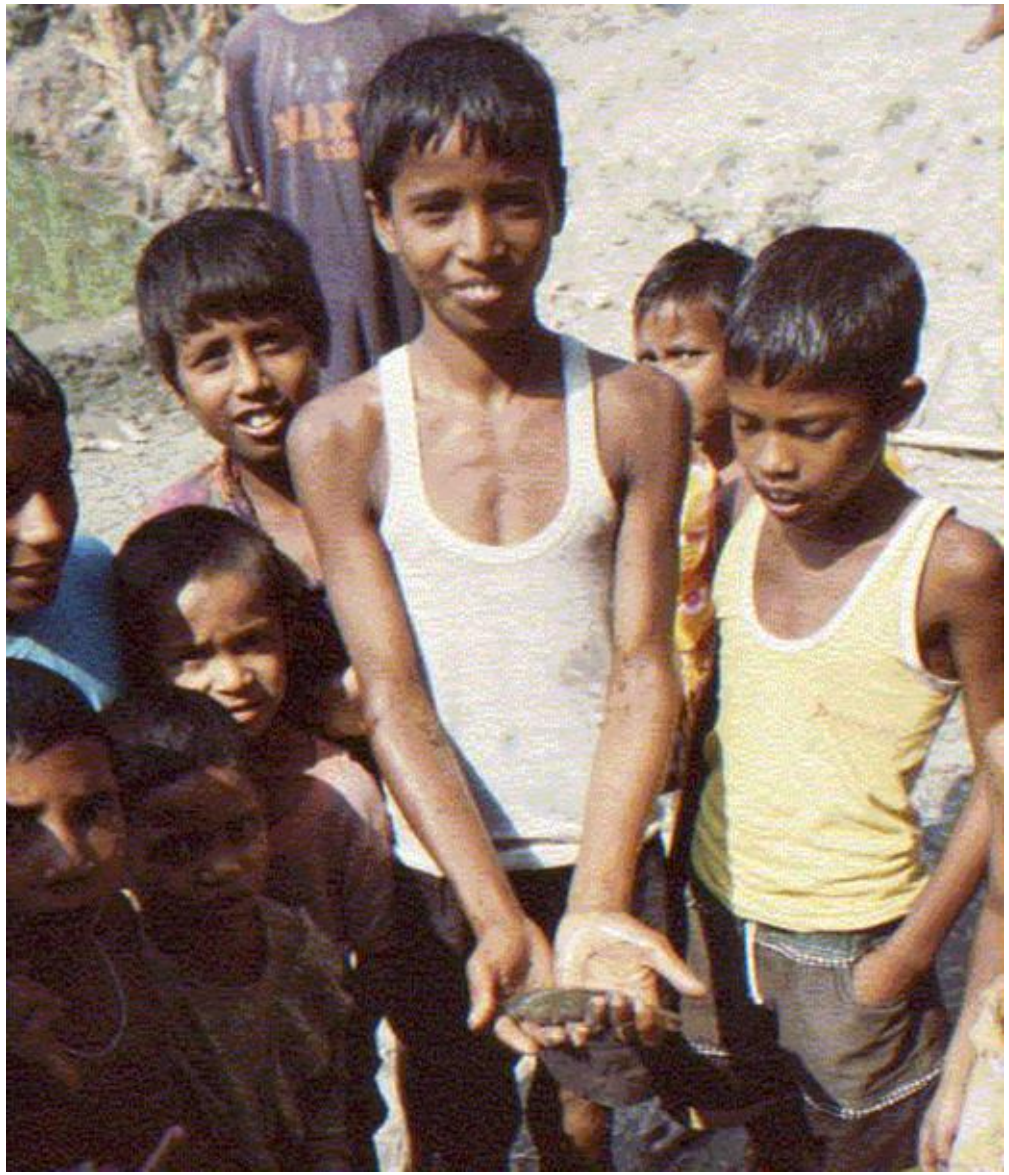

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Fit for purpose?

-linking hatchery design and management to the context

David Little

Expert Workshop on the “Improvement of seed supply for small-scale inland aquaculture”
Szarvas, Hungary, 27 – 28 March 2024

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Food and Agriculture Organization of the United Nations

MATE MAGYAR AGRÁR- ÉS ÉLETTUDOMÁNYI EGYETEM

BE THE DIFFERENCE

Outline thoughts

- Development of aquaculture directly linked to the availability of quality juveniles
- What type of aquaculture?
- Over what period of time?
- What ‘qualities’ of juveniles are in demand?
- And does that mean you need a ‘hatchery’ at all ?
- A hatchery that can also produce advanced fingerlings?
- A hatchery that can improve the cultural traits of the farmed fish over time?

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A puppy is not just for Christmas……

But it is possible hatchery investments CAN have temporary or demonstration functions

Local carp hatchery Surin, Northeast Thailand Built 1983

- Little aquaculture in a region highly dependent on a declining freshwater fishery
- Strong trend towards off-farm migration and part-time farming
- Important but time bound role in stimulating small-holder rainfed polycultures of hatchery carps and self-recruiting species

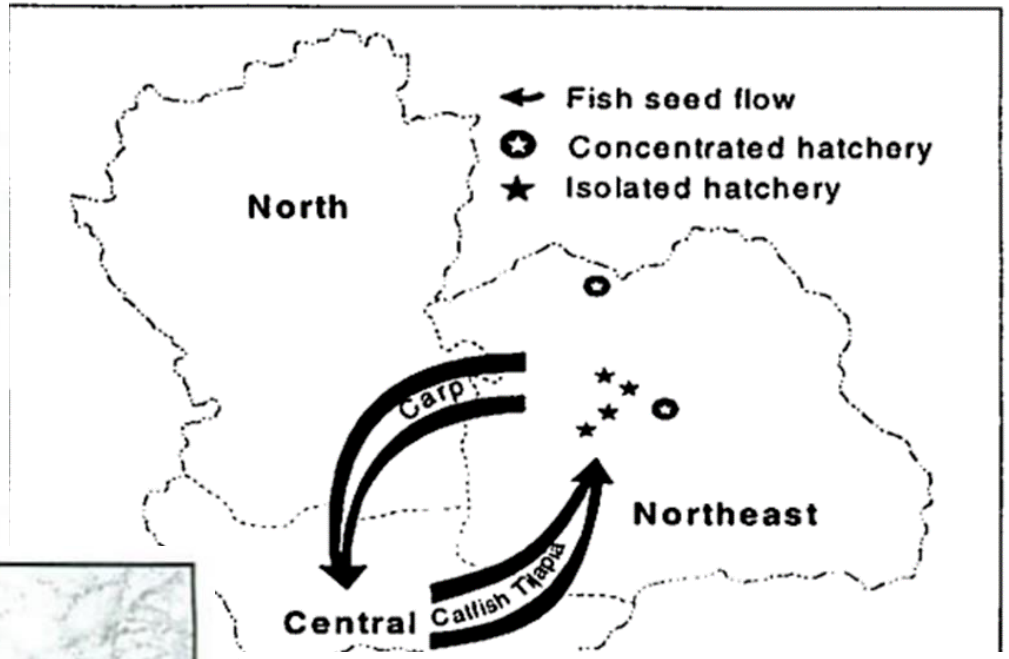
Aquaculture Research

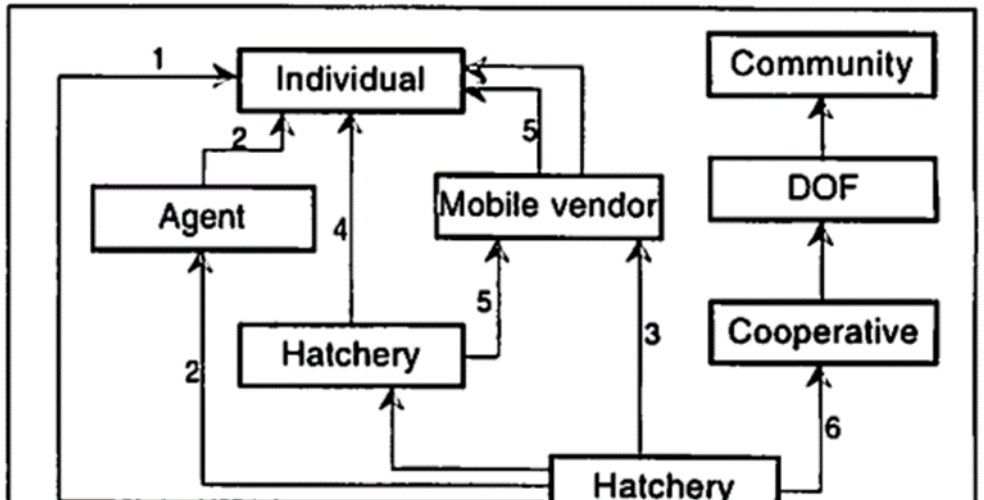
Small-scale hatcheries in north-east Thailand

D. LITTLE, M. SKLADANY, R. RODE

First published: January 1987 | https://doi.org/10.1111/j.1365-2109.1987.tb00122.x |

Demand explodes-light a fire





Failure of ‘constructions’

Both Asia and Africa- a long history of poor investment in hatchery infrastructure

Located in the wrong place, the wrong scale to be run by the wrong people/organisations producing the wrong species/size of juvenile sometimes at the wrong time of year

‘Functional confusion’

Photo Will Leschen

Functional confusion

- To develop and disseminate hatchery technology as without hatchery-produced juveniles - no aquaculture?

- But what is the nature of aquaculture and what roles does it have in terms of cash generation and local nutritional security?

Kaminski et al. Agriculture & Food Security (2024) 13:1
https://doi.org/10.1186/s40066-023-00452-2

Agriculture & Food Security

RESEARCH Open Access

Smallholder aquaculture diversifies livelihoods and diets thus improving food security status: evidence from northern Zambia

Alexander M. Kaminski[1*], Steven M. Cole[2], Jacob Johnson[3], Shakuntala H. Thilsted[4], Mary Lundeba[5], Sven Genschick[6] and David C. Little[1]

Photo Olek Kaminski

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BMC

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BE THE DIFFERENCE

Key issues

- Produce juveniles for whom?? What are their needs and how are these likely to change? e.g. assuming monosex tilapia required rather than mixed sex
- Characteristics of demand- species, timing, size, numbers/customer
- Linking production to distribution-who and how is it done?
- State investments are often poorly linked to entrepreneurial networks to distribute seed or respond to market information
- Private investments stimulated by development support for restocking ‘public waters’ often ineffective, unmonitored and contribute to inefficient bloating

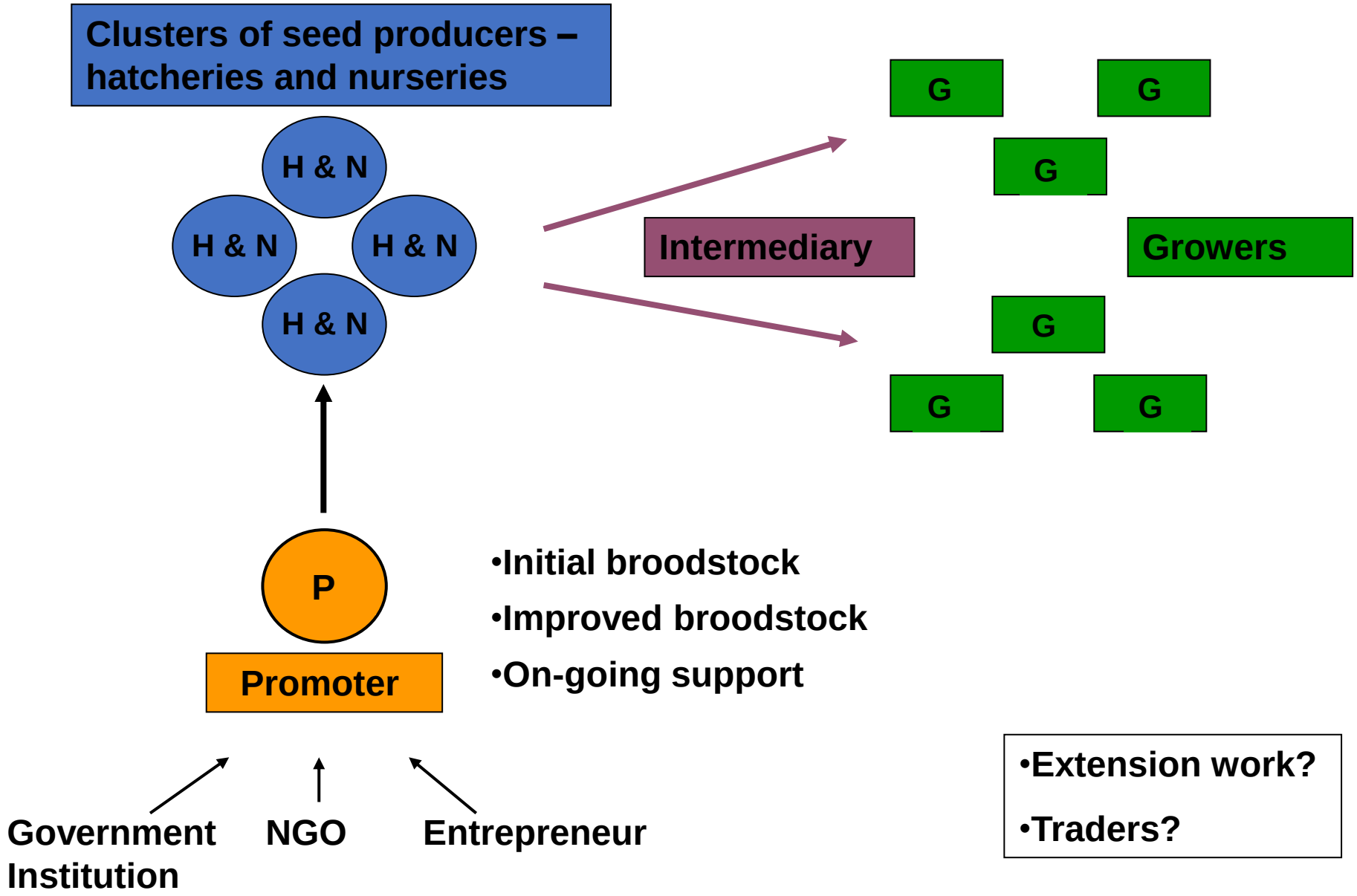
DEMAND ISSUES

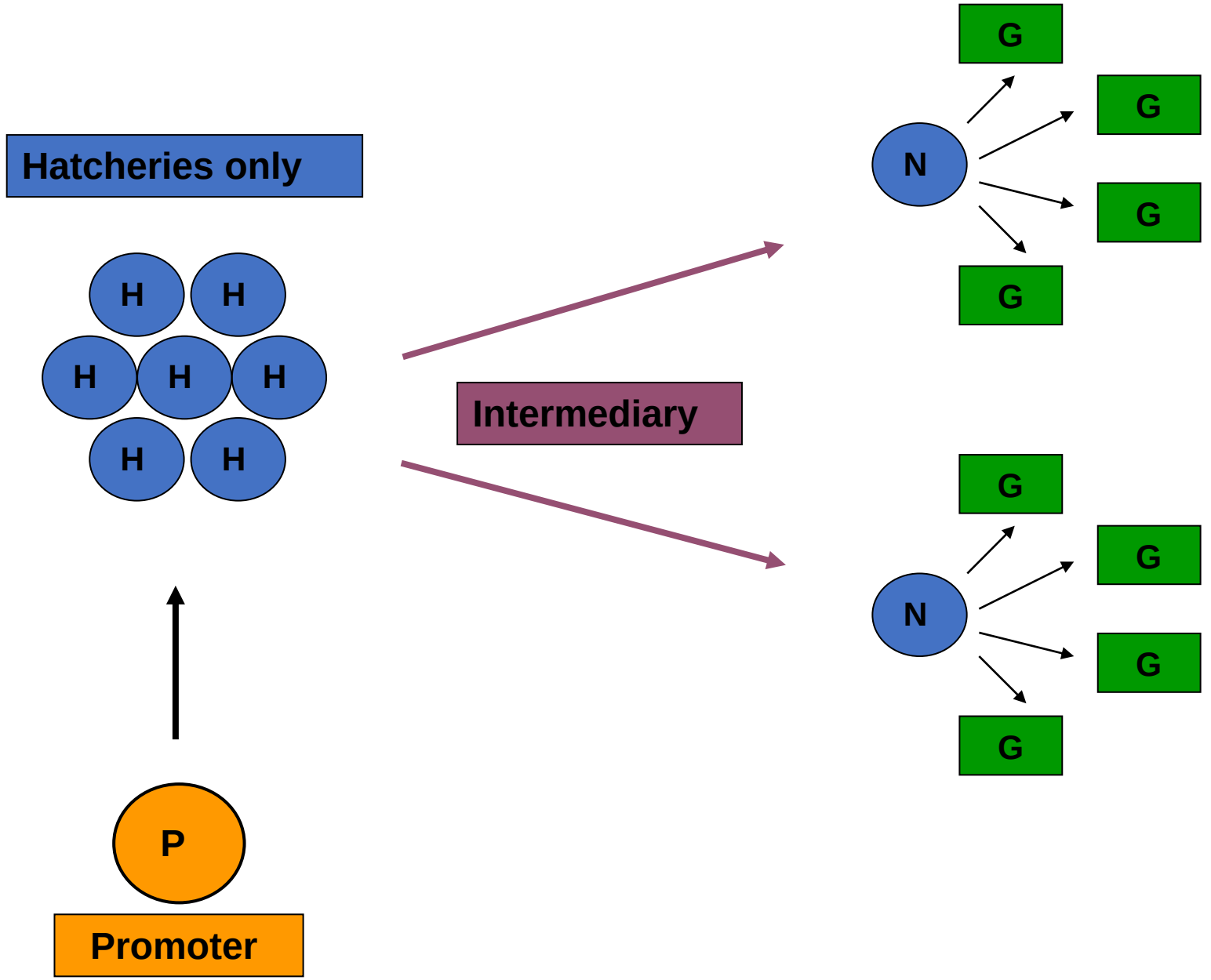
The lag…between decline of fishery supply and rise of demand for aquaculture products

- Failing fisheries may be more resilient than they appear-particularly for those that most depend on them
- Lack of purchasing power may prevent access to farmed fish even when its available…especially if it is larger more expensive fish
- Cheap wild fish continues to compete with, and often to undermine profitability of, local farmed fish even when aquaculture established
- Established aquaculture challenged by imported cheaper farmed fish –Chinese tilapia to SS Africa

Demand issues-

- Is the product good enough?
- Large enough to survive predation/poor management?
- Distribution costs and scaling production


Clusters of seed producers – hatcheries and nurseries
H & N
H & N
H & N
H & N
Intermediary
G
G
G
G
G
Growers
P
Promoter
•Initial broodstock
•Improved broodstock
•On-going support
Government Institution
NGO
Entrepreneur
•Extension work?
•Traders?


Hatcheries only
H
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Intermediary
G
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N
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P
Promoter

Institutional support-context

- Formal e.g. Thailand
  - sustained delivery of high quality *Chitralada* strain of Nile tilapia
  - Central repository of high quality fish
  - Sustained crowding out of poorer strains
- Informal
- eg local organisations-the church

Local nursing

- Local advanced nursing in hapa-in-ponds

- Increased benefits to hatcheries and local nurseries
- Improved access to high quality seed for dispersed farmers

Starting from scratch RAD in Uganda

- Rural Uganda –little fish available
- Limited seed and feed
- Rural Aquaculture Development set up a service hub selling fingerlings and buying back market fish locally
- Iced fish sales in markets
- Extending formulated diets, and reducing overall feed costs with live black soldier fly larvae

Scalable, too complex???

- Are such approaches scalable?
- Are they not still too complex?

- How dependent are they on subsidised capital investment?

- Are they personality -led and dependent and if so does this make them difficult to successfully replicate?

Conventional development approaches

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- Lots of construction-Capital investment led
- Centralised
- Technical support package ineffective
- Little understanding of latent demand for seed or constraints to broader aquaculture development
- Zombie facilities

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BE THE DIFFERENCE

Can local people adopt and does it matter?

- A “bold and catalytic project,” Gishanda Fish Farm
- Partnership between African Parks-managed Akagera National Park and FoodTechAfrica, a consortium of Dutch private companies, with the support of the Rwandan and the Netherlands governments
- RAS-based systems/ TilTEch YY male technology
- Extremely highly capitalised and dependent on a wide range of imported technologies-culture systems, energy and tilapia stocks themselves

https://www.youtube.com/watch?v=Kqh0Q1Aa_Gc

Malawi – a long running saga of poor investments in Government and HE sector by donors

Highly limited purchasing power of most people means farmed fish remains unaffordable-increased reliance on small wild pelagics

Pilots promoting improved pond production around small entrepreneurs' hatcheries suggests local development possible but slow progress to scale likely

Young, networked African entrepreneurs

Often externally trained and from non-fishery backgrounds

Not dependent on donor subsidies or investors

Photos Will Leschen

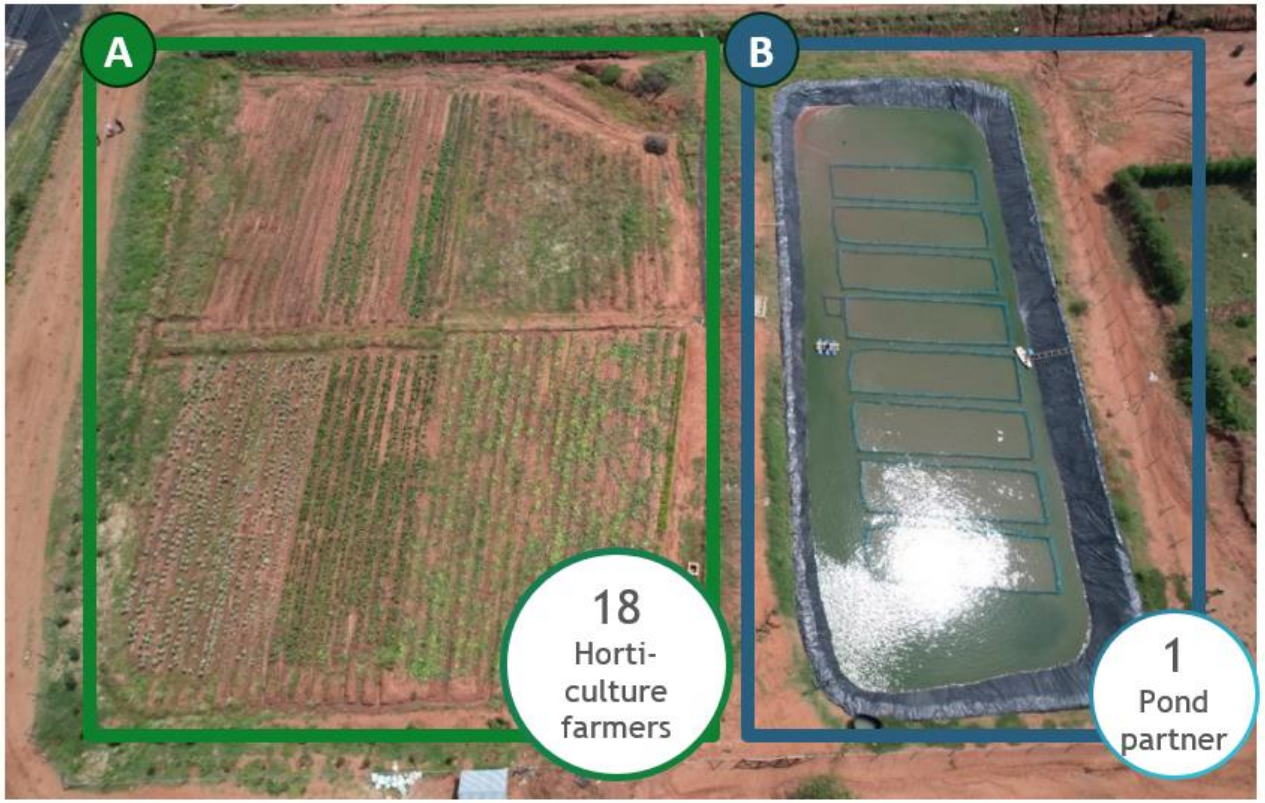
Vertically integrated lake-based tilapia aquaculture in SS Africa

- Feed based, expensive fish for those with greater purchasing power
- Efficient hatcheries but poorer access to selectively bred strains used in Asia

Limited land-new CSR opportunities for tilapia operations

- Promoted a novel model for expanding juvenile production
- Growth requires 5-fold increase in egg production but land acquisition costly and difficult
- Launched an innovative out-grower progamme for egg production

Mutual benefits and embracing circular economy principles



A Horticulture plants

- Partnership with Stable Foods to convert previously idle land to highly productive production sites
- Land is irrigated by effluent water from egg production ponds, rich in nutrients

B Egg production ponds

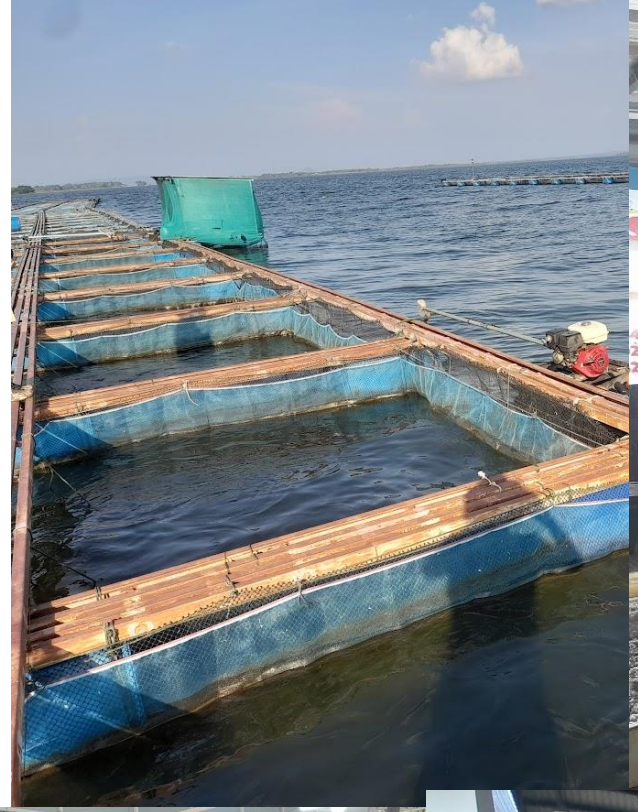
- VF increases egg production capacity by leasing land from community
- Landowner receives passive income, averaging ~$100 per month, 2x minimum wage

Slide courtesy of **Caesar Asiyo, Victory Farms**

Thailand

- Highly competitive environment for quality tilapia juvenile production serving a highly diverse grow-out customer base from intensive cage culture in rivers and impoundments to semi-intensive ponds

- Retail markets now sell mainly live fish, but huge demand for cheaper fish by food service vendors



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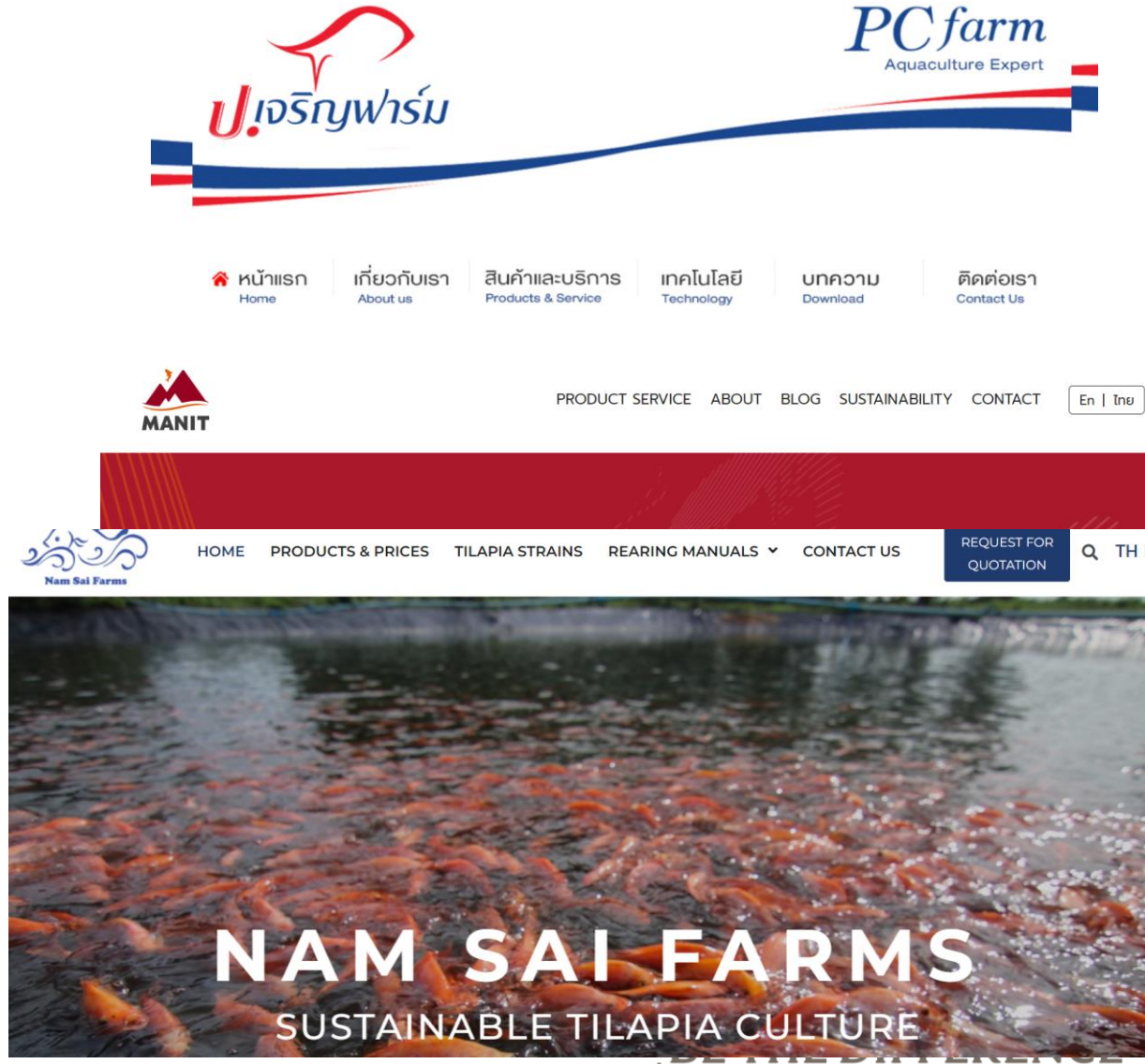
Thailand

- Three major hatcheries with independent, self-funded selective improvements programmes based on GIFT and other strains
- Compete of quality, price, service domestically and internationally

Thai Tilapia Association set up to collaborate on pre-competitive issues



Thailand

- Nam Sai model based around central farm supplying local branches with hatchlings for local sex reversal and sale
- PC and Manit -larger central farms supply through agents
- Increasing access on additional services and efficiency as labour costs rise
- Increasingly sophisticated marketing and communication with customers

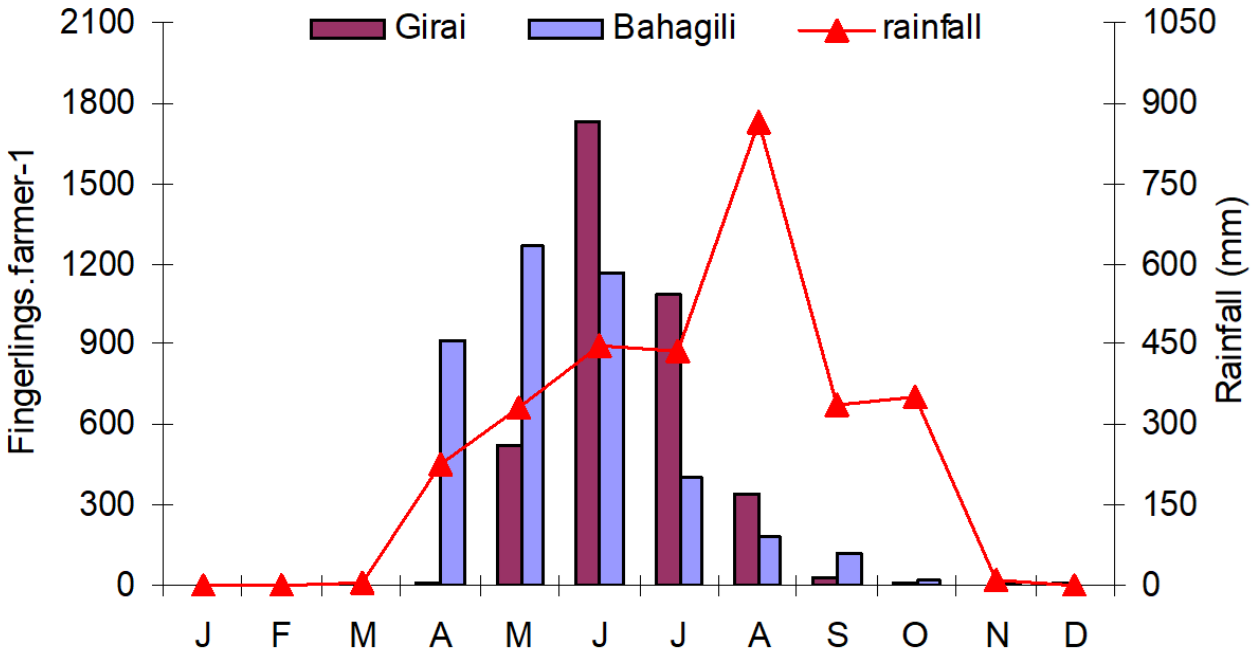
Moving seed closer to the customer-decentralised approaches in NW Bangladesh

- Long distance supply chains limit access to potential farmers
- Higher costs-poorer quality on arrival
- Little local production in 1980s-1990s-seed via rail from Jessore

A food system approach

- Common carp breeding and nursing in ricefields promoted as part of farmer field schools
- Small numbers of GIFT broodfish stocked in spring irrigated ricefields
- Follow-up analysis of adoption and benefits

Seasonality



- Seed production correlated to seasonal rain-fed demand
- 10% failed totally;
- >70% produced more than 4000 seed/season
- Low output per unit area: high output per unit broodfish
- Large fingerlings (>20g fish);
- >40% sold

Barman and Little, 2006

Large seed

- Improved survival
- Produced at the right time
- Close to farmers wanting to purchase
- Reducing risk to traders buying and selling

20 years later

Significant development of wholesale markets for live fingerlings

Large expansion of riverine and minor carps purchased from hatcheries and nursed in ricefields; commercial pivot away from Nile tilapia

3 phases identified

- an initial adoption and NGO-assisted diffusion across the region,
- a parallel process of dis-adoption for some and consolidation for others, (between 2000-2014 it was abandoned in 40% of the communities previously practicing)
- a period of intensification and expansion, with new adopters

Pounds et al,sub

Incentives

- Cash-it's a business and important part of farm incomes
- Relatively low risk as market driven
- Supports increased home consumption of fish

Disincentives

Loss of land

Too little, inconsistent water

No time

Where else are ricefields used for juvenile production?

- APDRA building expanding on a traditional source of fish in areas of Madagascar Highlands

- After Government privatised hatcheries and certified them restricted supply threatening traditional carp culture

- APDRA supported promoting juvenile carp production in ricefields

https://www.apdra.org/index.php/en/our-projects/madagascar-en

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Traditional knowledge and innovation analysis: rethink the contribution of ricefish farming towards food security in Madagascar Delphine LETHIMONNIER 1 , Rija ANDRIAMAROLAZA1 , Barbara BENTZ1 , Julie MANDRESILAHATRA1 , Olivier MIKOLASEK2 , Jean-Michel MORTILLARO2 , Modestine RALINIAINA3 , Diana-Edith ANDRIA-MANANJARA3, Marc OSWALD 4

BE THE DIFFERENCE

Moving emphasis away from hardware to software-effective promotion and support for hatchery development

- *Successful*-Riverine carps=-Technicians from India and Vietnam trained in China in induced breeding
- *Less successful*:Chinese technicians visit Sri Lanka or various countries in SS Africa
- *Mixed success:* Residential training in hands on tilapia at AIT, Bangkok
- On job training at well established commercial cage farms in Africa
- Long term commitments of hubs and projects funded by donors

Key characteristics of effective promoters

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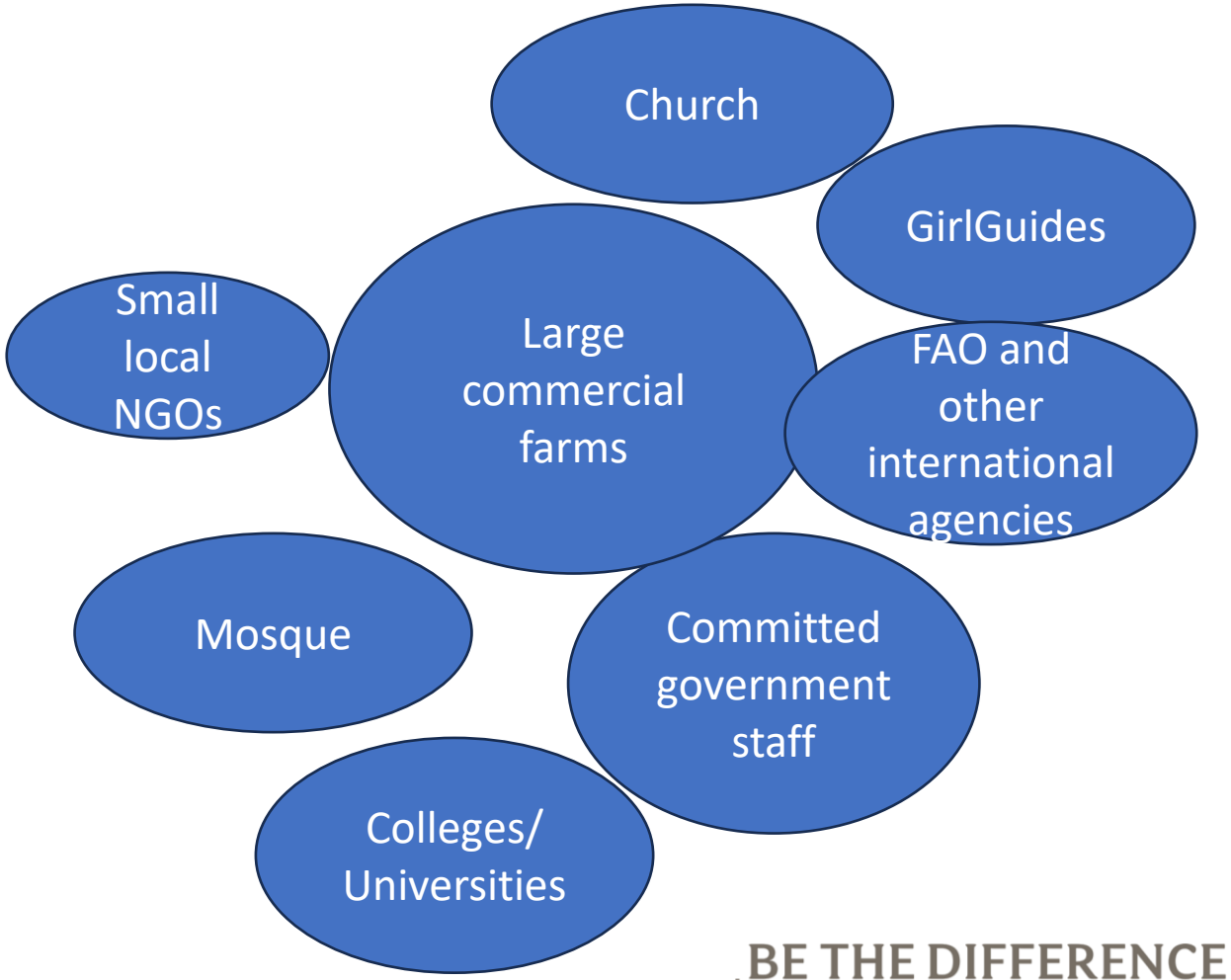
- Good participant selection –important for a short course or longer term training at a higher level
- NOT 9-5…its 24/365 business
- Demand driven
- Work in partnership (SDG17)
- PASSION- and commitment



New horizons

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- Hatchery strategies supporting nutrition-sensitive aquaculture

frontiers | Aquaculture Sections Articles Research Topics Editorial Board

ORIGINAL RESEARCH article

Front. Aquac., 16 October 2023
Sec. Production Biology
Volume 2 - 2023 | https://doi.org/10.3389/faquc.2023.1271715

This article is part of the Research Topic
Blue Foods Security and Sustainability
View all 9 Articles >

Cracking the code of hatchery-based mass production of mola (*Amblypharyngodon mola*) seed for nutrition-sensitive aquaculture

Francois Rajts[1] Sourabh Kumar Dubey[2*] Kalpajit Gogoi[3] Rashmi Ranjan Das[2]
Saurava Kumar Biswal[4] Arun Panemangalore Padiyar[2] Suresh Rajendran[3]
Shakuntala Haraksingh Thilsted[1] Chadag Vishnumurthy Mohan[1] Ben Belton[1,5†]

Free breeding, self-recruiting- taking the costs out of juvenile supply

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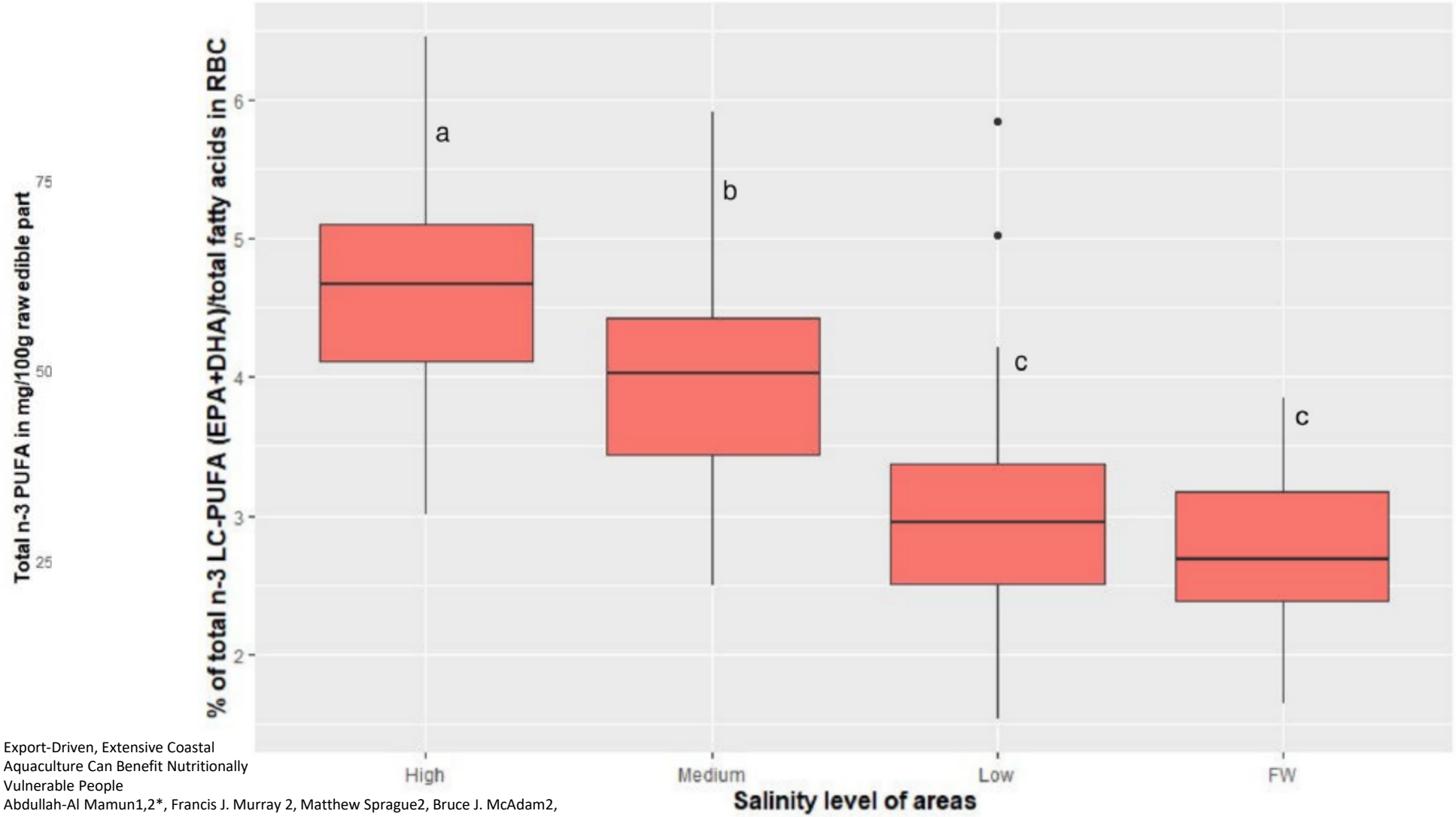

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Export-Driven, Extensive Coastal Aquaculture Can Benefit Nutritionally Vulnerable People
Abdullah-Al Mamun1,2*, Francis J. Murray 2, Matthew Sprague2, Bruce J. McAdam2,

Species selection and breeding goals

- Who does it? Who controls the direction of change and benefits?

- Would a selective breeding programme have bettered the social and human outcomes we are beginning to understand?
- And what of the environmental impacts of different juvenile supply and distribution strategies?

Conclusions

- Start small, start cheap-pilot technology that is easy to imitate, learn about demand characteristics

- Expect change, maintain farmer –promoter- researcher dialogue
- SDG17 –YES!! but consider drivers for partnership

- Public Investment in improved strains should work backwards from demand and key desired societal outcomes

Acknowledgements and thanks

- William Leschen
- Michael Skladany
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- Tim Messeder