

AQUACULTURE AND ADAPTATION TO CLIMATE CHANGE: climate risk management in tilapia cage culture in northern Thailand

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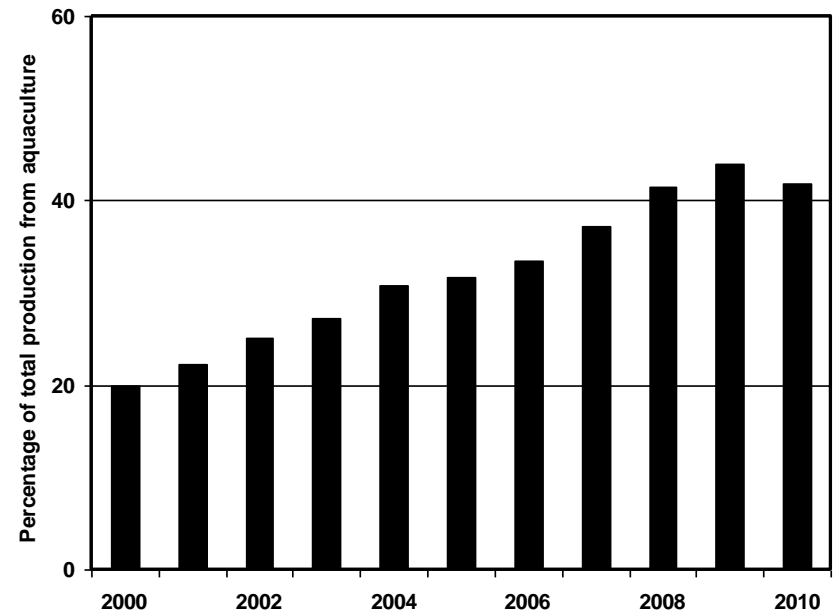
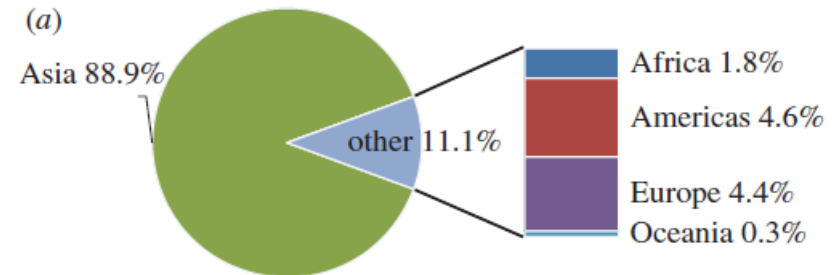
Outline

- Aquaculture - climate interactions
- AQUADAPT project
- Cage culture study
- Methods
- Main findings
- Implications
- Conclusions



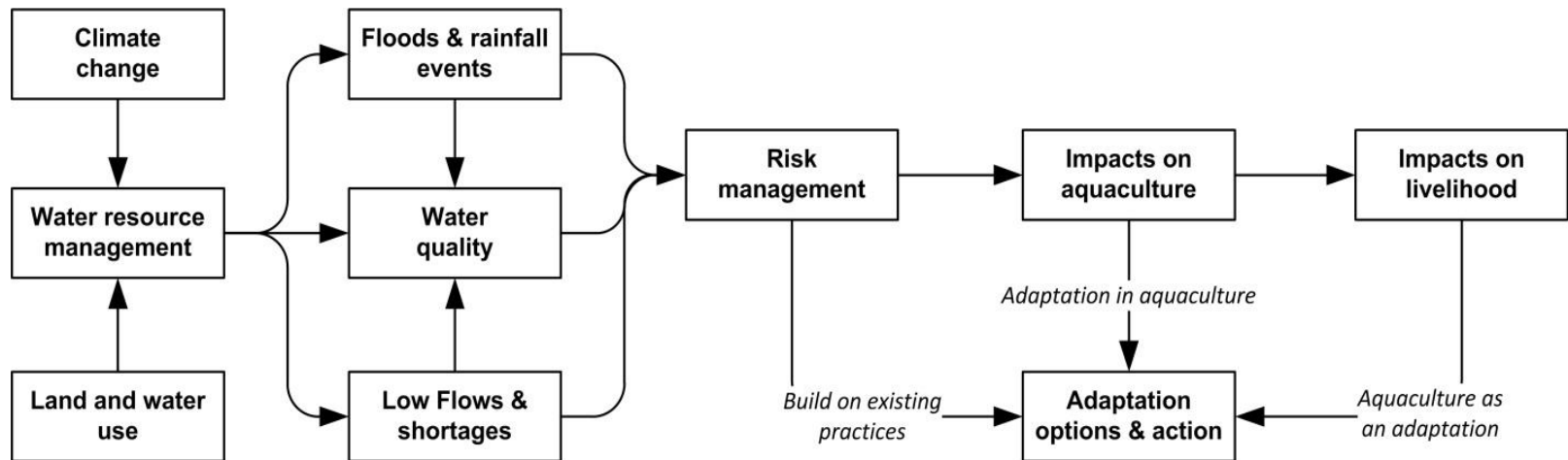
Aquaculture

- Aquaculture contributes almost half of the aquatic animal food consumed by humans, and is expected to grow.
- In Asia aquaculture is important to livelihoods, food security and economic development.
- Understanding the impacts of climate change on aquaculture and the potential role of aquaculture in adaptation is modest.



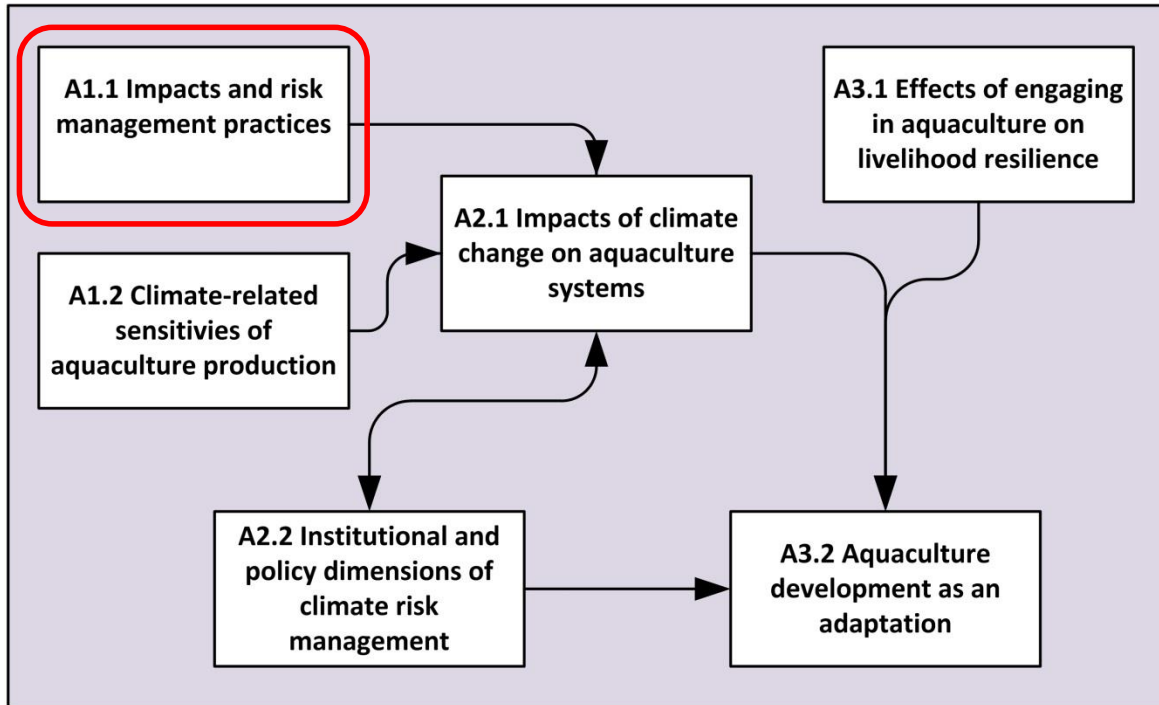
Climate risk management

- Improving risk management practice under current climate is an important way to build resilience to climate change and improve the design of adaptation strategies
 - e.g. early warning, seasonal forecasts, insurance, cropping calendar, site selection, water management
- This figure summarizes the conceptual framework for our studies

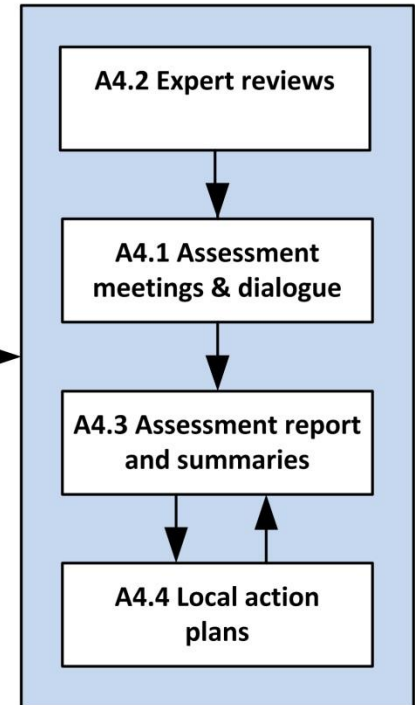


AQUADAPT Project

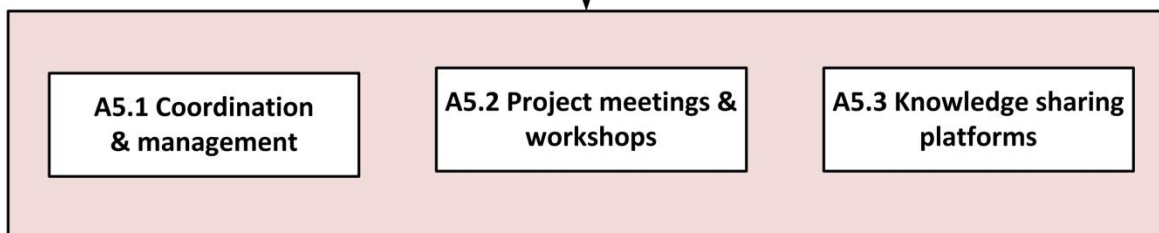
Research studies



Assessment and planning



Coordination



Rationale for cage culture study

- Cage-based aquaculture in rivers faces different challenges from those in ponds on private land.
- Industry in northern Thailand expanded significantly after 1999 and is now economically important.
- Since 2005 I have been visiting, making surveys, carrying out in-depth interviews and helping convene meetings with fish farmers.



High and low flows both have impact

- Floods (high flows) and droughts (water stress) are important cause of losses in current climate.
- Among those farmers with flood-related problems, common kinds of losses were: damage to nets (27%), death of fish (65%) and fish escapes (22%).
- Average losses due to floods was 9,640 Baht in 2005.
- In 2011, high flows had large impacts again; in 2013 low flows!



High and low flows: responses

Low flows

- Aerate or increase water circulation (80%)
- Move cages towards the mainstream (93%)
- Harvested crops early (12%)
- Avoid having fish in cages in **high** risk months

High flows

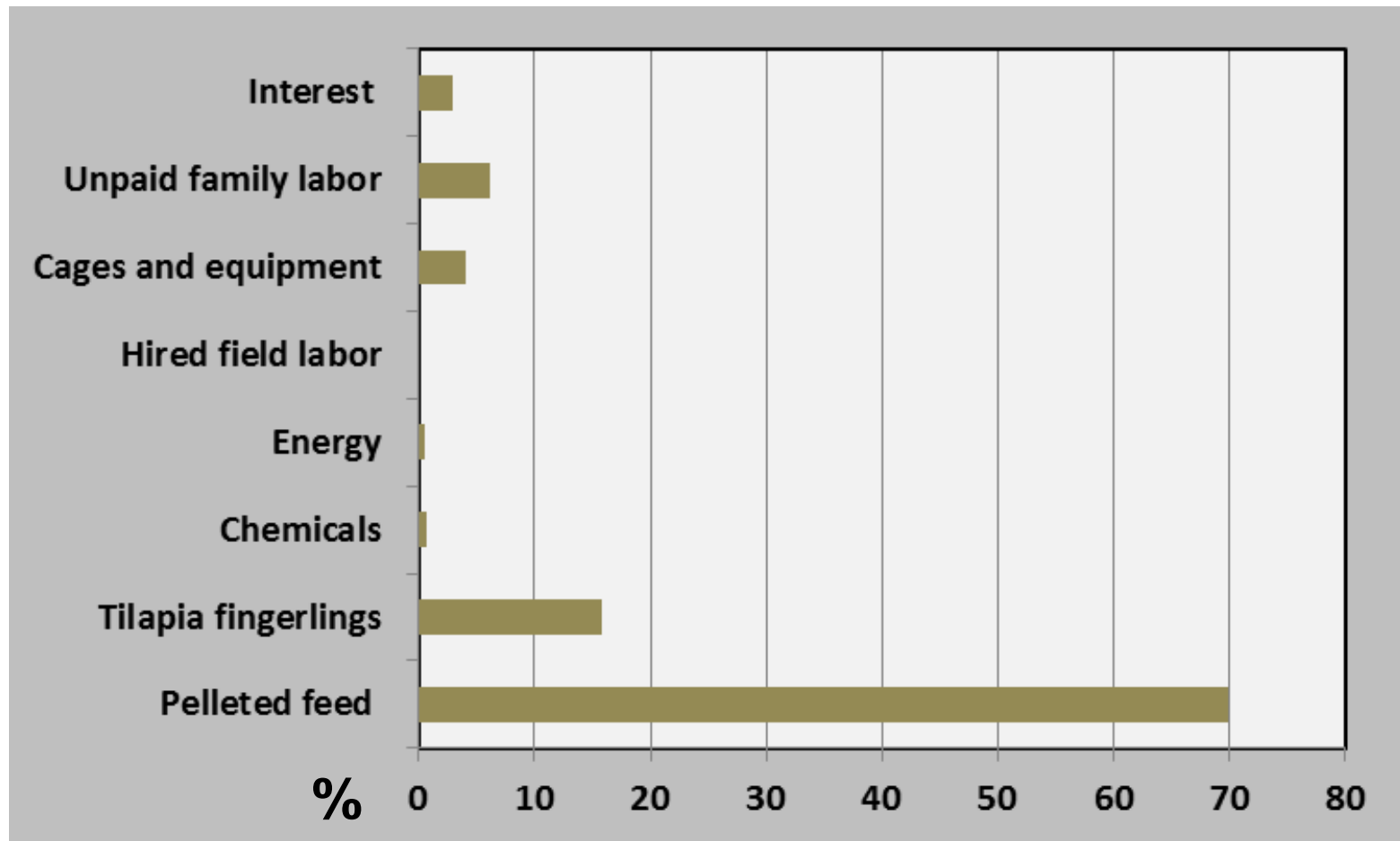
- Moving cages towards the banks (88%)
- Increase monitoring (93%)
- Move fish crop to ponds (8%)
- Harvested crops early (14%)
- Avoid having fish in cages in high risk months

Rearing practices

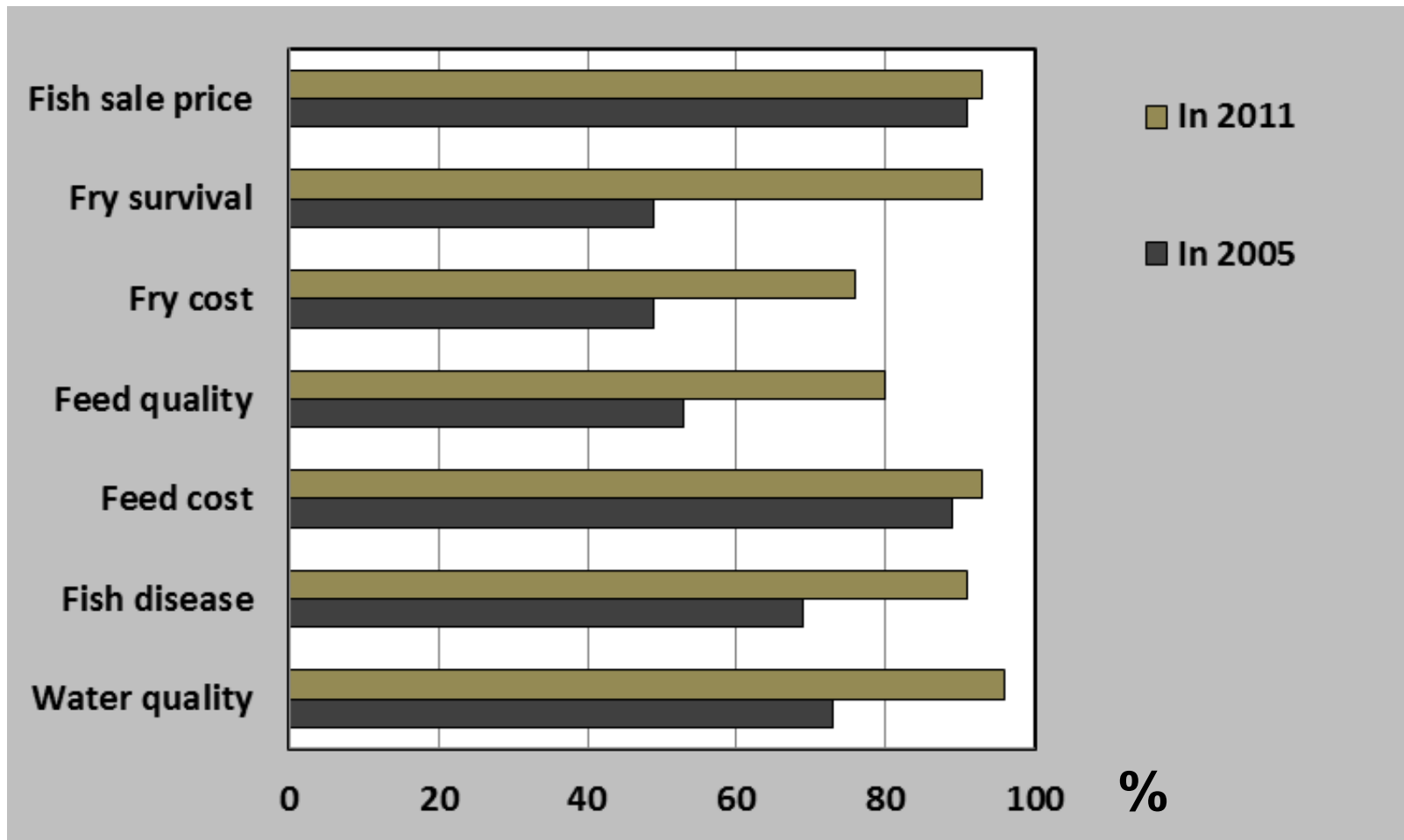
Variable	Small Farms (1-4 cages)	Medium Farms (5-12 cages)	Large Farms (13+ cages)	Average
Stocking density (fish/m ³)	45.6a	49.6ab	52.8b	49.1
Survival rate (%)	94	91	93	92
Feed Conversion Ratio (kg feed/kg fish)	1.49	1.45	1.53	1.47
Yield (kg/m ³)	25.1a	26.6ab	29.0b	26.6

- Rearing practices of different sized farms in the Upper Ping River (2005)

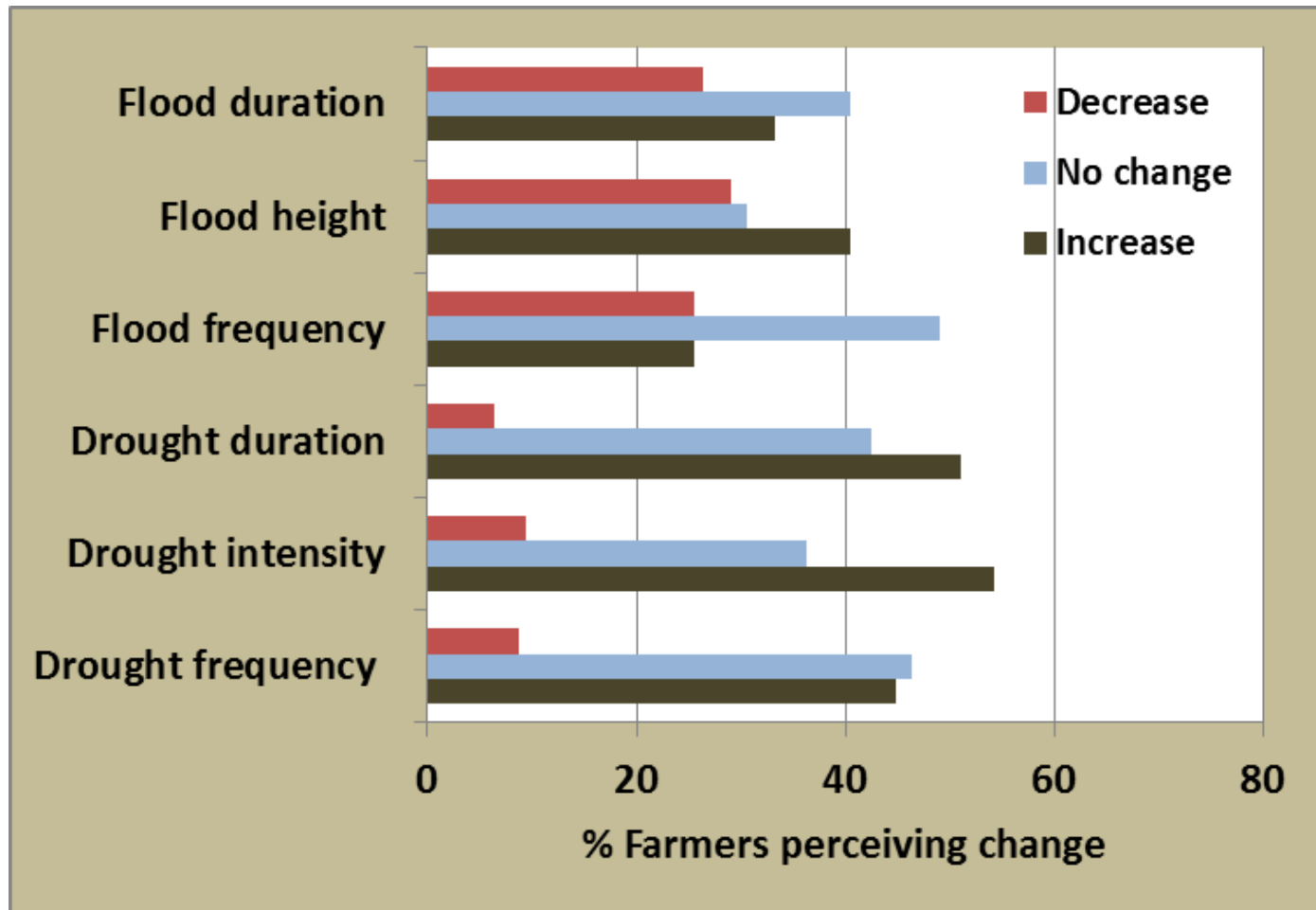
Input costs



Changing level of concern



Perceptions of recent trends in extreme flows



Farm level risk management

Importance on scale 1 to 5 for managing climate-related risks to production/profitability
Responses of 585 fish cage farmers growing Tilapia

Practice	Average importance
Good relations with fisheries officials	4.15
Good relations with local officials	4.06
Reduce production costs	4.02
Exchange knowledge	3.84
Diversify livelihood beyond farming fish	3.66
Grow batches of fish of different ages simultaneously	3.60
Use new technologies	3.48
Enter into production contracts	3.20
Cooperate in sale of fish	3.09
Cooperate to purchase inputs	2.96
Grow more than 1 fish species	2.91

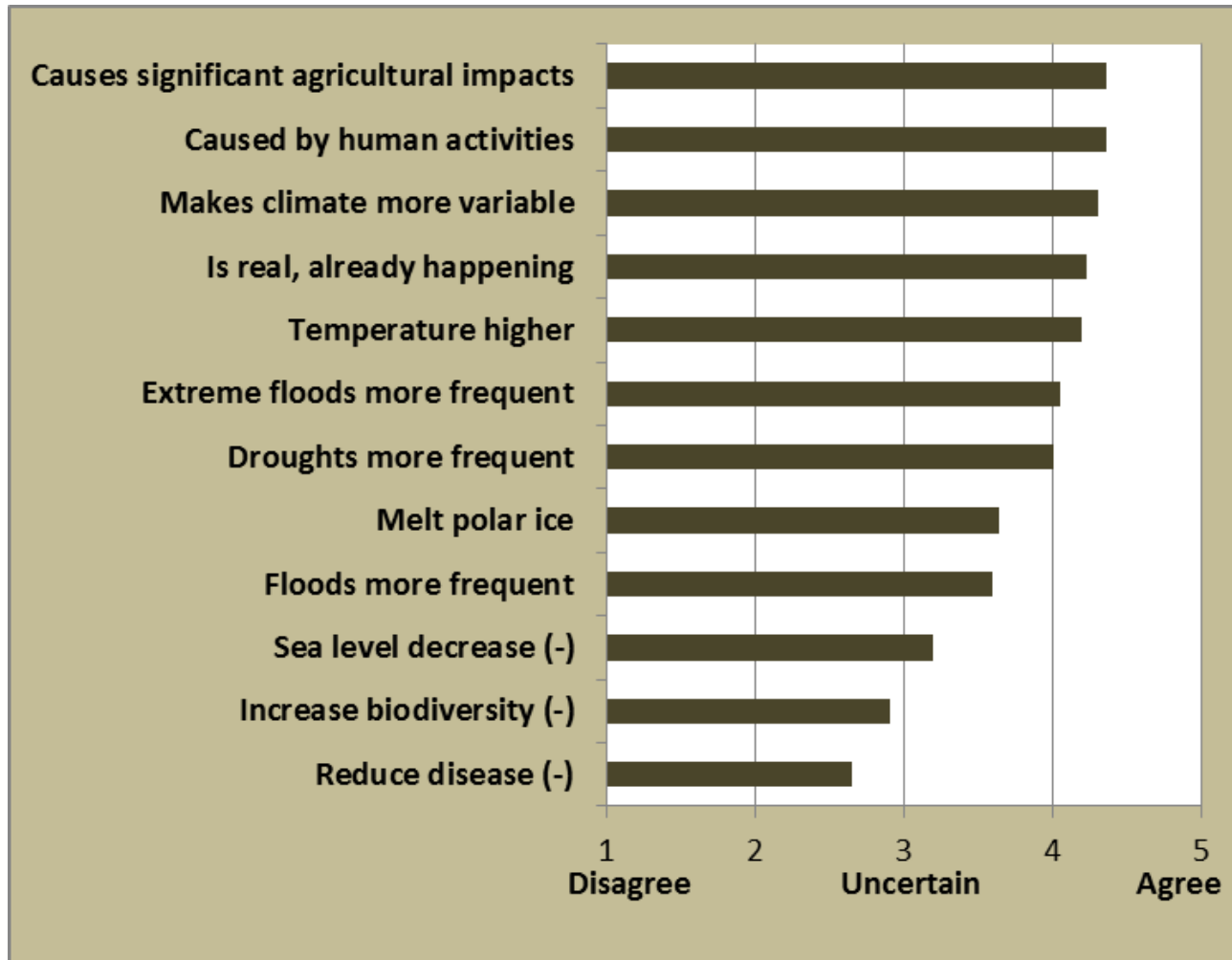
River basin level risk management

Importance on scale 1 to 5
for managing climate-
related risks to
production/profitability

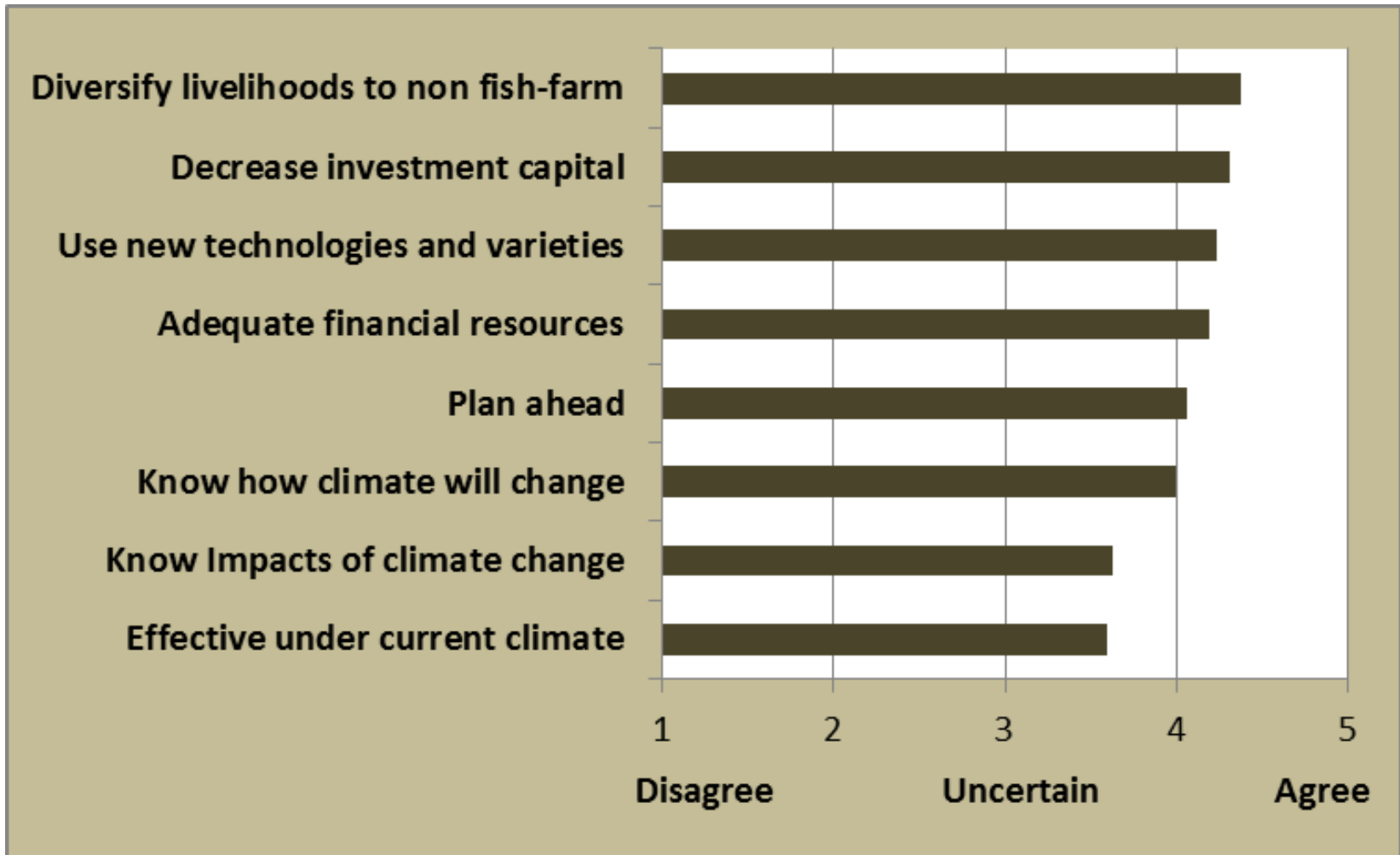
Responses of 585 fish cage
farmers growing Tilapia

Practice	Average importance
Dam water release	4.36
Dam water storage	4.29
Polluted run-off from fields and orchards	4.17
Monitoring news related to water management	4.07
Weirs to store water or maintain depth	4.03
River dredging	3.99
Flood protection/prevention	3.95
Operation of water sluice gates	3.87
Participation in activities with other water users	3.74
Irrigation water use in dry season	3.72
urban water	3.68
Participating in water management activities	3.65
Animal manure/wastes	3.50
River bank works/intrusion	3.41
Boating activities	2.87

Understanding of climate change



Adaptation strategies



Conclusions

- Fish farmers manage a complex set of risks including several which are climate-related.
- Maintaining profitability will require carefully managing changing risks in cost effective ways.
- Adaptation seems plausible as key species in the tropics can be reared in a broad range of systems and sector has significant capacity for innovation.
- But, there is a need for further study of the risks fish cage farmers in rivers face, as well as identifying how rivers and farms might be better managed to support sustainable aquaculture in a variable and changing climate.

Acknowledgements

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