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Farmer adoptability for livelihood transformations in the Mekong Delta: a case in Ben Tre province

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Sustainable livelihood development is an ongoing challenge worldwide, and has regained importance due to threats of water shortages and climate change. To cope with changing climatic, demographic and market conditions in Vietnam's Mekong Delta (VMD) an agricultural transformation process has been suggested in the recent Mekong Delta Plan. This agricultural transformation process requires the implementation of alternative livelihood models. The majority of current agricultural livelihood models in the VMD have been introduced by the government in a top-down manner. In this study, we applied a bottom-up approach to understand the motivations and abilities of local farmers to adopt alternative livelihood models. It is based on the MOTA methodological framework, which is further tested with the use of multivariate analyses. The study was conducted in Ben Tre coastal province. Results showed that farmers' motivations and abilities to apply alternative models vary substantially among different groups, driven by their perceptions on triggers and opportunities. Acknowledging this diversity is essential to the development of agricultural transformation plans. Furthermore, based on the analysis, a projection of the precise support that communities need to supplement their knowledge, skills and financial capacities, as well as interventions to reduce the risks of new livelihood models, is given.

Keywords: delta plan; MOTA; plan implementation; livelihood transitions; Mekong Delta

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1. Introduction

The Vietnamese Mekong Delta (VMD) is the region in Southwest Vietnam where the Mekong River approaches and empties into the sea through a network of distributaries. The delta encompasses over 40,500 square kilometers, and is comprised of 13 provinces (Renaud and Künzer 2012). The Mekong Delta is a predominantly agricultural region, incorporating rice cultivation, fisheries and forestry. It contributes 50% of Vietnam's rice (90% for export) and 70% of its aquaculture products (IUCN and VAWR 2016). In recent years, the VMD has been recognized as a hotspot for vulnerability to climate change and its effects, particularly sea-level rise, due to its low elevation and dense human population (Dasgupta *et al.* 2007; IPCC 2007). Also, upstream dam developments starve the delta of its sediments, enhancing subsidence, coastal erosion and salinity intrusion (IPCC 2007; Tuan and Chinvanno 2011; Thuc *et al.* 2016). Under some climate change projections, the delta could face 40% inundation by the end of the century, threatening the livelihoods of millions of people and affecting domestic and international food security (Thuc *et al.* 2016). These factors present serious challenges to the sustainability of agricultural systems in the delta.

The Vietnamese government acknowledges these threats to the area and has initiated a policy process aimed at offering solutions to current problems. With its international partners, it has developed the Mekong Delta Plan (MDP). The MDP is a strategic plan that intends to set strategic goals for the long-term future (Seijger *et al.* 2017; Minh Hoang, 2019). Central goals for the coastal region, as laid out in the MDP, include "adaptation to salinity" and "transformation to an agro-business model" (MDP 2013, 82; 42). However, the MDP does not prescribe which livelihood models should be adopted in particular regions. Goals set in the MDP will be translated into both local and regional development plans. In order to translate the abstract, strategic goals of the MDP into alternative livelihood models, it is essential to understand the possible options for livelihood transformation and their challenges. In October 2017, the Government of Vietnam has adopted the Prime Minister Resolution 120/NP-CP on Sustainable and Climate-Resilient Development of the Mekong Delta in Vietnam (GoV 2017), which endorses many of the issues addressed in the MDP.

Ben Tre is a coastal province in the VMD vulnerable to climate change, especially sea level rise and associated saltwater intrusion (Renaud *et al.* 2014). As such, the province is currently seeking to transform agriculture to adapt to these issues. Agricultural livelihoods in Ben Tre province are diverse regarding their level of diversification and favorability to the agro-ecological environment. Livelihood diversification in the Mekong Delta was officially approved with the issue of Decree No. 09/2000/NQ-CP in 2000, which lessened constraints on agricultural activities by allowing rice farmers to diversify their crops instead of requiring them solely to cultivate rice. The decree drastically changed the agricultural landscape of the VMD, with the transformation from rice to aquaculture and mixed cropping systems most noticeable (Nguyen Duy Can *et al.* 2007; Tran and James 2017). The current situation of salt water intrusion in the province is critical, as was seen especially clearly during the 2015/2016 El Niño year (CGIAR 2016). Locally induced human causes present additional challenges, including the uncontrolled conversion of coastal land into shrimp ponds (IUCN and VAWR 2016), and the trend for young people to migrate to the cities for work, resulting in farm-labor shortages (Nguyen and Nguyen 2017). These changes, in turn, affect people's ability to transform their livelihoods, as the relationship between technology for irrigation and salinity control, hydrological conditions and

markets are closely linked and constantly evolving. Thus, there is an urgent need to develop and improve livelihood models to support farmers' resilience in the face of such a changing environment.

Sustainable livelihoods have been a prominent topic in the literature on agricultural transformation. The most common approach to studying livelihoods may be the DFID framework (DFID 2001; *see also* Scoones 1998), in which livelihoods have been understood regarding the capitals (natural, physical, social, human, financial), institutional processes and strategies that go into the activities of making a living. A livelihood that is *sustainable* has been defined as one that can "cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base" (Chambers and Conway 1992, p. 6). In recent years, concern has grown over how best to guide livelihood *transformations*, as wider-scale, system-level change for sustainability (Scoones 2016). After the initial development of the livelihoods framework, researchers also stressed the need to recognize subjective, personal drivers in livelihood change (e.g. Bebbington 1999), in addition to the influence of broader political, institutional and economic factors. However, these approaches do not explicitly consider farmers' *motivation* to adopt new livelihoods, or how this interacts with given or perceived conditions, available resources and capabilities. In this paper, we address this gap by considering these factors in terms of farmer *motivation* and *abilities,* explored *via* the MOTA methodological framework, as recently developed by Ho *et al.* (2015). Although not yet applied in many case studies, the MOTA framework has so far proven to render successful results (Ho *et al.* 2015). By further testing and extending the analytical framework with a 'snapshot' of the motivations and abilities of farmers in the study area, this paper seeks to contribute to developing methods to assess project implementation feasibility, as well as supporting decision-makers in Vietnam to facilitate a transformation to agricultural sustainability for the VMD.

According to Smajgl and colleagues, "Policy initiatives that are antagonistic to household-level motivations can reduce implementation effectiveness and render such top-down investments redundant" (2015, 4). They found that a large proportion of households in the western part of the Mekong Delta have already invested in adaptation to salinity levels by cultivating shrimp. Investments in infrastructure for keeping out saltwater have therefore become less favorable. In this study, we aimed to add a bottom-up perspective to inform planning practices based on local behaviors and preferences, and therefore contribute to understanding strategic delta planning processes. Strategic choices should not be based purely on hydrological and climatic factors, but should include farmer preferences, to address the feasibility of implementing strategic goals. By incorporating the abilities and motivations of local farmers, insights are gained about the gaps between the desired situation and the local situation. So doing can not only help in setting strategic goals for regional development but also in understanding the type of policy interventions and implementation strategies that are needed to address anticipated challenges.

2. Materials and methodology

2.1. Study area

In this study, the Ba Tri and Thanh Phu districts have been selected as study sites to exemplify the livelihood zoning within the province. The two districts are located

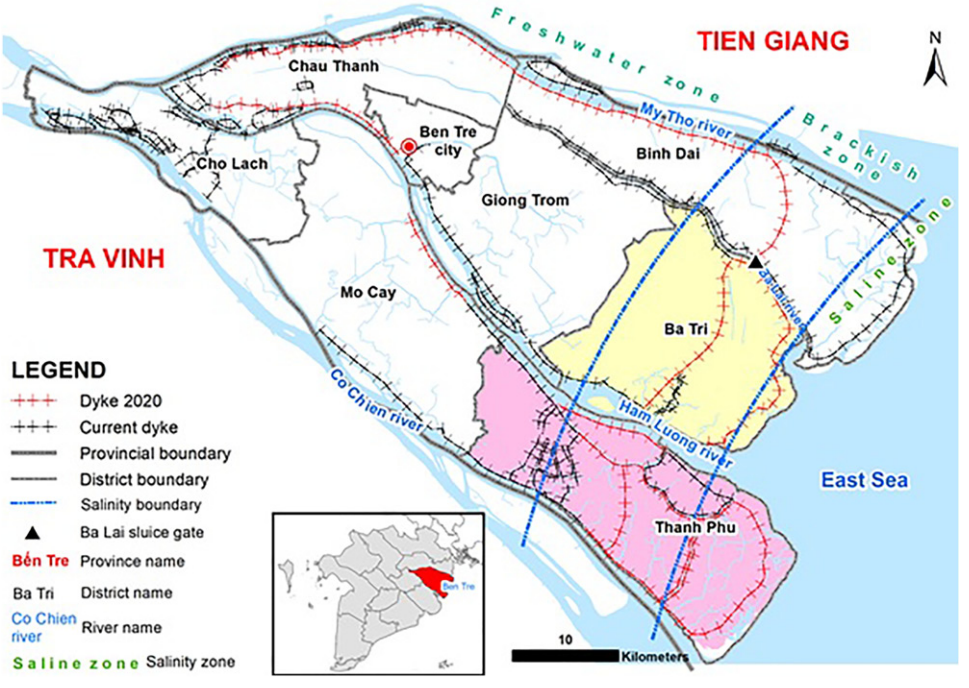


Figure 1. Ben Tre in the Vietnamese Mekong Delta and the studied districts.

between two major rivers, making them prone to salinity intrusion *via* the river channels. However, their relative distances from Ba Lai saline-control irrigation system separates the predominant or feasible livelihoods of the two into freshwater-based livelihoods (Ba Tri) and those favoring a saline or brackish environment (Thanh Phu) (Figure 1).

2.2. MOTA

2.2.1. Conceptual framework

The Motivation and Ability (MOTA) framework takes a multi-stakeholder and multi-level approach, centering on the integrated relationship between "Trigger–Motivation–Ability", in which outcomes are conveyed through a combination of motivation and ability of multiple stakeholders at different levels co-existing within the implementation process. The MOTA approach recognizes that one's perception shapes the influence of a trigger (an external event or stimulus, such as a change in resource availability or price) on motivation, or subjective assessment, of that trigger, which may be either positive or negative and range from weak to strong in intensity. In other words, a specific trigger may be perceived as a threat, as neutral or as an opportunity. Next, actors' decisions and actions are influenced by their *motivation* and *ability*. What actors do is based on their perception of some causative factor (the trigger), their preference and level of commitment (motivation), and their capacity to act in a given manner (ability, whether technical, financial or institutional). The framework thus focuses on the integrated relationship between these three key variables:

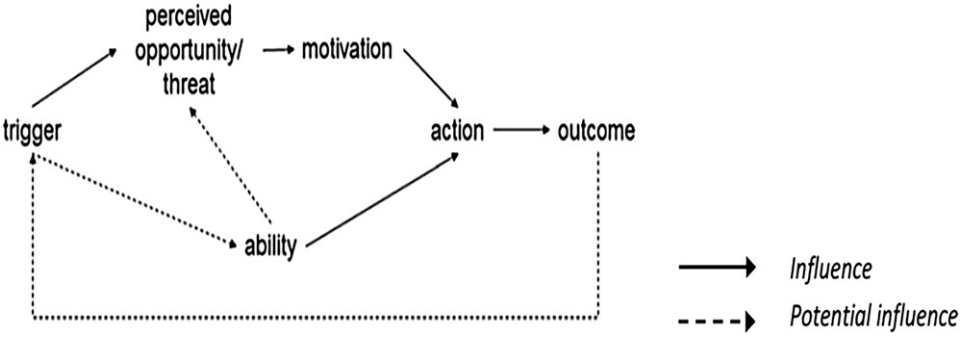


Figure 2. MOTA framework from the trigger to rational plan (Adapted from Ho *et al.* 2015).

Motivation, Ability and Trigger. Figure 2 illustrates the analytical framework of MOTA and its fundamental components.

By highlighting the interactions between these three components, the framework addresses potential influencing factors that can be adjusted in order to narrow the gap between *desired outcomes* (those assumed by planners or policymakers) and *plausible outcomes* (those likely to result from the collective actions of stakeholders during implementation). This is comparable to Bressers' (2004) differentiation between decision making on policy instruments and the adequate application of these instruments. The investigation of *plausible outcomes* is done by (i) assessment of sub-components concerning perception, motivation and ability; (ii) quantification and projections (mapping) of MOTA scores based on the analysis of motivation and ability; and (iii) analysis of the correlation between perception–motivation and perception–ability.

2.2.2. *MOTA scoring and mapping*

The normalized MOTA scoring (-1 to $+1$ scale) is calculated by multiplying the *Motivation* score with the *Ability* score, each of which is collected separately. In cases multiple tiers of either *Motivation* or *Ability,* or both, are considered, the average scores will be used instead. The MOTA Mapping is done by projecting the *Motivation* and *Ability* scores onto two-dimensional planes, as exemplified in Figure 2. The horizontal axis presents the level of motivation and the vertical axis the level of ability. On the right side of the horizontal axis are supporters/followers; these actors have neutral to very positive motivation towards the proposed action. On the left side are those who oppose, and have a negative motivation towards the proposed action. The vertical axis shows the level of abilities. Actors with a high level of ability can influence the process through the resources they possess. People who have high positive or negative motivations and a high level of ability (over 50%) are considered to be leaders and key players for the implementation of the proposed strategy. MOTA mapping could provide information regarding the direction of plausible outcomes as a function of Motivation and Ability among different groups of respondents, illustrating the likely feasibility of implementation (e.g. a lower score may signal a less feasible plan). In line with Bryson (2004)'s framework, MOTA scores may vary widely across the projected domain; the aggregation of collective action can be intuitively classified into eight zones, as shown in Figure 3. The *X*- and *Y*-axes represent Motivation and Ability index spectrums, respectively.

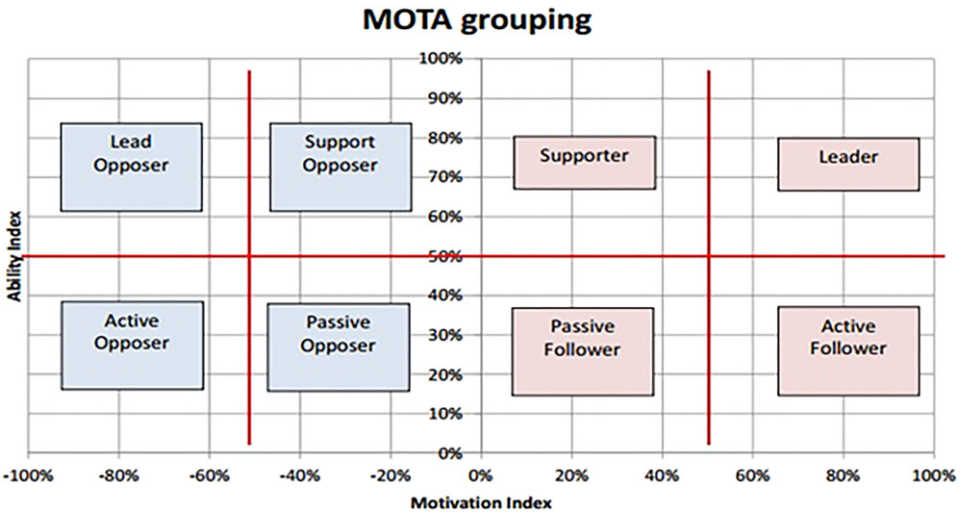


Figure 3. MOTA mapping.

2.2.3. *Identification of triggers*

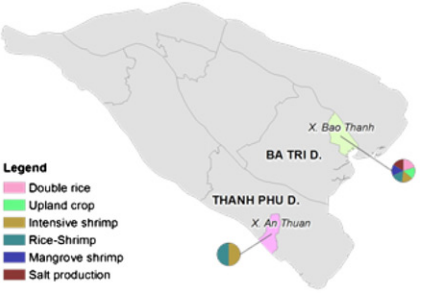
Apart from MOTA scoring and mapping, the novelty of this manuscript includes the effort to identify the underlying *triggers via* exploring respondents' perceptions of socio-economic and environmental conditions. These were gathered through open discussions with respondents over the comparison between the current living conditions and the past in relation to natural, technical and social dimensions. More specifically, respondents evaluated past and present conditions for the following topics: floods and droughts, groundwater, salinity, cultivation techniques, equipment, seed quality, labor force and market price. For each query, four options, including "*Better", "Worse*", "*Similar"* and "*No Idea"* were provided. By associating MOTA scores with these perceptions, *Triggers* behind respondents' MOTA were revealed. Statistical methods adopted for this task include two established multivariate analyses: Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA), both of which are elaborated in Section 2.3.

2.3. *Datasets*

The data were collected partly within the framework of IUCN's "Integrated Planning to Implement the Convention on Biological Diversity Strategic Plan and Increase Ecosystem Resilience to Climate Change" project conducted by the Center of Water Management and Climate Change (WACC), Vietnam National University – Ho Chi Minh City. The survey took place in November 2015 in the Ba Tri and Thanh Phu districts, Ben Tre province. Researchers from WACC conducted 50 structured interviews (by questionnaire) of farmer households in each selected commune (Bao Thanh in Ba Tri District and An Phu in Thanh Phu district). The interviewed farmers were consulted with local authorities and representatives of IUCN representative livelihood models in the communes/districts. Detailed information of the site location and households is shown in Table 1.

Additionally, two surveys were carried out in April 2017 and September 2017 to investigate potential transformative livelihood models in Ba Tri and Thanh Phu districts through different communes surveyed in 2015 (Nguyen and Nguyen 2017).

Table 1. Collected samples at Ba Tri and Thanh Phu districts.

District	Commune	Samples	Livelihood	Locations
Ba Tri	Bao Thanh	10	Double rice	
		8	Upland crop	
		8	Intensive shrimp	
		8	Rice-Shrimp	
		8	Mangrove shrimp	
		8	Salt production	
Thanh Phu	An Thuan	25	Intensive shrimp	
		25	Rice-Shrimp	

2.4. *Data analysis*

Two multivariate analysis techniques were used to explore the structural pattern of the collected data set and ultimately, identify the *Triggers,* namely PCA and HCA. These statistical analyses serve to reveal the hidden patterns among the communities' motivations and abilities in adopting new livelihood models. By incorporating respondents' perceptions regarding their living conditions in PCA in the form of supplementary factorial variables, hidden drivers or *Triggers* constituting the diversity of MOTA scores can be revealed. A similar approach has been successfully adopted in recent studies exploring the socio-ecological nexus of Ecosystem Services (Ho *et al.* 2017; Ho, Ballatore *et al.* 2018a, Ho, Diep *et al*. 2018b). Before performing the analyses, quality control for the dataset was provided using Bartlett's Test for Homogeneity of Variances (Bartlett 1937) and the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (Tabachnick and Fidell 2001). Also, the consistency of the generated principal components was verified using the Kaiser Criterion (Hair *et al.* 1998).

Our analysis started with a PCA based on the numerical measurements of *Motivation* and *Ability*, divided into the three categories of *Financial Ability, Technical Ability* and *Institutional Ability,* as the primary variables. *Motivation* assesses farmers' level of interest in and intention to change cropping systems, while the three "FIT" (*Financial, Institutional and Technical*) *Abilities* assess household assets and capacities in each of the three categories. (Financial ability includes access to credit or other sources of funding for farming needs; institutional ability includes access to resources through social networks and governance mechanisms, and technical ability includes both technological/material assets and informational/knowledge resources.) Specific target cropping systems were not given; instead, interviews sought to assess present motivation and ability to change current livelihoods to something else, in general. Other information, including demographic information and perceptions of socio-economic and environmental conditions, were collected as categorical variables, and thus incorporated as supplementary qualitative variables. Subsequently, an HCA was performed through the Euclidean distance and Ward's agglomerative methods based on the factor map of the PCA (the first two principal components to explore the synergies between quantitative and qualitative measurements). These analyses were performed with R software and the FactomineR package (Le *et al.* 2008; Husson *et al.* 2015; R Core Team 2015).

3. Results

3.1. MOTA analysis

3.1.1. Motivation and ability

Interviews investigated farmers' Motivation and Ability to change cropping systems given their perceptions of current and changing conditions, as discussed above. For Motivation, answers ranged from 1 to 5 as from lowest to highest for the Thanh Phu and Ba Tri districts, as shown in Figure 4.

The result shows that farmers' motivation to change livelihoods in Thanh Phu is higher than in Ba Tri (Figure 4). The proportion of farmers who prefer to maintain the same cropping system is only 20% in Thanh Phu whereas it is 56% in Ba Tri. In Ba Tri, those who did not want to change gave the following reasons: afraid of failure (28%) (primarily due to shrimp disease); inappropriate conditions (20%); afraid of no or low profit (12%); purely do not want to change (10%) and no capital (8%). In Thanh Phu, the reasons given by those who did not want to change were: afraid of low or no profit (16%); shrimp disease (12%); inappropriate conditions (8%); lack of technical capacity (8%) and certainly do not want to change (2%). For both districts, regarding those wanting to change, in order to increase income was the most commonly cited reason (motivation) (41% in Thanh Phu and 16% in Ba Tri), followed by changing water conditions (a trigger), as salt water has severely intruded recently (4% for both of districts).

Table 2 summarizes the Motivation and Ability scores of respondents from two study sites averaged by hamlets/communes. The overall MOTA score for each hamlet/commune is calculated by multiplying the associated *Motivation* score by the *Ability* score (averaged across three categories). The overall MOTA score for the two districts is calculated by normalizing the MOTA scores for its respective associated hamlets/communes. In general, the MOTA score for Ba Tri is lower than that for Thanh Phu. More specifically, the average *Motivation* score for Ba Tri is 0.19, which is inferior to Thanh Phu at 0.51.

Similarly, the *Ability* scores for the two are 0.47 and 0.59, respectively. Of the three *Ability* aspects, respondents from both districts show the highest confidence in *Institutional,* followed by *Technical* and *Financial.* Differently put, respondents are the most concerned about the budget for realizing the livelihood transformations (if need be) the most, while at the same time, relatively in favor of the advancements in technology and the institutional support from the government.

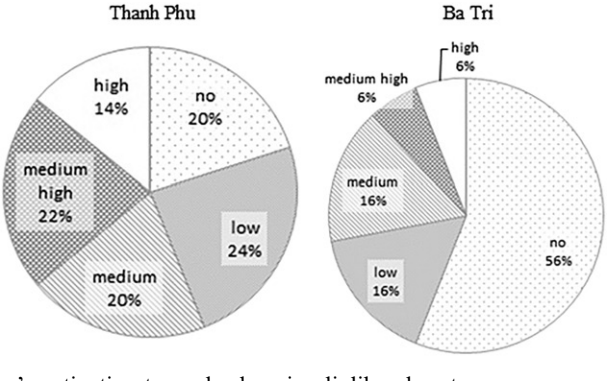


Figure 4. Farmers' motivation towards changing livlihood systems.

Table 2. Motivation, Ability and MOTA scores in Ba Tri and Thanh Phu District.

District		Hamlet/Commune	Samples	M	Ability			MOTA	
					F	T	I		
Ba Tri	Farmers	AP 6	3	0.00	0.42	0.70	0.70	0.00	0.10
		THANH LOI	5	0.00	0.30	0.59	0.56	0.00	
		THANH PHU	7	0.50	0.57	0.68	0.79	0.34	
		THANH PHUOC	13	0.21	0.29	0.57	0.62	0.10	
		THANH QUY	14	0.23	0.29	0.54	0.42	0.10	
		THANH THO	8	0.22	0.28	0.44	0.70	0.10	
Thanh Phu	Farmers	AN DIEN	3	0.42	0.50	0.67	0.77	0.27	0.35
		AN HOA	1	0.25	0.75	0.80	0.70	0.19	
		AN HOI A	5	0.35	0.80	0.66	0.72	0.25	
		AN HOI B	14	0.45	0.55	0.68	0.71	0.29	
		AN NINH A	13	0.62	0.52	0.65	0.72	0.39	
		AN NINH B	13	0.37	0.48	0.60	0.70	0.22	
		AN THUAN A	1	1.00	1.00	0.85	1.00	0.95	

Notes: M, Motivation; F, Financial ability; T, Technical ability; I, Institutional ability.

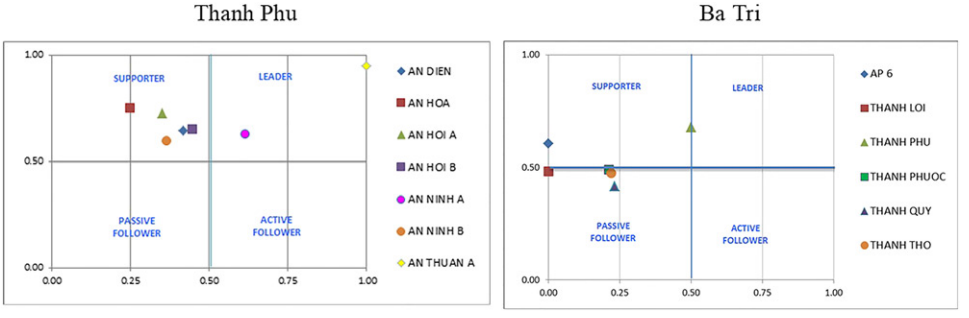


Figure 5. MOTA mapping results of Thanh Phu and Ba Tri Districts.

3.1.2. MOTA mapping

Since no farmers objected outright to livelihood transformations, their positions would all be grouped on the right-hand side of a MOTA map (Figure 5), depicting positive, if somewhat weak, support for changes. The markers represent the hamlet/communes of Thanh Phu (left) and Ba Tri (right). The coordinates of each hamlet/commune marker are inherited from the respective *Motivation* and *Ability* scores summarized in Table 2. In general, most hamlets in Ba Tri are passive followers. Those in Thanh Phu district lie between the supporter group and the leader group. They have medium motivation and high ability, so they can be leaders or supporters, depending on the benefits they see from making a livelihood transformation. An Hoa, An Hoi A, An Hoi B, An Dien and An Ninh B hamlets all belong to the "supporter" group, with high ability but low motivation for transformation. An Ninh A and An Thuan hamlets fall in the "leader" quadrant, and as such can be the lead group for livelihood transformation processes.

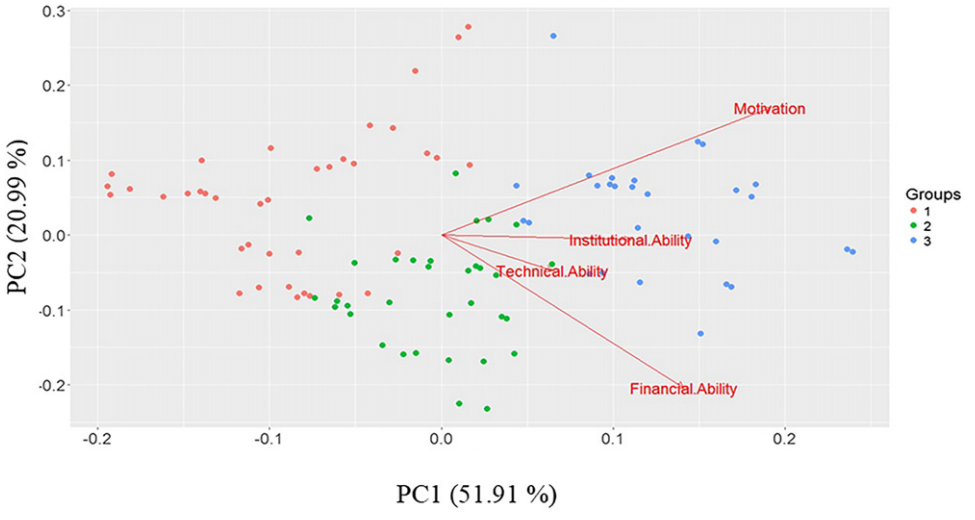


Figure 6. Results of principle component and hierarchical cluster analysis.

3.1.3. Relationship of perception with motivation and ability

The sample data were verified using the Kaiser–Meyer–Olkin statistic equal to 0.69 (>0.5) and Bartlett's Test of Sphericity (<0.05), thereby supporting the use of factor analysis methods. The first two principal components account for 72.9% of the extracted variance (Figure 6). The first principal component, representing 51.91% of the extracted variance, separates responses with different scores in Institutional Ability and Technical Ability. These two variables are also positively correlated with one another. The second principal component, representing 20.99% of the extracted variance, distinguishes responses with divergent Motivation and Financial Ability scores, on the one hand, and points to the negative correlation between these two variables, on the other. The relative lengths of each arrow on the factor map represent the relative explanatory capabilities of the variables. The collected responses, accordingly, are mostly explained by Motivation and Financial Ability. From the factor map generated from the PCA, an HCA was performed to distinguish individuals according to their motivation and abilities, as depicted in Figure 6.

Of the three groups of individuals classified in Figure 6, Group 3 has the highest motivation as well as ability. In contrast, Group 1 has the lowest scores, while Group 2 falls in the middle of the range. These conclusions were drawn by comparing the means in each group with the overall mean for the entire population. For instance, the overall Motivation of all 100 individuals is 0.345, while the respective scores for Groups 1–3 are 0.186, 0.181 and 0.759, respectively. These differences were then verified through the tests of significance.

In search of the *Triggers,* the supplementary factorial variables were analyzed. Among those evaluated, only six appear as significant, as summarized in Table 3 (variables that remained insignificant across all groups are not shown). About location, Group 1 is most associated with Ba Tri, Group 3 with Thanh Phu and Group 2 is not explicitly characterized. Concerning variables associated with respondents' perceptions, Group 3 distinguishes itself the most from the norm *via* optimistic assessments of *Material, Seed Quality and Techniques,* and pessimistic assessments of *Ground Water*

Table 3. Characteristics of each cluster.

MOTA (overall mean)	Group 1	Group 2	Group 3
Motivation (0.345)	Low (0.186)	Low (0.181)	High (0.759)
Financial ability (0.4475)	Low (0.179)	Average (0.598)	High (0.642)
Technical ability (0.6105)	Low (0.469)	Average (0.688)	High (0.716)
Institutional ability (0.659)	Low (0.502)	Insignificant	High (0.87)
Location	Ba Tri	Insignificant	Thanh Phu
Triggers			
Material	Insignificant	Similar	Better
Seed quality	Insignificant	Insignificant	Better
Techniques	Insignificant	Insignificant	Better
Ground water	Insignificant	Insignificant	Worse
Market price	Insignificant	Insignificant	Worse

and *Market Price*. Groups 1 and 2, on the other hand, are not significantly characterized by any categorical variables.

Combining the two preliminary observations above render essential implications regarding the *Triggers* to adopt new livelihood models, including both the acknowledgment of threats related to *Ground Water* and *Market Price*; and confidence in emerging opportunities related to *Techniques, Seed quality* and *Materials*. These perceived threats and opportunities constitute important driving forces to motivate *action,* or in this case, adopt new livelihood models. Unsurprisingly, at the other end of the spectrum, those who are not, either suffering from unfavorable farming conditions or emerging opportunities are less likely to change their current livelihood practices. In other words, not only could we identify the most willing and capable of adopting new livelihood models from the population but also understand what is driving their decisions. These local insights are of particular importance to produce better-informed decisions for livelihood transformation masterplans.

4. Discussion

Driven by the demand for understanding farmer adoption of livelihood models for agriculture transformation processes (a key component of the MDP), this study applied the recently-developed MOTA approach to understand farmers' motivations and abilities for two coastal districts of Ben Tre province, Mekong Delta. The following sections will discuss farmers' transformation capacity, the implication of the MOTA framework, and contributions of this study to strategic delta planning.

4.1. Transformation capacity

The MOTA analyses showed the motivations to transform to new livelihoods in both districts are still rather low although farmers' abilities are mostly above the average values. This finding implied that the transformative program needs first to focus on raising motivations of farmers, for example, *via* showcasing livelihood models (including market linkages), providing efficient water resources, agriculture training incentives. This study has demonstrated, for example, that financial and water resources are limiting factors that affect the transformative process.

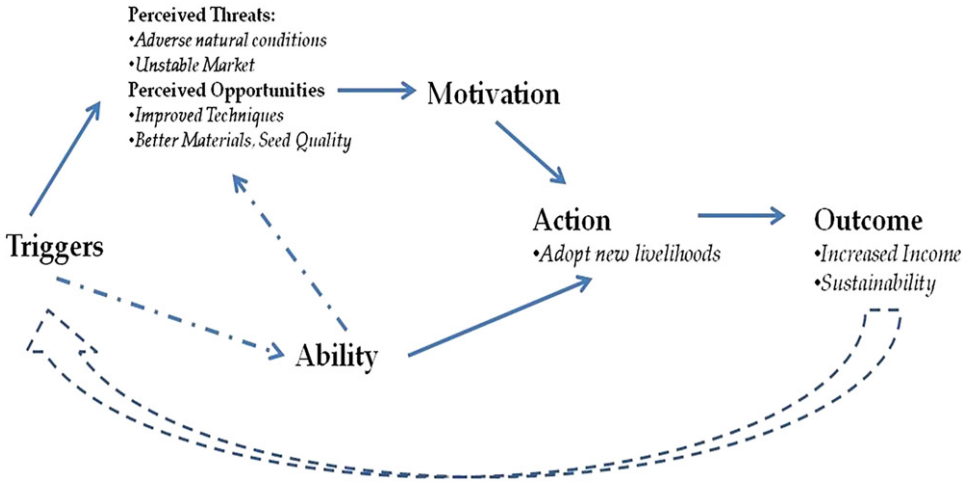


Figure 7. MOTA of farmers' adaptability of new livelihood models.

We found that initial investment is a significant factor to consider in transforming livelihoods. It is clear that intensive shrimp farming for either family or commercial farms is not suitable for farmers with low financial capacity (*see also* Joffre and Schmitt 2010). To overcome this barrier, crop diversification through integrated and polyculture models could be an appropriate option for farmers with low financial capacity. For example, integrated models, such as rice-shrimp or mangrove-shrimp, are less risky due to the availability of a back-up crop in case the main crop fails, as well as being more sustainable for the environment (Ha *et al.* 2013; Joffre and Bosma 2009; Joffre *et al.* 2015).

Water resources (including salinity levels) are of the utmost importance to consider when deciding on suitable models. Smajgl *et al.* (2015) suggest that the boundary between freshwater and saline water zones is vital for defining suitable areas to apply different models. Each livelihood model, with its favorable agro-ecological conditions, can only be deployed in a suitable agro-ecological zone. Models such as commercial eel farming using canvas tanks, mixed male giant freshwater prawn–coconut farming, semi-intensive male giant freshwater prawn farming and integrated rice-cash crop and cattle are best suited to areas where freshwater is available (Nguyen and Nguyen 2017). By contrast, brackish shrimp farming, of which there are several types, is the best option for coastal areas with more than six months of salinity. For example, the adoption of the male giant freshwater prawn–coconut model by coconut farmers (shrimp ponds with the existence of dredged channels inside coconut farms) in freshwater areas in Thanh Phu district and the mangrove–shrimp model in saline water areas of Binh Dai District have been successfully deployed (Joffre 2015, Joffre *et al.* 2015; Nguyen and Nguyen 2017).

4.2. Implications of the MOTA framework

Initially, the MOTA framework was developed based on Fogg's behavioral model (Fogg 2009) to understand the motivation of stakeholders. In addition to assessing the feasibility of implementation, the MOTA framework can also be applied for understanding the effectiveness of (proposed) plans and activities by conducting a

longitudinal study. A recurrent MOTA assessment in the same study area can show (lack of) changes in farmer perspectives and abilities over time. This not only provides insights into the effectiveness of plans and initiatives but can also render insights into the MOTA framework itself, especially on the assumed trigger – outcome relationship. In addition, by extending the application of the MOTA framework with the use of multivariate analyses, this study was able to identify the underlying 'trigger' factors – that is, perceived threats (Ground Water and Market Price) or opportunities (Techniques, Seed quality and Materials) – behind farmers' different levels of motivation and abilities. Based on this analysis, the MOTA framework for farmers' adoption of new livelihood models can thus be summarized in Figure 7.

4.3. Contributions to strategic delta planning

As indicated in the introduction, the Vietnamese government has indicated that a strategic choice on the future of the Mekong Delta is necessary. The strategic delta plan that has been developed and accepted for implementation proposes a clear need for livelihood transformation to regain a sustainable delta. The MDP, like a strategic plan, is innovative in the Vietnamese setting. Vietnam has a planned economy: agricultural livelihood models are planned and proposed through a system of master planning. Based on a 'food security' paradigm, the majority of agricultural activities are aimed at rice production. Agriculture and irrigation plans follow this paradigm (van Staveren *et al.* 2018). The MDP was largely developed top-down but leaves room for bottom-up interpretations and local adjustments in the implementation phase. Hence, it allows space for alterations at the local level, to incorporate market demands. However, the MDP relies mainly on hydrological conditions and salinity levels. The MOTA framework can support provincial and district planners in assessing the feasibility of projects and plans by explicitly taking farmers' motivations and abilities into account (closing the gap between *desired* and *plausible* outcomes).

Our study aims to enrich the understanding of strategic delta planning processes where various factors in the planning process (e.g. agenda setting, decision-making and implementation) and central concepts (actors, tools and innovations) exist (Seijger *et al.* 2017; Minh Hoang *et al.* 2019). Furthermore, the MOTA framework can be used to assess possible coalitions of actors with (dis)similar abilities and motivations. The results of this study and the application of MOTA can furthermore be used to assess whether or not practices and livelihood models in line with the proposed strategic goals are desirable from a local farmer perspective, in addition to a focus on soft implementation (Seijger *et al.* forthcoming). Strategic delta planning processes are not only designed to alter agricultural practices, as in this study, but also governmental planning procedures (Korbee *et al.* 2019).

5. Conclusions

Sustainable livelihoods should be considered as a backbone for agricultural transformation in the MDP given the changing environment, including drought and saline intrusion, as well as socio-economic drivers. In this paper, the MOTA framework was used to assess the motivation and abilities of farmers in two coastal districts in Ben Tre province. This showed that motivations and abilities were quite diverse among farmers and there is a clear link between motivation and ability. The high motivation group

has high ability in finance and technology (e.g. favorable existing water infrastructures). Also, results showed that farmers' motivations and abilities to apply alternative models vary substantially among different groups, driven by their perceptions on triggers and opportunities. This understanding will be useful for developing agricultural transformation plans for the VMD.

This study is also of particular relevance for policies associated with agricultural planning in the VNM. Policy planners should seriously consider the motivations and abilities of local farmers. The history of a top-down approach in agricultural planning in the delta, which prioritizes rice farming to ensure food security, has put many constraints on the abilities of local farmers to improve their livelihoods. The applied MOTA approach, which is a mosaic of regional planning and local perspectives, can contribute to acquiring greater legitimacy for adopted agricultural policies by enabling governments and target groups to develop more realistic objectives and feasible plans. It can provide insights into where specific abilities need to be supported in order to increase motivations (and *vice versa*), and thus enable effective action.

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