Acta Scientific AGRICULTURE (ISSN: 2581-365X)

Volume 4 Issue 10 October 2020

Research Article

The Role of Indigenous Knowledge and Livelihood to Adapt to Floods in Sustainable Development in Mekong Delta, Vietnam (A Case Study in An Giang Province)

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Received: September 09, 2020

Published: September 23, 2020

Abstract

This research was carried out to explore the role of the appropriateness of farmer's indigenous knowledge and their adaptive capacity to floods in An Giang province. KAP (Knowledge-Attitude-Practice), PRA (KIP and focus group discussion) and household survey have been applied to collect data. The results showed that indigenous knowledge plays an important role in adapting to changes in the environment. The Livelihood Vulnerability Index (LVI) in different Zone (upper zone, middle zone, and lower zone) was decreasingly based on major components as social networks, knowledge and skills, natural resources, finance and incomes, livelihood strategies, natural disaster and climate variability. The research also suggested some solutions to conserve the valuable indigenous knowledge in adapting the change of climate of local people.

Keywords: Climate Change; Indigenous Knowledge; Flood; Adaptation

Introduction

Climate change caused serious damages for livelihood of local people such as flood, drought, and salinity intrusion [6,8]. In An Giang province, local people influenced by the annual floods, especially the downstream of the Mekong River Basin, has been severely impacted by upstream disturbance due to presence of upstream reservoirs [7]. That has caused considerable difficulties for flood management in this area [1]. In this case, indigenous knowledge, the knowledge gained over time through experience [4,9] has been used to adapt with these changed. However, the fact that there has not had many systematical research and evaluation relevance system to indigenous knowledge to adapt to flooding changes in agricultural production in the study area in the scene of climate change. Therefore, the topic "The role of indigenous knowledge to adapt to floods in sustainable development in Mekong Delta, Vietnam: A case study in An Giang province" was conducted to explore the role and contribution of indigenous knowledge in adaptation with the change of the flood. The research recommends some solutions to reduce the vulnerability on livelihoods due to floods in the context of climate change.

Research Objectives

Generally, the main purpose of the study is that to provide information on farmer's indigenous knowledge and their adaptive capacity to floods in An Giang province provide a scientific foundation for proposing solutions and policies to conserve and enhance the use of indigenous knowledge in reducing the vulnerability of people living in flooded areas and livelihood strategies of flood affected people are both effective and sustainable.

The research will focus on the specific objectives below:

- To analyze the role of indigenous knowledge and the ability of farmers to adapt to floods in different conditions.
- To evaluate the farmer's vulnerability and their adaptive capacity to floods of different zone (upper zone, middle zone, lower zone).

Approach research

In order to satisfy the research objectives, a sustainable livelihood approach study [2] was used to assess the vulnerability of flood-affected livelihoods and the effects of floods that were considered in the context of vulnerability. The framework of sustainability. In this study, livelihood damage was defined as the vulnerability to impact or disturbance occurring in and outside of the household related to household livelihoods. The vulnerability to change in the study communes was calculated by applying the LVI calculation method proposed by [3]. The variables used to calculate the vulnerability index are the vulnerability of communities when floods are impacted and classified according to five different livelihood assets in the sustainable livelihoods framework such as natural capital, human capital, physical, social capital, financial capital (Figure 1).

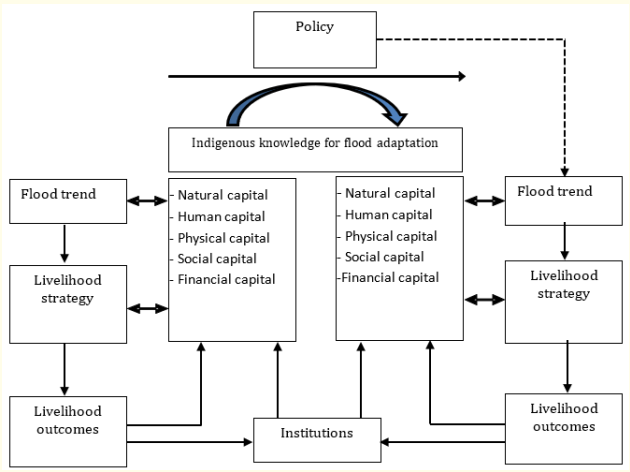

Figure 1: Sustainable livelihoods Framework for research (Source: Adapted from DFID, 1999).

Research Methods

The information was collected by using a combination of quantitative and qualitative research methods. In particular, qualitative research methods including carrying out the evaluation with the participation of people and using the following tools such as Timeline; Seasonal Calendar; Venn Diagram; Problem Ranking Matrix; and detailed interviews of local leaders. Quantitative research methods are included interview local experienced households living with floods (around 360 households) and more than 50 years of living of study sites such as: the upper zone (Phu Huu. Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes). Therefore, these households have enough time to experience and accumulate local living experiences while gaining indigenous knowledge that has been applied to life experiences

Results and Discussion

Assessing of stability for farmer's indigenous knowledge in agriculture production and life activities

The study compiled 39 indigenous knowledge and adaptability to floods and weather forecasts in agricultural production and livelihoods of local people in the study area. In which, there are 31/39 indigenous knowledge still valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. In addition, there are 8/39 indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

Assessment on vulnerability to flood changes on the livelihoods of farmers in no dyke in study sites

Through the analysis of sources and livelihood vulnerability index (LVI) of 10 key components, 30 subcomponents and 5 capital sources showed that the upper zone is the most vulnerable in study sites. Within 5 capital sources such as: Natural capital, Human capital, Financial capital and Social capital have high vulnerability index in all three regions. On the contrary, physical capital has the lowest vulnerability index (Figure 2).

Specifically, livelihood vulnerability index average of H, N, S, P, F (In which: H: Human capital; N: Natural capital; S: Social capital; P: Physical capital; F: Financial capital) in Phu Huu commune is the highest at 0,390; Vinh Phuoc commune at 0,331; and the lowest is Vinh An commune at 0,287. The values of the LVI components

ranged from 0 (low level of vulnerability) in the center of the figure to 0.5 (maximum extent of vulnerability) in the outermost region and the oscillation range was 0,1.

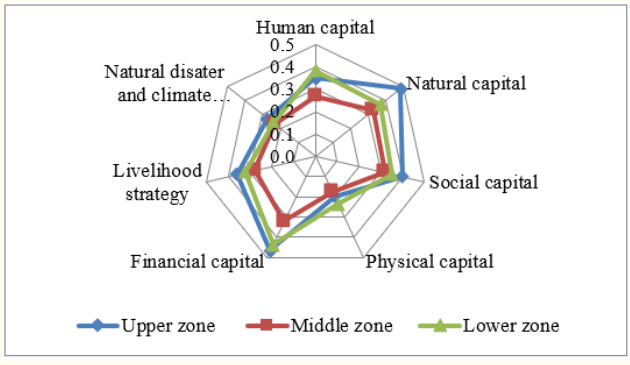

Figure 2: Vulnerability diagram of five capital of upper zone, middle zone, lower zone in no dyke in study sites.

LVI-IPCC vulnerability index no dyke in study sites

Results calculated in accordance to LVI-IPCC (level of exposure, adaptive capacity and sensitivity) based on the sub-components of household characteristics, livelihood strategies and social networks in three communes in Phu Huu Vinh An, Vinh Phuoc indicate that interviewed households in Phu Huu (upper zone) with greater level of influence, sensitivity and adaptability than households in Vinh An and Vinh Phuoc; Vinh An commune (middle zone) has lowest level of influence, sensitivity and adaptive capacity.

Assessment on vulnerability to flood changes on the livelihoods of farmers in high dyke in study sites

Through the analysis of sources and livelihood vulnerability index (LVI) of 10 key components, 30 subcomponents and 5 capital sources showed that the lower zone is the most vulnerable in study sites.

For each of capital sources of the three in study sites in high dykes showed that human capital in middle zone had a higher vulnerability index than the upper zone and lower zone. On the contrary, lower zone of the social capital and financial capital have higher vulnerability than the upper zone and middle zone. For upper zone of the vulnerability indexes are lower than middle zone and lower zone.

Specifically, livelihood vulnerability index average of H, N, S, P, F (In which: H: Human capital; N: Natural capital; S: Social capital; P: Physical capital; F: Financial capital) in Luong An Tra commune (lower zone) is the highest at 0,258; An Hoa commune (middle zone) at 0,201; and the lowest is Phuoc Hung commune at 0,183. The values of the LVI components ranged from 0 (low level of vulnerability) in the center of the figure to 0.5 (maximum extent of vulnerability) in the outermost region and the oscillation range was 0,1.

LVI-IPCC vulnerability index high dyke in study sites

Results calculated in accordance to LVI-IPCC (level of exposure, adaptive capacity and sensitivity) based on the sub-components of household characteristics, livelihood strategies and social networks in three communes in Phuoc Hung, An Hoa, Luong An Tra in high dyke study sites.

The results showed that the vulnerability of people in three communes is low and medium (Figure 3). In particular, Luong An Tra (lower zone) has the LVI-IPCC vulnerability index as the lowest, followed by An Hoa commune (middle zone), the highest is Phuoc Hung (upper zone) with the index times turns is -0,016; -0,011 and -0,005. The vulnerability to climate change in the three communes in the high dyke area is nearly the same and there is no difference in the three communes with high dike systems, which makes the high dyke in the less vulnerable caused flood.

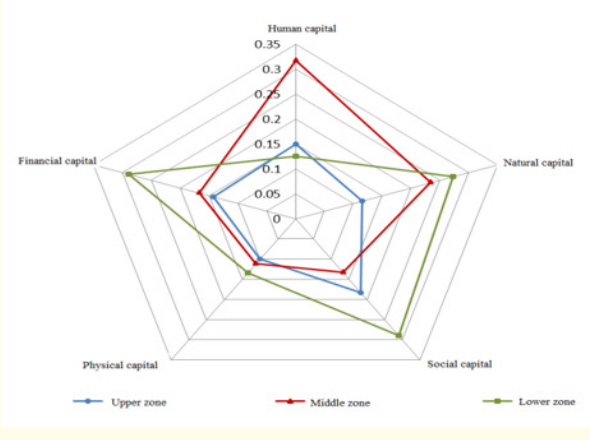

Figure 3: Vulnerability diagram of five capital of upper zone, middle zone, lower zone in high dyke in study sites.

Comparison of household livelihood vulnerability in no dyke and high dyke in study sites

The results of the household survey show that the index of livelihood damage caused by the impact of floods outside the dyke is higher than that in the dyke. This shows that the area outside the annual dyke is heavily influenced by floods such as floods that

cause crop failures, affecting houses and livelihoods, mainly based on natural resources. It is also limited and less of a job during the flood season. However, in the dyke area, there are also many difficulties. The dike is not affected by the floods, but it is polluted by water, the stock of pesticides and agricultural diseases, especially affecting More health than the dike. Therefore, the area outside the dike is more vulnerable to livelihoods due to flood than the embankment. Specifically, through the LVI and LVI-IPCC indicators.

Comparison of household indigenous knowledge in agriculture production in no dyke and high dyke in study sites

The results (Table 2) show that with α = 5% < Sig. Factors based on personal experience, training sessions in the commune, exchange of knowledge from friends and technical staff of the company affect the agricultural production of farmers outside the dike. Fields of study are different and have significant implications between upper zone and lower zone areas.

Comparison of correlations between indigenous knowledge with livelihood vulnerability in no dyke and high dyke in study sites

Results table 3 shows that indigenous knowledge is correlated with livelihood, production experience, area inside and outside of the study area by Pearson correlation (alpha of 0.22; 0.02; 0.00). meaning level of 5%. This shows that farmers who have a large area of cultivation have a lot of experience in production and have easy access to technical advances in science and technology and their knowledge will create better livelihoods. Compared with those with less acreage, it is more suitable for research [4,7]. In addition, farmers with less production experience less risks [5].

Study sites	High dyke			No dyke		
	Phuoc Hung	An Hoa	Luong An Tra	Phu Huu	Vinh An	Vinh Phuoc
LVI	0.183	0.201	0.258	0.390	0.287	0.331
LVI-IPCC	-0.005	-0.011	-0.016	-0.005	-0.001	-0.015

Table 1: Comparison of household livelihood vulnerability in no dyke and high dyke in study sites

ANOVA					
Information access factor of household to agricultural production	Mean			F	Alpha
	Upper zone	Middle Zone	Lower Zone		
Personal experience	4.40	3.87	3.87	8.103	0.000
Training at commune	3.13	2.53	2.73	4.741	0.010
Training at company	2.67	2.53	2.53	0.147	0.863
Communication knowledge	2.80	2.73	2.73	0.034	0.966
Related people	3.73	2.60	2.60	18.904	0.000
Technical officces	2.60	1.60	1.60	11.231	0.000

Table 2: Comparison of differences in farmer's indigenous knowledge of no dyke in different ecological zones (upper zone, middle zone, lower zone).

Correlations					
Indigenous knowledge is correlated with livelihood, production experience, area inside and outside of the study area		Production experience	Production experience	Indigenous knowledge	Flood season livelihoods
Production experience	Pearson Correlation	1	.024	.121*	.070
	Sig. (2-tailed)		.651	.022	.184
	N	360	360	360	360
Cultivated area	Pearson Correlation	.024	1	-.165**	-.003
	Sig. (2-tailed)	.651		.002	.956
	N	360	360	360	360
Indigenous knowledge	Pearson Correlation	.121*	-.165**	1	.192**
	Sig. (2-tailed)	.022	.002		.000
	N	360	360	360	360
Flood season livelihoods	Pearson Correlation	.070	-.003	.192**	1
	Sig. (2-tailed)	.184	.956	.000	
	N	360	360	360	360
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 3: Comparising of correlations beetween indigenous knowledge with livelihood vulnerability in no dyke and high dyke in study sites.

Conclusion

The study compiled 39 indigenous knowledge and adaptability to floods and weather forecasts in agricultural production and livelihoods of local people in the study area. In which, there are 31/39 indigenous knowledge still valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. In addition, there are 8/39 indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

Indicators of livelihood damage in the study area were reduced in terms of social networks, knowledge-skills, natural resources, income and finance, livelihood strategies, natural disasters, the different between beginning, middle, end of the area. Thus, the study provides a number of solutions to the conserve the indigenous knowledge, combining indigenous knowledge with current adaptation measures to improve adaptability to floods, climate change.

In addition, Livelihood Vulnerability Index from 10 main components, 30 subcomponents and 5 livelihoods sources in the dyke area and outside dyke area, indicate that the livelihood vulnerability index Floods in the outlying dike area are more vulnerable than those in the high dyke and the uptake trend is also focused on two issues: the impact of floods on the outlying embankments and the impact of the natural environment due to Intensify the crop for dike areas. The Government should also have insurance policies for people in flood areas to ensure production and adaptation to floods in order to reduce vulnerability to climate change.

In other to mitigate vulnerability, an early warning system for floods should be established for the people to manage and mitigate the vulnerability of livelihoods caused by floods; strengthening propaganda and dissemination of knowledge to prepare for the flood season, opening training courses adapted to abnormal floods.

Recommendations

Further research on the role of indigenous knowledge in the field is needed for customs, culture, breeds, crops and livestock for different ethnic groups such as Cham, Hoa, Kinh and Khmer in different flood and coastal areas in the Mekong Delta.

The studies on assessing and comparing livelihood vulnerability almost applied the vulnerability index by [3]. Further in-depth studies should be conducted in the flood-prone provinces and in Vietnam to compare real data and establish a set of vulnerability assessment criteria for the particular flood-prone areas in Vietnam based on the actual data and calculation results.

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