Resilience of Agricultural Systems Facing Increased Salinity Intrusion in Deltaic Coastal Areas of Vietnam

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Introduction

- Increased salinity intrusion is a challenge for agricultural production in the Mekong (MKD) and Red River (RRD) deltas in Vietnam
- Different development pathways e.g. sluicegate and dyke construction to prevent salinity intrusion for double rice cultivation would lock the agricultural systems in specific configurations

Objective

- Measure and assess the resilience to increased salinity levels of different agricultural systems in the RRD and MKD based on farmers' perception
- Characterization of factors that influence the resilience of these systems
- Resilience definition: the sensitivity of agricultural systems to increased salinity intrusion and capacities of the systems to recover from salinity damage and to change to alternative farming systems if salinity intrusion increases before severe impacts are felt

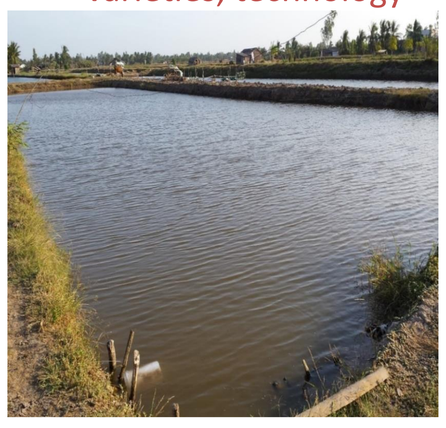
Sluicegate construction

Sea dyke

Soft measures e.g. rice varieties, technology

Rice production

Upland crops



Aquaculture

Methods

In-depth interviews with authorities

Semi-structured and structured interviews

Focus group discussions

Role-playing games with farmers

- Three case studies along three salinity transects in the RRD and MKD
  - In the MKD: villages along the salinity transect - freshwater zone, brackish water zone, saline water zone
  - In the RRD: villages at different distances to the sea dyke - farthest from the sea dyke, further from the sea dyke, close to the sea dyke
- A single question with a 5 point-Likert scale was applied to address each resilience component, including three statements:
  - To which extent is your farming system impacted if salinity intrusion increases?
  - In the case of salinity damage, to which extent can you re-engage in your farming system?
  - To which extent can you alter/convert your farming system to another system if the conditions of production change?

Results

Table 1. Number of the interviewed households

Provinces	Kien Giang (MKD)	Soc Trang (MKD)	Nam Dinh (RRD)
Numbers of interviewed households and wealth categories (poor-average-better off)[a]	112 (28-58-19)	114 (41-42-31)	118 (n/a)[a]

[a] The wealth categorization was based on the wealth ranking exercises. No wealth ranking exercise was conducted in the RRD due to a small number of households who have changed the farming systems in each village.

Table 2. Mean and median values of farming systems on resilience-related components in the Mekong delta (standard deviations and interquartile ranges in parentheses)

Farming systems	Mean (above) and median (below) values of farming systems on resilience-related components (standard deviations and interquartile ranges in parentheses)		
	Sensitivity [a]	Capacity to recover [b]	Capacity to change [c]
Rice	2.65 (1.10)	3.53 (1.19)	2.79 (1.27)
	2.5 (2.0-3.0)	4.0 (2.5-4.5)	3.0 (2.0-4.0)
Rice shrimp	2.53 (1.12)	2.96 (1.28)	2.74 (1.36)
	2.0 (2.0-4.0)	3.0 (2.0-4.0)	2.0 (2.0-4.0)
Shrimp	2.37 (1.05)	3.13 (1.27)	2.66 (1.20)
	2.0 (1.5-3.0)	3.0 (2.0-4.0)	2.5 (2.0-4.0)
Observations	218	217	219

The values in the table represent a "1-5 Likert scale" standing for: very much (1) to very little (5) severity

No significant difference between farming systems on sensitivity and capacity to change, significant difference between farming systems on capacity to recover (p-value<0.05, Kruskal-Wallis test)

[a] Mean/median value of the first question on expected salinity impact if salinity intrusion increases; lower value is better

[b] Mean/median value of the second question on the capacity to recover after salinity damage if salinity intrusion increases; higher value is better

[c] Mean/median value of the third question on the capacity to recover after salinity damage if salinity intrusion increases; higher value is better

Table 3. Median values of farming systems on resilience-related components in the Red River delta (interquartile ranges in parentheses)

Farming systems	Double rice	Vegetable	Rice vegetable	Fish pond	Soft-shell turtle	Large fish pond
Sensitivity	1.0 (1.0-2.0)	n/a	4.5 (4.0-5.0)	2.0 (1.0-4.0)	2.0 (1.0-2.0)	n/a
Capacity to recover	4.0 (4.0-5.0)	n/a	4.5 (4.0-5.0)	4.0 (2.5-4.5)	4.0 (2.0-4.0)	n/a
Capacity to change	3.0 (2.0-4.0)	4.5 (4.0-5.0)	4.0 (3.0-5.0)	2.5 (2.0-4.0)	4.0 (3.0-5.0)	2.0 (2.0-4.0)

The values in the table represent a "1-5 Likert scale" standing for: very much (1) to very little (5) severity

- **Sensitivity**

Double rice system was perceived as the system most sensitive to salinity, followed by the rice-shrimp and shrimp systems.

- **Capacity to recover**

Rice system was perceived as the system with the best recovery capacity after being affected by salinity, while the rice-shrimp system can recover least easily.

- **Capacity to change**

Rice farmers also perceived a higher capacity to change their farming system, followed by rice shrimp and shrimp systems.

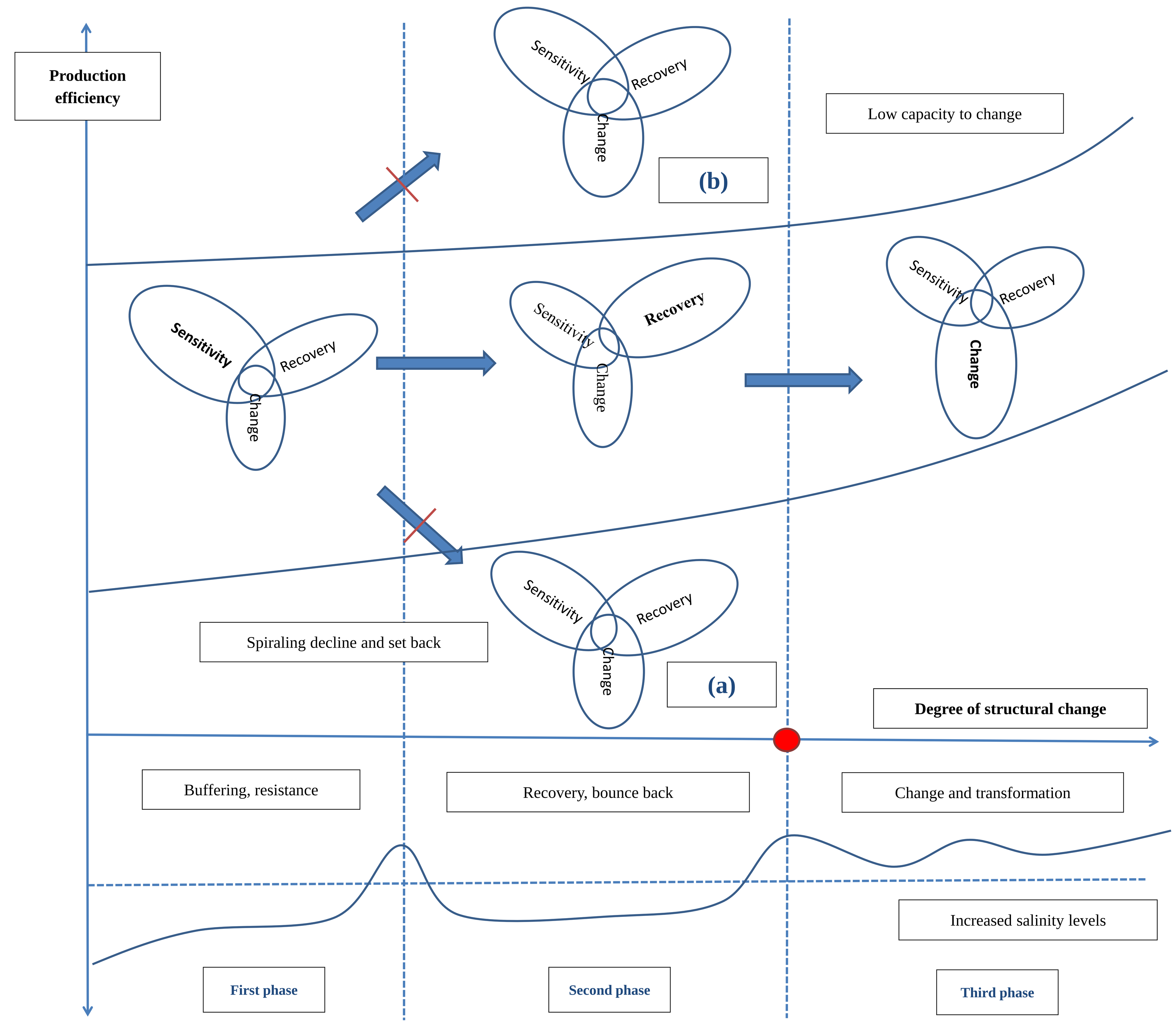


Figure 1. Resilience management: at the first phase when the salinity intrusion is within the coping range, agricultural management should focus on reducing sensitivity. When the salinity increases, the management needs to shift from reducing sensitivity to enhancing recovery capacity (second phase) and facilitating change and transformation (third phase). Adaptation at previous phases should not increase the sensitivity or reduce the capacity of the systems to recover (a) or reduce the capacity to change (b) (based on Binh, 2015; Pardoe, 2016; Wise et al., 2014)

Conclusions

- None of the agricultural systems ranked first in all sensitivity and capacities
- An increase in one resilience capacity by switching systems would be achieved at the expense of other resilience components.
- Adjustment of resilience capacities e.g. through policies and interventions to sustain agricultural production or facilitate transformation to alternative systems when necessary is crucial
- Systems which are flexible to change should be favored

References

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