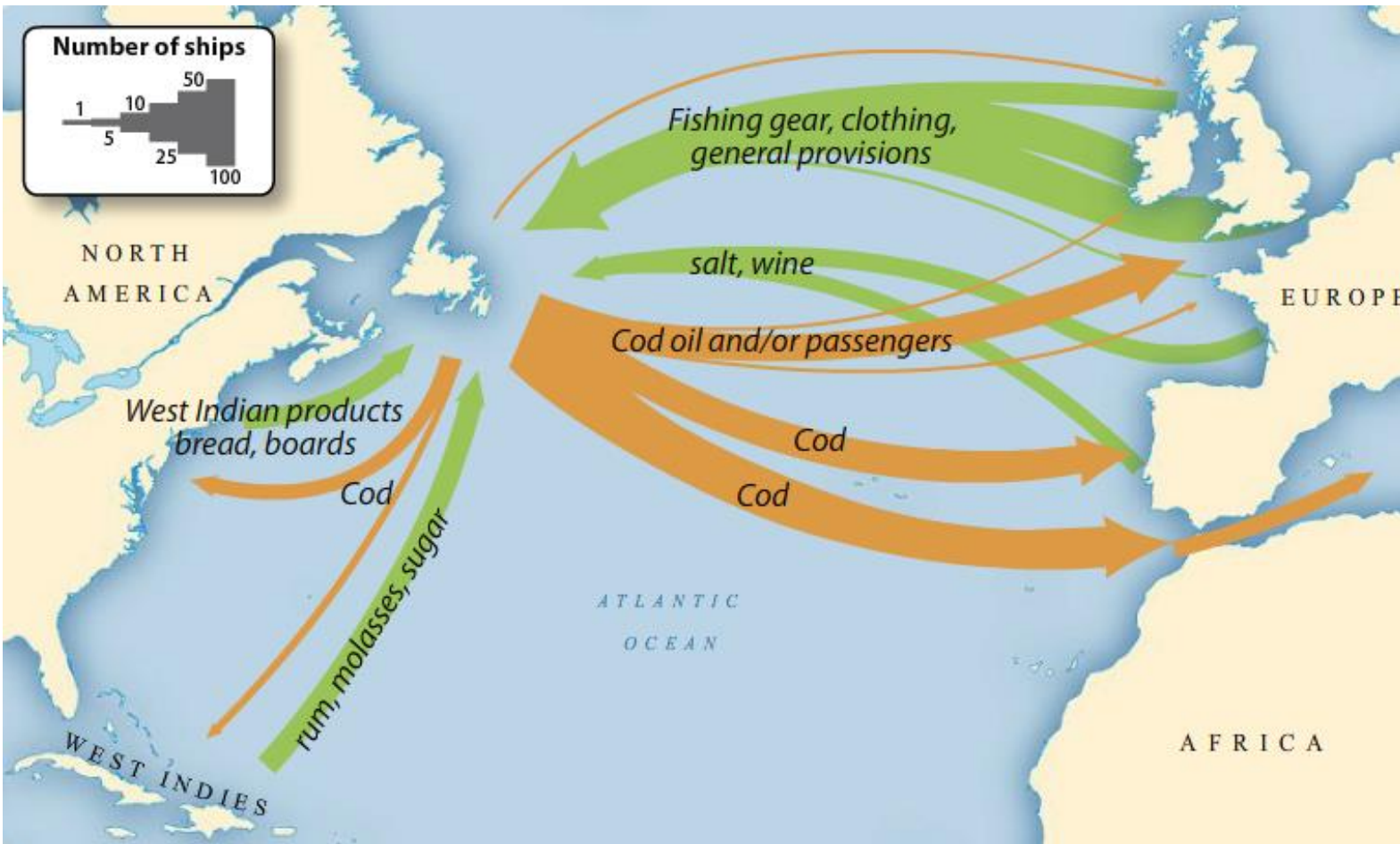


# market externalities



The value chain for the Norwegian-Spanish salted fish trade with two Spanish branches. (Lindkvist 2015)

# global flows



English Cod trade, 1697  
(*Canadian Atlas Online*)



Bacalhau à minhota (Wikimedia Commons)

**culture and  
social  
relations**

# #THEME: food & cooking

- Cooking and eating practices
- Food categorizations
- Commensality

# **#THEME: culture, social relations, well-being**

- Subjective well-being
- Practices to sustain and promote dried fish for cultural objectives
- Quality of social relations
- Cultural understandings of health in relation to food consumption, etc.

# Cultural ecology

- taste preference for dried or fermented fish
- cultural identity

ideas

- seasonal fishing
- fish processing & storage

adaptation

- irregular fish supply
- inland resources

ecology

# Indigenous knowledge and practices

### CONTENTS

Traditional practices frequently used for the newborn in Turkey: A literature review Nurcan Özyazıcıoğlu & Sevinç Polat	445
"Persistent post-infectious cough" is better treated by which one? Prednisolone, Honey, Coffee, or Honey plus coffee: A meta-analysis Mohammad Ali Raessi, Jafar Aslani, Neda Raessi, Homa Gharaie, Ali Akbar Karimi Zarchi, Fereshteh Raessi & Mostafa Ahmadi	453
Anethum graveolens L. supplementation has anti-inflammatory effect in type 2 diabetic patients Laleh Payahoo, Alireza Ostadrahimi, Majid Mobasseri, Yaser Khaje bishak, Mohammad Asghari Jafarabadi, Ali Baradaran Mahdavi & Sepide Mahluji	461
Medicinal herbs: Traditional knowledge used for constipation therapy in metropolitan Bangkok Prayosh Suntonvipart, Songkoon Chantachon & Marisa Koseyayothin	466
Nuances of traditional knowledge in utilization of rice landraces by a farming community in North- Eastern Thailand Satian Chunta, Preecha Prathepha, Thiha & Boonrat Jongdee	473
Diversity in chemical composition and antibacterial activity of the essential oils of wild populations of <i>myrtle</i> from natural habitats in Southwestern Iran Abdollah Ghasemi Pirbalouti, Behzad Hamedi, Leyla Mehravar & Mohammad Firouznejhada	484
<i>Masular</i> – A traditional fish product of <i>Tharu</i> community of Nepal Ghanendra Gartaula, Bhupendra Dhami, Pramesh Kumar Dhungana & Bhisma Nanda Vaidya	490



Gartaula, Ghanendra, Bhupendra Dhami, Pramesh Kumar Dhungana, and Bhisma Nanda Vaidya. 'Masular – A Traditional Fish Product of Tharu Community of Nepal'. *Indian Journal of Traditional Knowledge (IJTK)* 13, no. 3 (2014): 490–95.



# Cultural heritage



Surströmming

# Foodways

A research field that perceives the system of production, circulation and consumption of foodstuffs as:

- a) culturally significant**
- b) mutable and dynamic; and**
- c) enmeshed within intersecting realms**



Hative Kecil roadside stall – photograph by Philip Hayward, September 2011.



Galala Church gates – photograph by Philip Hayward, August 2011.

# Food history

Ancient Roman garum factory in Portugal  
(Wikimedia Commons)

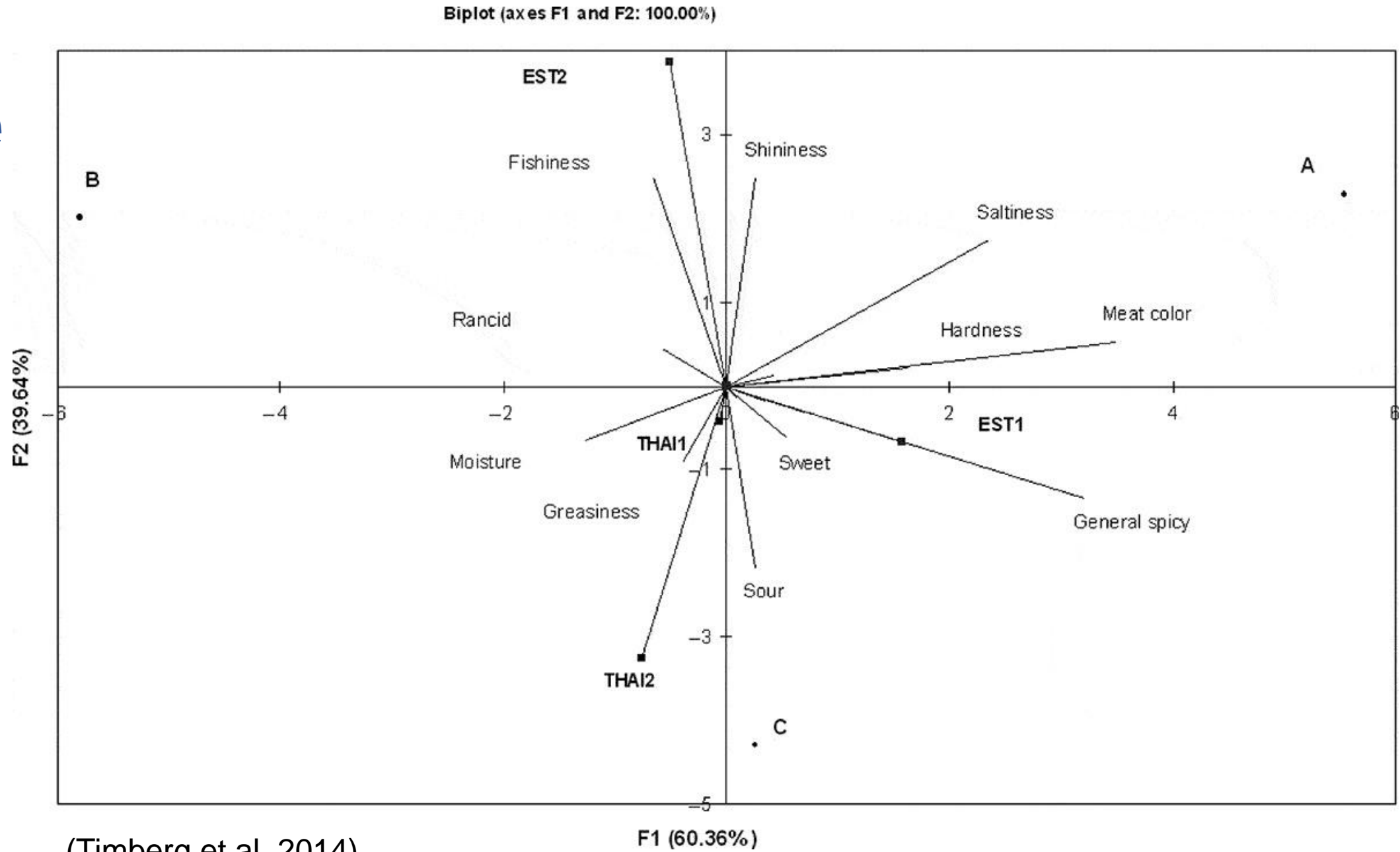




Left: *liquamen* fish sauce in the process of dissolving through enzyme hydrolysis

Right: The Roman feast table setting in the Ashmolean Museum, Oxford (S. Grainger and S. Hay)

# Taste



(Timberg et al. 2014)

# Cultural food security

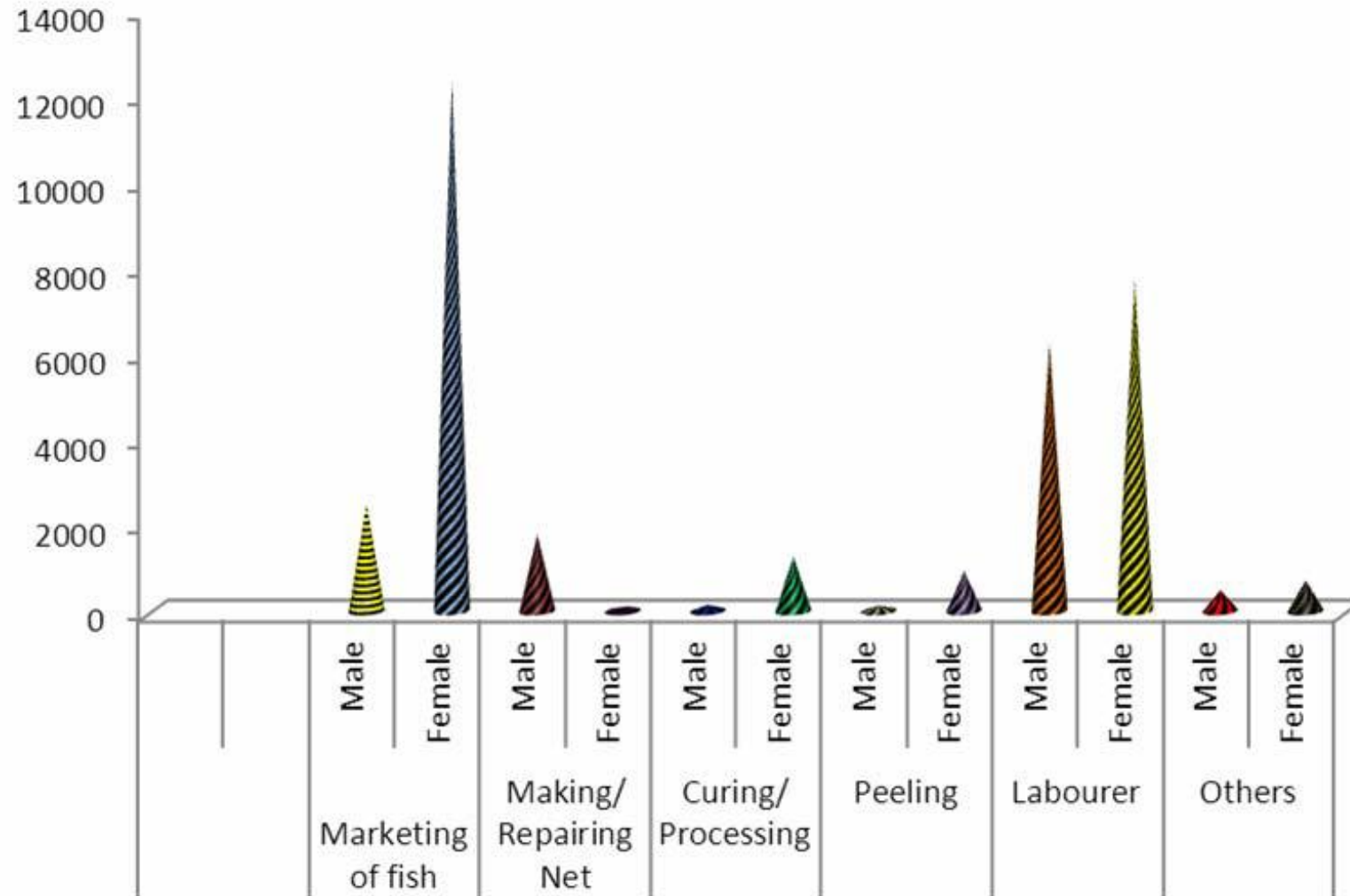
Indicators of cultural food security might include the levels of traditional food **knowledge**, **access** to traditional food systems, and the **safety** of traditional/country food. (Power 2008)

# #THEME: Gender

- Women's role in the social economy of dried fish
- Relations between men and women in social economies of dried fish
- Masculinities



# women's labour



Gender divisions in fishing-related activities in Karnataka (Swathi Lekshmi 2012)

# barriers to economic inclusion

- Poor access to capital
- Cost of storage
- Price fluctuations
- Packaging challenges

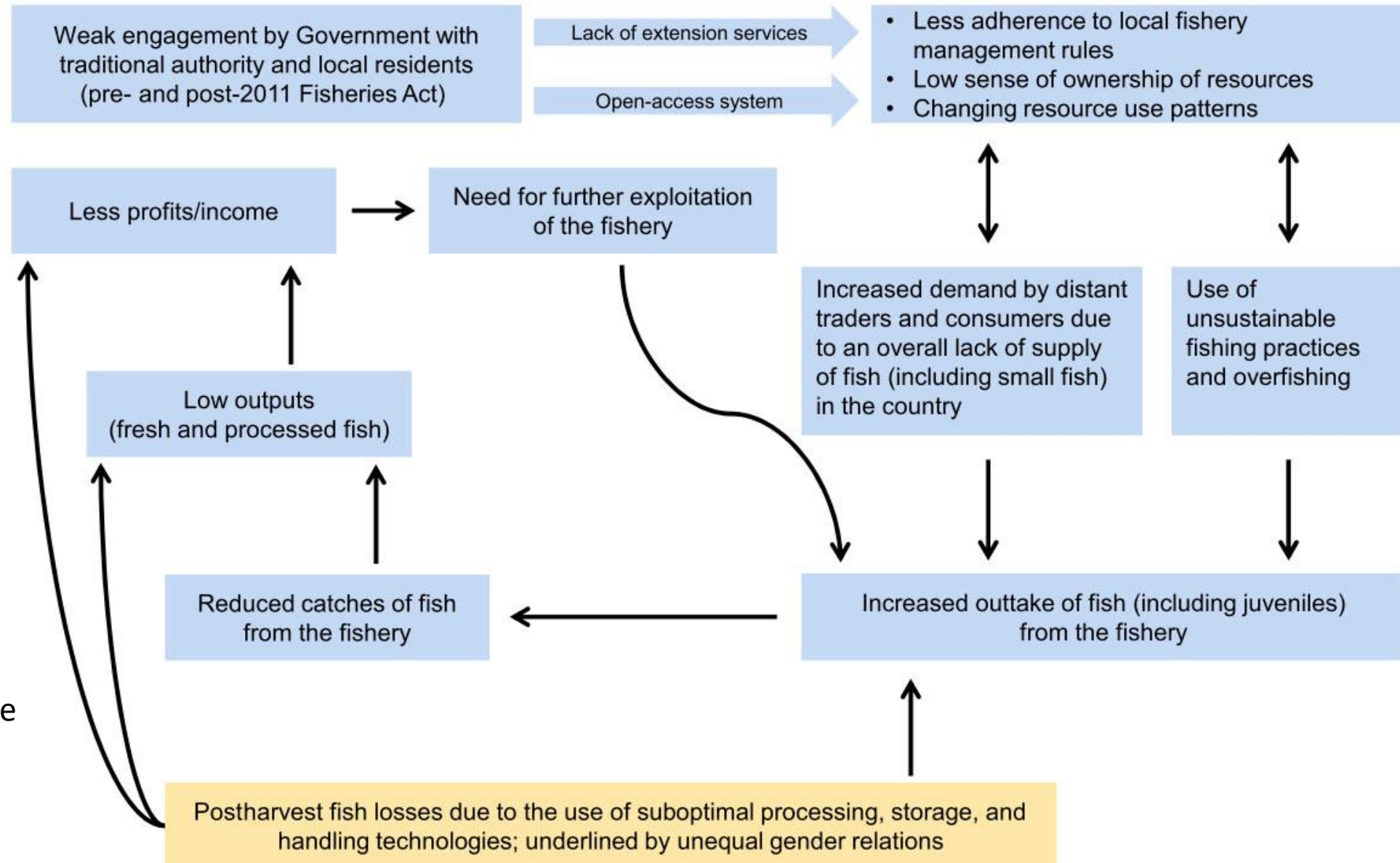
# sustainable livelihoods

**Table 5: Activities of women respondents during lean season**

<b>Activities</b>	<b>Frequency in %</b>
Poultry	52.38
Weaving	38.09
Bamboo works & Handicrafts	33.33
Gardening & Plantation	28.57
Dairy	23.67
Fish Culture	8.52

(Rabbanee et al. 2012)

# social and economic structures



Social-ecological trap: Barotse Floodplain fishery, Zambia (Cole et al. 2018)

# gender ideologies

*'It is through the SHG classes that we got the courage to do business. We began to think of the importance of our own money and ways of making money'  
(Nabeesa, 46 years).*

*'It is after Kudumbashree and the SHGs that younger women entered vending. Otherwise Muslim women do not sell fish' (Shabana, 60 years).*

*'I go to Anjuthengu and take part in the auction and buy fish. But in the Vettoor seashore, I make someone purchase fish for me and I stand in a shed. I don't want to be seen in the seashore with fish. It will shame the male elders in my family.'  
(Noorjahan, 50 years).*

(Aswathy and Kalpana 2001)

**Nutrition,  
food security,  
health**

# **#THEME: Nutrition & food security**

- Nutritional properties of dried fish
- Population level nutritional contribution of dried fish consumption

# #THEME: health

- Studies linking dried fish to health (e.g., health impacts of sodium consumption from salted fish)



# malnutrition reduction

**TABLE 1**

Food composition of the intervention foods per 100 g dry weight<sup>1</sup>

	WF <sup>2</sup>	WF-L <sup>2</sup>	CSB++	CSB+ <sup>3</sup>
	%	%	%	%
Rice, white, milled	77	79	—	—
Fish, <i>Esomus longimanus</i> <sup>4</sup>	6.1	—	—	—
Fish, <i>Paralaubuca typus</i> <sup>4</sup>	6.1	—	—	—
Spider, <i>Haplopelma sp.</i> <sup>4</sup>	1.8	—	—	—
Fish mix <sup>4</sup>	—	9.5	—	—
Mineral and vitamin mix	—	1.7	1.7	1.4
Vegetable oil	4.8	4.8	3.0	8.5
Sugar	4.8	4.8	9.0	8.5
Maize (white or yellow)	—	—	58	65
Dehulled soya	—	—	20	—
Whole soya	—	—	—	20
Skim milk powder	—	—	8	—

Nutrition-dense food supplements that include dried fish, designed for the extremely poor in Cambodia (Skau et al. 2014)

# consumption

**TABLE 3** Annual Per Capita Expenditure on Fish and its Share of Total Expenditure on Food and Animal Protein

Income Quartile	Country							Northern Vietnam	Southern Vietnam
	Bangladesh	China	India	Indonesia	Philippines	Thailand			
Annual per capita fish consumption (kg)									
I	13.05	13.08	10.1	na	52.84 <sup>b</sup>	22.08 <sup>a</sup>	6.86	23.88 <sup>a</sup>	
II	19.2 <sup>a</sup>	23.4	11.5 <sup>a</sup>	na	32.82 <sup>a</sup>	27.96 <sup>ab</sup>	11.71 <sup>a</sup>	25.56 <sup>a</sup>	
III	22.92 <sup>ab</sup>	33.72	13.8 <sup>a</sup>	na	34.42 <sup>a</sup>	32.40 <sup>a</sup>	13.68 <sup>a</sup>	39.24	
IV	33.64 <sup>b</sup>	54.12	24.5	na	54.07 <sup>b</sup>	32.52 <sup>a</sup>	19.32	62.52	
All	22.2	31.08	15	na	43.64	28.8	12.86	37.8	
Expenditure on food as a share of total expenditure (%)									
I	na	63.4	73.2	67.2	59.2	64.5	80.4	97.9	
II	na	54.7	62.4	60.5	49.1	53.7	81.2	93.0	
III	na	47.8	51.2	53.3	41.3	46.0	75.4	91.2	
IV	na	33.2	22.2	38.2	19.21	28.0	45.7	81.9	
All	na	43.1	35.2	47.3	42.2	40.3	59.5	87.1	
Per capita total annual fish expenditure (US\$)									
I	15.97	11.88	9.12 <sup>a</sup>	3.96 <sup>a</sup>	27.99 <sup>a</sup>	20.04	4.08 <sup>a</sup>	19.79 <sup>a</sup>	
II	23.51 <sup>a</sup>	22.92	10.20 <sup>a</sup>	5.52 <sup>ab</sup>	23.00 <sup>a</sup>	27.48	7.32 <sup>ab</sup>	20.99 <sup>a</sup>	
III	28.06 <sup>a</sup>	36.12	12.00 <sup>a</sup>	7.68 <sup>a</sup>	18.18	36.24	9.72 <sup>a</sup>	32.66	
IV	41.19	66.36	24.48	11.64	37.26	47.76	13.32	61.04	
All	27.19	34.32	14.04	7.20	25.42	32.88	8.64	33.57	

WorldFish household survey data (Dey et al. 2005)



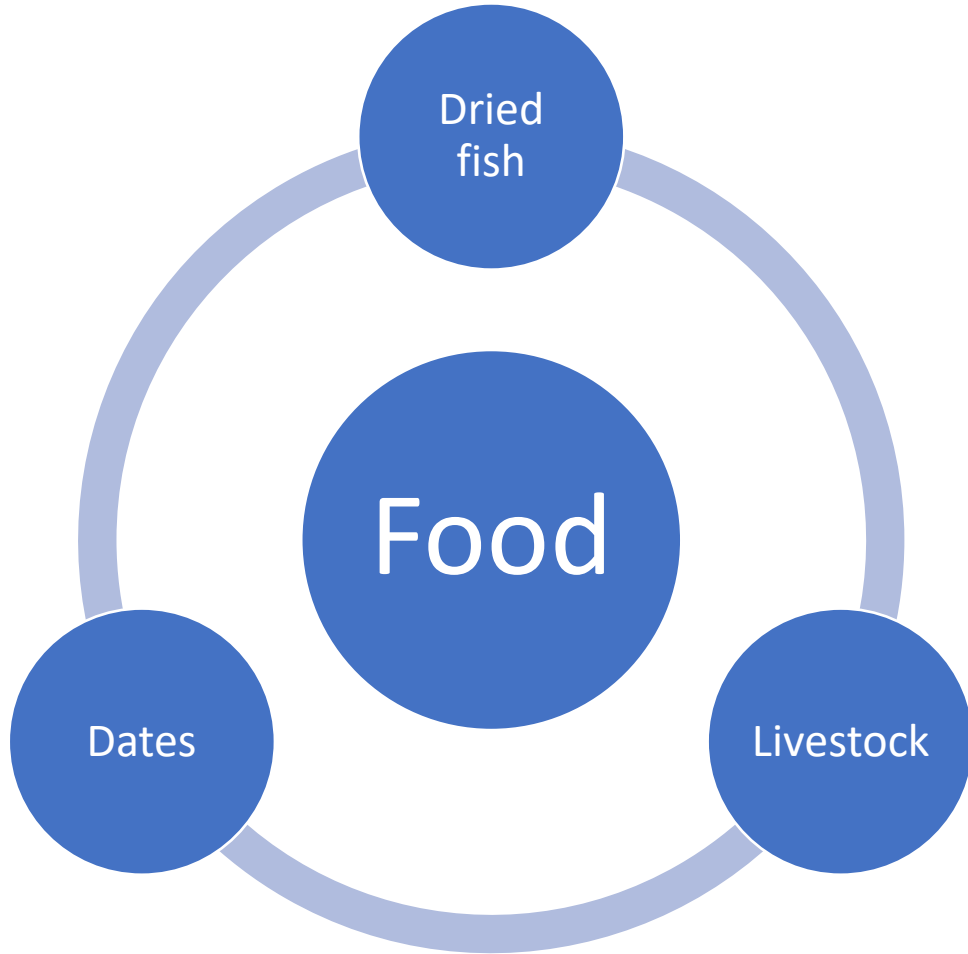
Food and Agriculture  
Organization of the  
United Nations

RAP PUBLICATION 2015/12

## The consumption of fish and fish products in the Asia-Pacific region based on household surveys



# food security



Dried fish in the Middle East (from ElMahi 2000)

# nutrient analysis

- micronutrients
- protein
- fatty acids
- fibre
- ash
- moisture content

# lactic acid bacteria strains

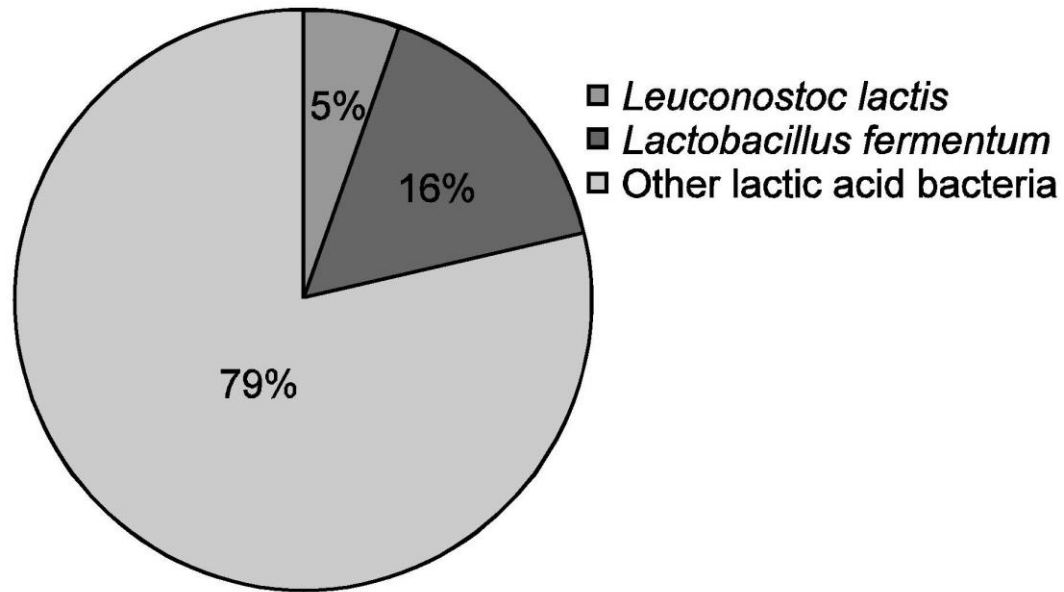


Fig. 2: Distribution of *Leuconostoc lactis* and *Lactobacillus fermentum* in the lactic flora of adjuevan

**Table 3** T-RF lengths of 16S rRNA gene of representative isolates from fermented small fish with boiled rice in Myanmar

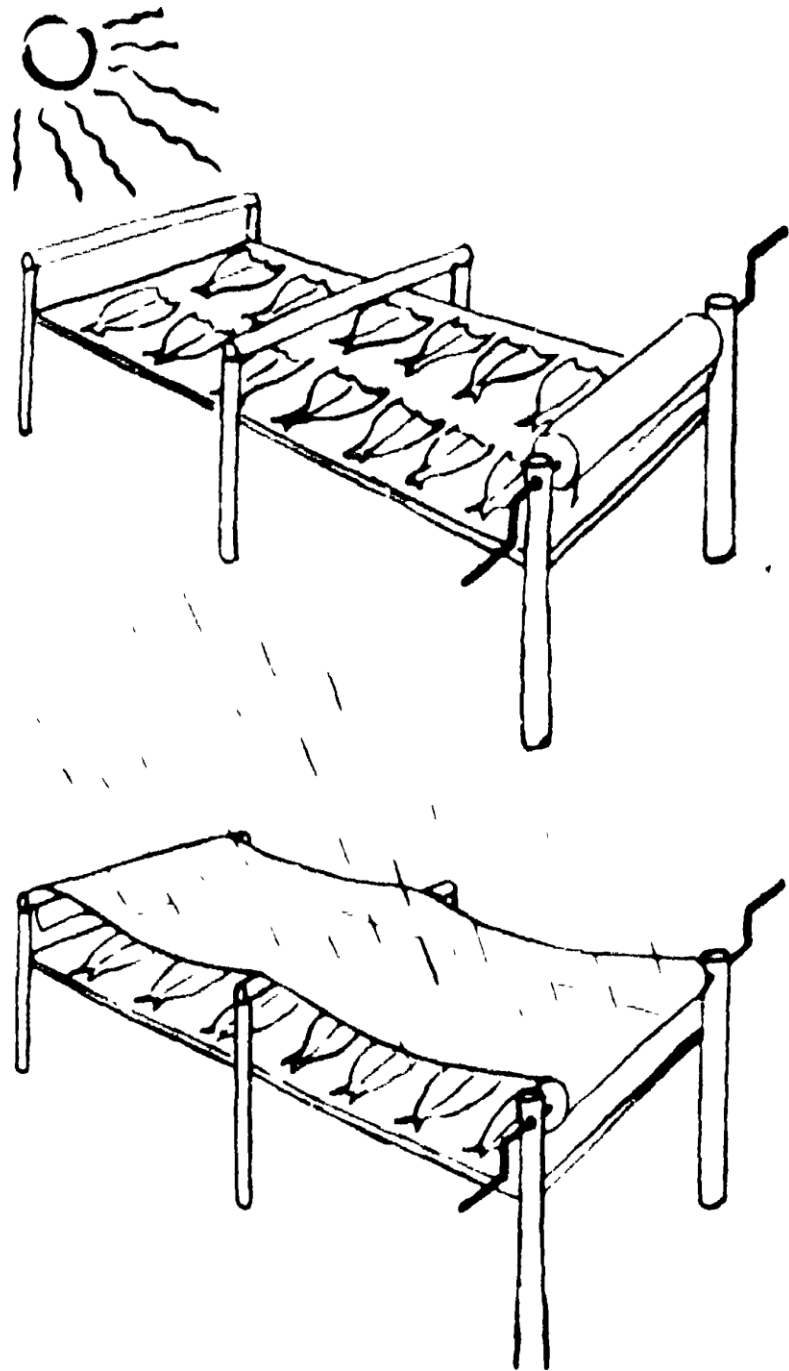
Isolates	Length <sup>b</sup>
<i>Lactobacillus plantarum</i> D0-1-1 <sup>a</sup>	905
<i>Lactobacillus plantarum</i> D5-5-2(iv) <sup>a</sup>	906
<i>Lactobacillus plantarum</i> group D1-5-1(i)	904
<i>Lactobacillus plantarum</i> group D0-1-2(i)	905
<i>Lactobacillus farciminis</i> D4-4-1(i)	485
<i>Lactobacillus farciminis</i> D2-6-1(i)	486
<i>Lactobacillus farciminis</i> D3-6-2(v)	486
<i>Lactobacillus futsaii</i> D4-4-2(v)	485
<i>Weissella paramesenteroides</i> D0-1-6(ii)	909, 912
<i>Pediococcus pentosaceus</i> D0-1-3(i)	78,79
<i>Lactobacillus reuteri</i> D0-1-2(ii)	48,49

# food quality and safety

- Physical contaminants
- Pesticides
- Unsafe bacteria and fungi
- Zoonotic parasites
- Genotoxins (esp. PAH)
- Food safety standards

# disease risks

- nasopharyngeal carcinoma
- hypertension
- exposure to carcinogens
- respiratory disease

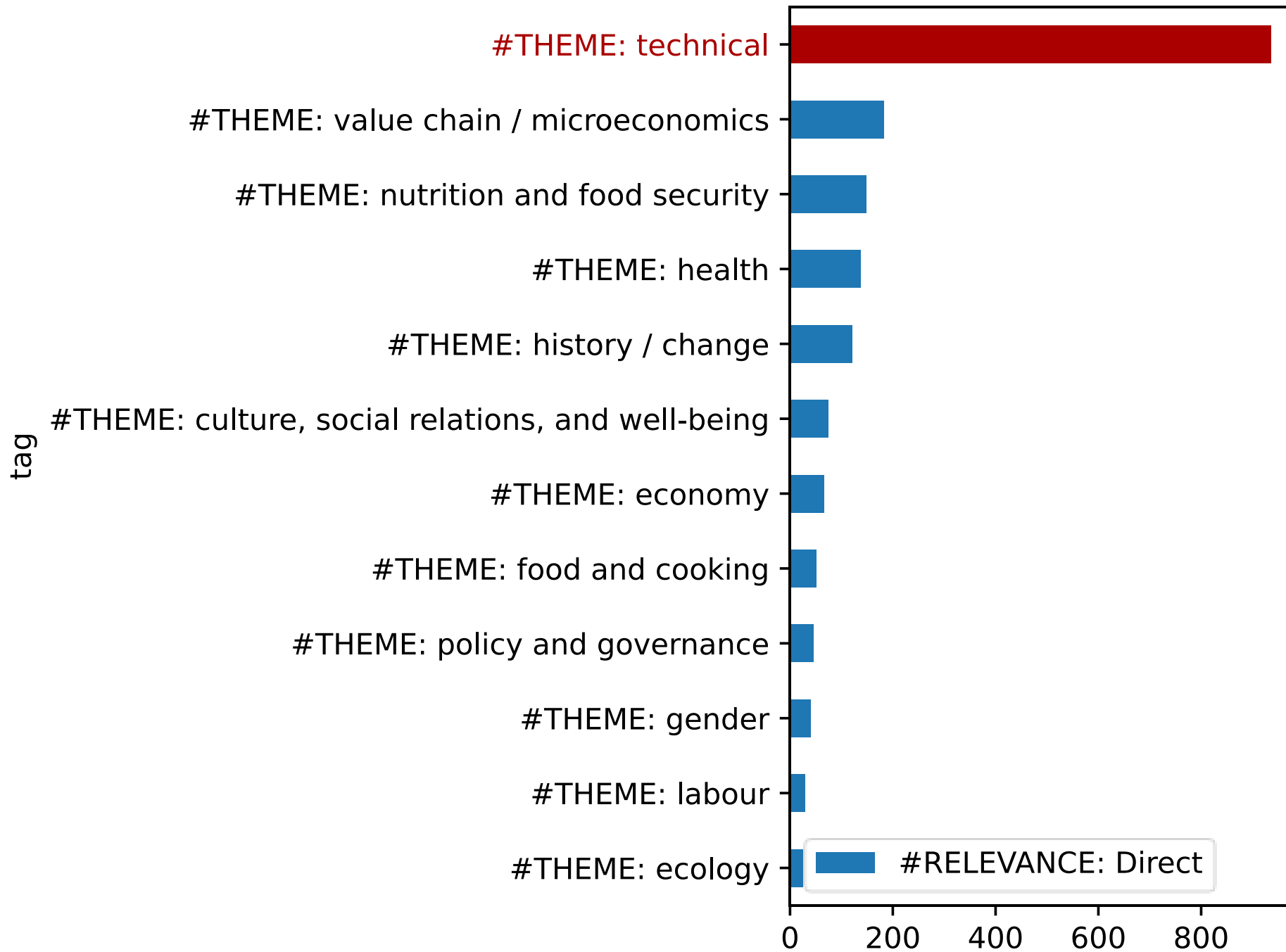


**Fig. 5** Prevention of contamination by keeping the fish off the ground with polyethylene covers to prevent rain damage

Waterman, J. J. 'The Production of Dried Fish'. Food and Agriculture Organization of the United States, 1976.



**technical**

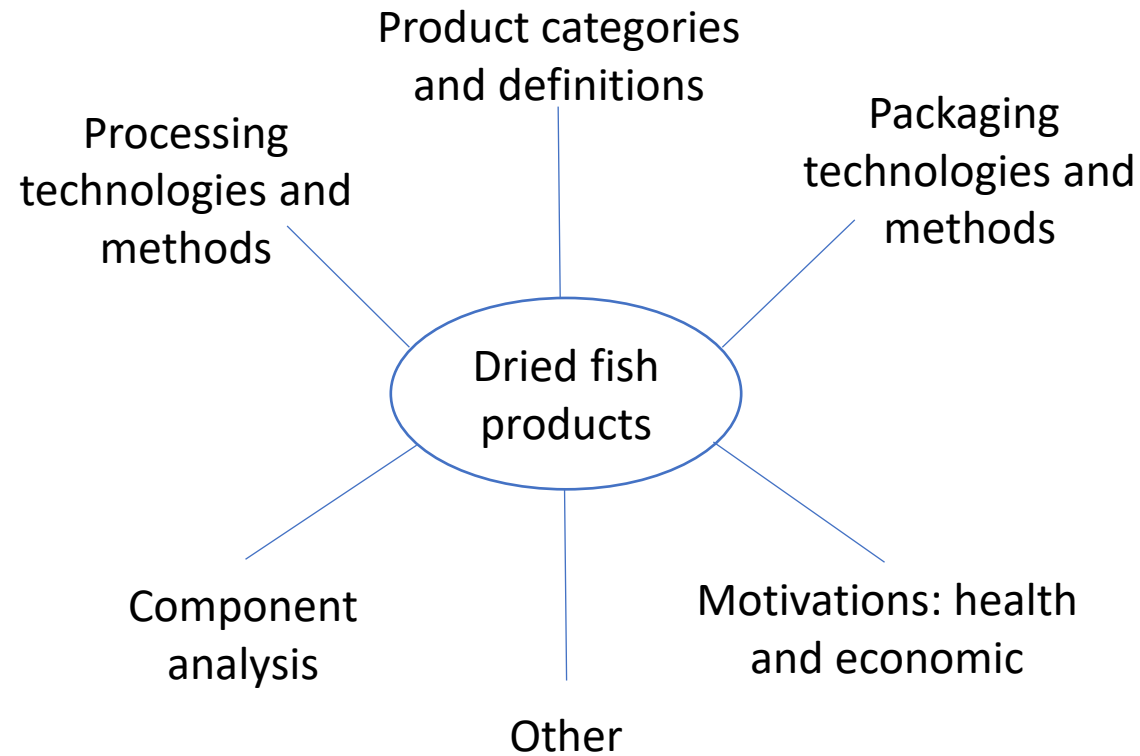


# #THEME: Technical

*Works grounded in scientific or engineering analysis and methods.*

Broadly: Food Science

# #THEME: Technical Categorization by sub-theme



# #THEME: Technical product categorization

Table 1. Fish Sauces.

Country	Name	Fish species	Method (fish:salt) and time of fermentation
Egypt	-	<i>Affinis affinis</i> (gambusia)	4:1 salt; for 150 d then salted fish was manually drained using cheese cloth to separate fish keep out salted fish
Sudan	Terkin	<i>Hydrocynus</i> sp. (kass or tiger fish) <i>Alestes</i> sp. (kawara)	-; 6 mon
Japan	Shottsuru Uwo-shoytu Ikashoyu	<i>Astroscopeus japonicus</i> (sandish) <i>Clupea pichardus</i> (sardine) <i>Omnastrephis sloani</i> (squid) <i>Omnastrephis pacificus</i> (squid)	5:1 salt + malted rice and koji (3:1) added;
Korea	-	-(shrimp)	Salt 4:1; 6 mon
Khmer Republic	Nuoc-mam	<i>Stolephorus</i> sp., <i>Ristrelliger</i> sp., <i>Engraulis</i> sp., <i>Decapterus</i> sp., <i>Darasoma</i> sp., <i>Clupea</i> sp.	3:1-3:2 salt; 3-12 mon
	Nuoc-mam-gau-ca	<i>Clarius</i> sp., <i>Ophicephalus</i> sp.	Livers only 10:1 salt; for 6 d then boiled and
Cambodia	Nuoc-mam	<i>Stolephorus</i> sp., <i>Ristrelliger</i> sp., <i>Engraulis</i> sp., <i>Decapterus</i> sp., <i>Darasoma</i> sp., <i>Clupea</i> sp.	3:1-3:2 salt; 3-12 mon
Thailand	Nam-pla	<i>Stolephorus</i> sp., <i>Ristrelliger</i> sp. <i>Cirrhinus</i> sp.	5:1-1:1 salt; 5-12 mon
Malaysia	Budu	<i>Stolephorus</i> sp.	5:1-3:1 salt + palm sugar and tamarind; 3-
Myanmar	Ngapi	-	5:1 salt; 3-12 mon
Philippine	Patis	<i>Stolephorus</i> sp., <i>Clupea</i> sp., <i>Decapterus</i> sp., <i>Leionathus</i> sp.	3:1-4:1 salt; 3-12 mon
Indonesia	Ketjap-ikan	<i>Stolephorus</i> sp., <i>Clupea</i> sp., <i>Leiognathus</i> sp., <i>Osteochilus</i> sp., <i>Puntius</i> sp., <i>Ctenaps</i> sp.	6:1 salt; 6 mon
	Bakasang	<i>Stolephorus</i> sp.	5; 1.5-3.5 fish; salt ratio; 3-6 wk
India and Pakistan	Colomba cure	<i>Ristrelliger</i> sp., <i>Cybbium</i> sp., <i>Clupea</i> sp.	Gutted fish with gills removed and tamarind added 6:1 salt; up to

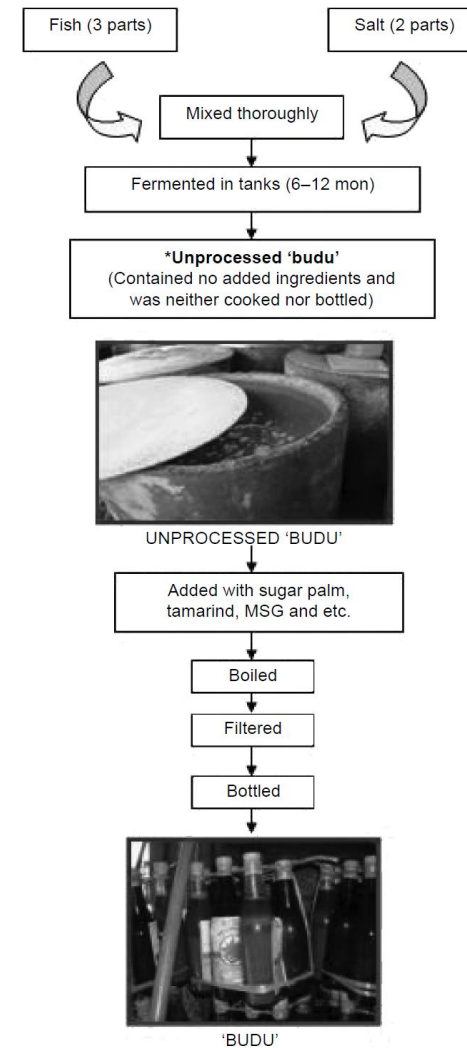
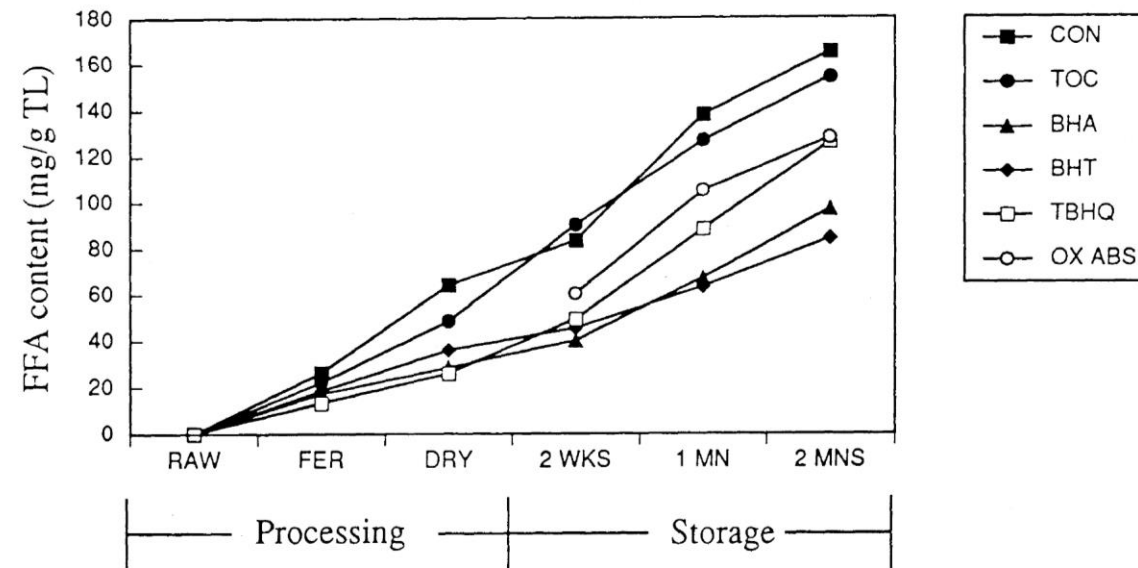


Fig. 1. Flow chart for production of budu (Source: Rosma et al. 2009).

Ali F. El Sheikha, and Didier Montet. 2014. "Fermented Fish and Fish Products: Snapshots on Culture and Health." In *Microorganisms and Fermentation of Traditional Foods*, edited by Ramesh C. Ray and Montet Didier. CRC Press.

# #THEME: Technical Processing improvements



**Figure 6.** Changes in free-fatty acid (FFA) content of total lipid in salted fermented fish during processing and storage.

# #THEME: Technical

## Derivative products

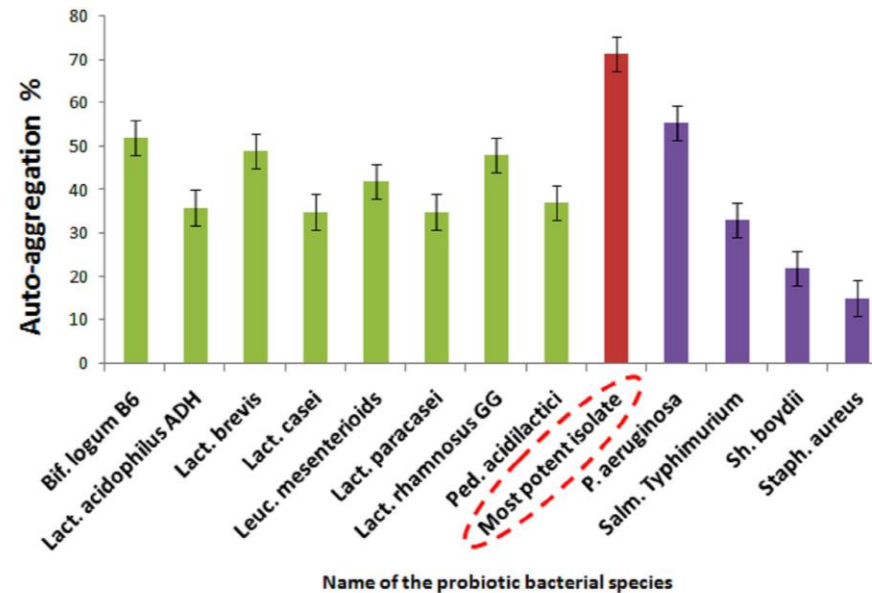


Fig. 5 – Graph showing the comparison of auto-aggregation values by the most potent isolate in the current study with other known probiotic bacteria.

**value chains,  
economics**



# #THEME: Value chains and microeconomics

- Empirical study of dried fish value chain segments as economic activity
- Flows of resources, capital, and labour across segments
- Value addition across the chain
- Economic relations in fish drying and marketing
- Analysis of consumption choices; household food preferences

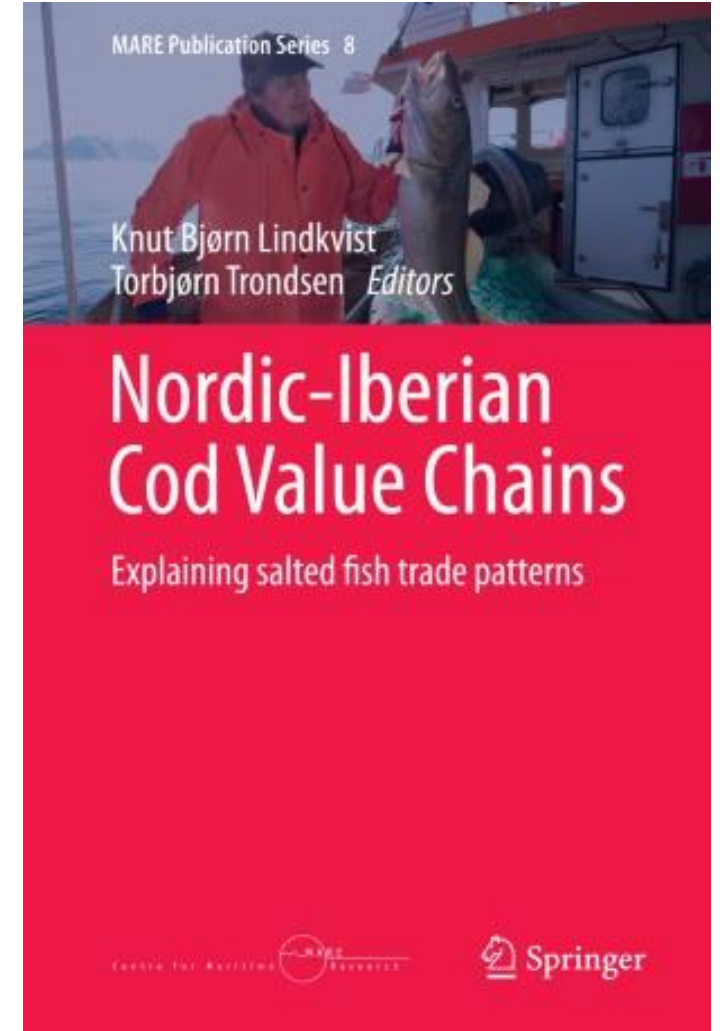
# descriptive assessments of value chains and markets



- Largest subgroup by far
- Framed as sectoral/ market studies before 2000s, 'value chains' since – little difference
- Mostly qualitative, some financial analysis
- Mostly Africa/Asia, often linked to ODA projects
- Variable quality

# business management

- Mostly focused on salt cod trade between N & S Europe
- Traceability, supply chain management, product quality
- Theoretically grounded (e.g. economic geography)
- Only 1 comparable study from Global South



# microeconomic studies

- 4 areas: Demand (elasticities); consumer preferences (WTP); price formation & transmission (e.g. market integration); technology adoption (e.g. profitability of fish smoking using alternatives to mangrove wood)

Table 7: Distribution of Marketing Margins by Intermediaries

Producer price ₦ per kg	Wholesale price ₦ per kg	Sub-wholesale price ₦ per kg	Retail price ₦ per kg
300.69	390.88	486.20	585.84
Share of marketing margins (%)	31.63	33.43	34.94

**Mafimisebi & Okunmadewa. (2006). Are Middlemen Really Exploitative? Empirical Evidence from the Sun-Dried Fish Market in Southwest, Nigeria**

# waste and loss

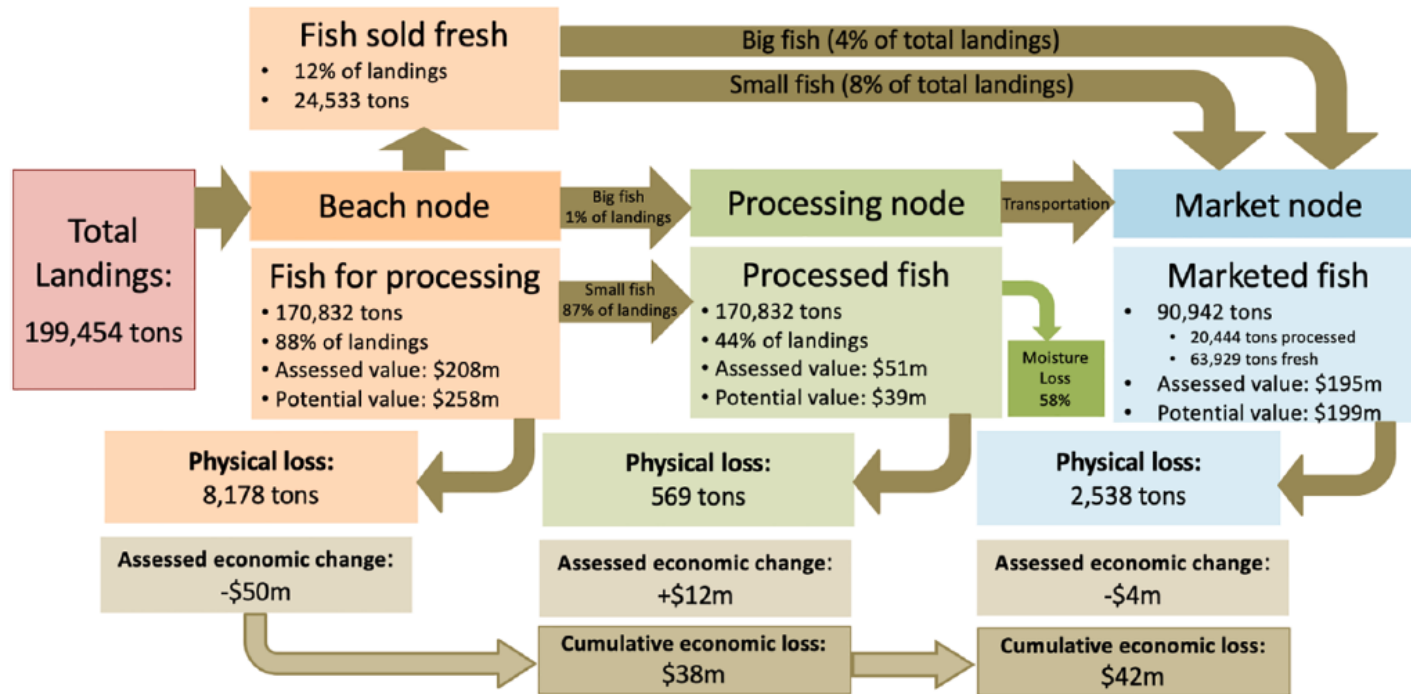


Fig. 5. Schematic diagram on the PHFL assessment and valuation of the fishery sector along the fish value chain.

- Small number of studies in Africa and South Asia.
- Distinct from heavily technical studies of loss and waste.
- Focus on assessment of post-harvest losses along the VC, linked to handling practices.
- Links between containers used for transportation and waste/loss.
- Impacts of technological change in bycatch utilization.

**Torell et al (2020) Assessing the economic impacts of post-harvest fisheries losses in Malawi**

# social dynamics of markets and livelihoods

- Mainly from anthropology & geography, focus on Global South
- Political ecology & social organization of fishing & marketing
- Influence of globalization, ecological change, social relations, migration, culture on livelihoods
- Descriptive studies of trader and retailer behaviour



Abbott et al (2015). Rain and Copper: The Evolution of a Fish Marketing Channel in a Rapidly Changing Region of Southern Africa

# #THEME: Economy

- Macro-economic analysis
- Dried fish production, consumption, employment trends, or trade at the aggregate regional or national scale
- Works that provide information on the broad economic context within which dried fish economies operate

# #THEME: Labour

- Labour relations
- The social organization of work practices
- Quality of work



# Anthropology of work / gendered work

- Several rich anthropological studies of in fisheries from Newfoundland.
- Numerous studies addressing gendered nature of work in fisheries in Global South
- Some descriptive, others with gender studies lens

*"I started selling fish when I was 10 years old. I helped my mother who bought fish in Palayam market and sold it by the roadside in Pattom (a central part of Trivandrum city). I married when I was 18 and stopped going to the market because my husband wouldn't allow it. But, then our income decreased, and I had to look after my sisters when my mother died so again I started going to the market."*

Quote from respondent in:

**Hapke & Ayyanketil (2004) Gender, the work-life course, and livelihood strategies in a South Indian fish market**

# exploitative working conditions



- Several studies from Bangladesh – mainly Dublarchar
- 1 study from India, 1 from Myanmar
- Focus on exploitative working conditions (bonded labour, slavery), and arduous/dangerous working conditions

# **policy and governance**

# #THEME: Policy & governance

*Analysis or theoretical discussion of policy or governance institutions*

- Fisheries management
- Economic development
- Resource management
- Poverty-reduction
- Price controls
- Food safety regulations
- etc.

# history of policy impacts on fisheries development

- Broad scope of geography & time
- Chart policy impacts on fisheries with large dried components – classic examples are Butcher, (SE Asia) & Kurlansky (N Atlantic)
- Other examples:
- Effects of colonial salt tax policy on organization of India's fish curing yards (Reeves et al, 2014)
- Interplay of state-led fisheries policy and informal governance mechanisms (Nova Scotia; Lake Victoria; DRC)

THE CLOSING OF THE FRONTIER  
A History of the Marine  
Fisheries of Southeast Asia  
c.1850-2000

JOHN G. BUTCHER



A MODERN ECONOMIC HISTORY OF SOUTHEAST ASIA  
General Editors: Anthony Reid, Anne Booth, Pierre van der Eng



A BIOGRAPHY OF THE FISH THAT CHANGED THE WORLD

cod



Mark Kurlansky

WINNER BEST FOOD BOOK  
GLENFIEDICH FOOD & DRINK AWARDS



# Studies of effects of fisheries management and trade policies

- Policy oriented studies on impacts of policy on fish marketing and trade (inc. DF)
- Provide policy recommendations based on field research - e.g. Neiland & Béné, 2004 – Lake Chad Basin
- Kent (1987, 1988) provides early review of role of fish (including DF) in alleviating malnutrition throughout the Global South and gives policy recommendations

# governance of the modern salt cod trade from N Europe to Iberia

- Rooted in conceptions of VC governance from economic sociology theory
- Emphasizes quality conventions and standards
- Focus on innovation, competitiveness & public policy to promote salt cod industry



FIGURE 3. REGIONAL COLOR PREFERENCES FOR SALTED COD IN 2010.

Larsen (2014). Governance, Quality Conventions, and Product Innovation in a Value Chain: The Case of the Spanish Salted Fish Market

**conclusions**



# Strengths of the literature

- Strong literature on Global South from Global South Authors
- Literature with deep history and thematic continuity
- Substantial literature on nutritional benefits and health threats
  - Methods and technologies to address these
- Considerable buried rich detail

# Research gaps and opportunities

Broadly, what we know already:

- The literature is fragmented, lacks synthetic analysis
- Social science and social-ecological areas very thinly represented

# Research gaps and opportunities

## Systematic value chain research

- Critical approaches to gender, social difference, value chains
- Dried fish political ecologies
- Comparative environmental impact assessments of value chains

# Research gaps and opportunities

## Consumption related

- Consumption surveys with disaggregated data on dried fish
- Population-level analyses of nutrition security
- Systematizing of nutrient composition literature
- Food security studies

# Research gaps and opportunities

## Interventions

- Technical solutions lack governance framing
- Rights-based approaches:  
Food sovereignty, cultural food security
- Socio-cultural factors affecting uptake of improved technologies / interventions

# ried Fish Matters



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