

Farmers' Perceptions on Land Degradation: A Case Study in Vietnam

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Abstract

This study aims to investigate farmers' perception of land degradation in Vietnam, where land degradation is concerned as one of the nation's most pressing issues. Based on survey data from 826 farmers in three representative regions of Vietnam (including Hoa Binh province in Northern region, Quang Tri province in the Central Coastal region, and Can Tho province in Southern region) conducted in 2017, the study reveals that over 85% of the respondents have observed indications of land degradation on their farms. The farmers' perceptions of land degradation indicators were influenced by regional topography. Inappropriate farming techniques, excessive chemical use, and a lack of knowledge were reported as the major causes of land degradation. Furthermore, the farmers had limited understanding of land degradation as well as the benefits of soil conservation measures. Sustainable land management adopters exhibited their better perception of land degradation and measures for land improvement compared to non-adopters. Therefore, it is crucial to increase the farmers' perception on land degradation and the advantages of adopting sustainable land management and this should be accomplished through widespread dissemination via mass and local media in the future.



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Introduction


Land degradation is a significant global concern that affects both the environment and development.¹ It encompasses various processes that result in the decline of land productivity, including diminished soil biological diversity and activity, erosion

caused by wind and water, loss of soil structure, salinization, acidification, water logging, soil nutrient depletion and pollution.² The consequences of land degradation are detrimental, as it hinders agricultural development, exacerbates poverty and vulnerability, and fosters social tensions due to the increasing

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demands on limited natural resources prompted by growing populations. Land degradation is caused by natural constraints, such as high annual rainfall and steep terrain conditions, as well as inappropriate land management.³ The decision of farmers to adopt sustainable land management (SLM) depends on their perception of the landscape. The term "farmers' perception of land degradation" refers to how farmers perceive the relationship between soil erosion and soil fertility processes.⁴ Perception is one of the key factors that determine the adoption of various land sustainable practices.

SLM is considered as knowledge-based procedures that help integrated land, water, biodiversity and environmental management to meet the increasing demand for food and fiber while simultaneously maintaining the ecosystem services and livelihoods.⁵ Typical types of SLM practices include diversified cropping system with soil erosion control structures, integrated agroforestry, contour farming in sloping land, intercropping system and mulching in degraded and dry areas.^{6,7} These practices play a pivotal role in positive changes in sustainable use and administration of land resources.⁸ Practices that fail to uphold sustainability in land management can pose risks to biodiversity and exacerbate carbon emissions, particularly when forest are destroyed, while also adversely affecting water resource management.

In Vietnam, land degradation is considered one of the foremost challenges of the country.⁹ According to the National Action Program to Combat the Desertification for the 2006-2010 period and orientation to 2020, approximately 9.3 million hectare of land in Vietnam are grappling with desertification. This area sustains the livelihoods of approximately 22 million people, which accounts for roughly one-fourth of the nation's total population. SLM practices in Vietnam include the agroforestry models, intercropping models based on the legumes (i.e. mung bean/ peanut/ or soybean) and sesame.^{10,11}

Despite the recommendations from the Vietnamese government regarding the adoption of SLM, non-SLM practices or inappropriate land management

such as monoculture, erosive farming practices and excessive use of chemicals still prevails in many regions of Vietnam.^{12,13,14} Increasing the rate of SLM adoption is therefore very essential for preventing land degradation. The inadequate perception of farmers regarding land degradation appears to be one of the reasons for the low proportion of SLM adoption. However, there is a lack of studies examining the farmers' perception of land degradation. Consequently, how the Vietnamese farmers perceived on land degradation remains unanswered questions and requires further investigation. This study thus aims to investigate the current perception of Vietnamese farmers regarding land degradation, and propose measures to improve their perceptions for better adoption of SLM in the future.

Methodology

Land degradation is a pervasive issue across all regions of Vietnam, with certain areas experiencing particular severe impact. The Northwest mountainous region, Central coastal region, Mekong delta region, and Central highland are among the most affected regions.¹⁵ This study focuses on investigating farmers' perceptions of land degradation in three regions: Northwest mountain, Central coast, and Mekong delta. To ensure representative study sites, one district was selected from each region through focus group discussion with land management experts. Da Bac district (Hoa Binh province) province was chosen as the study site for the Northwest region. This district exhibits diverse topography, including high mountains (some mountains with more than 1000 meters high), hills, rivers and streams, with slopes averaging 35 degrees and an average elevation of 560 meters above sea level. For Mekong delta region, Co Do district (Can Tho province) was selected. This district is characterized by flat fields primarily used for rice production. In the Central coastal region, Hai Lang district (Quang Tri province) was chosen as the study site. This district features sandy soil, low fertility and experiences severe drought during the dry seasons. By selecting these representative districts, the study aims to capture the farmers' perception of land degradation in the specific contexts of these regions.

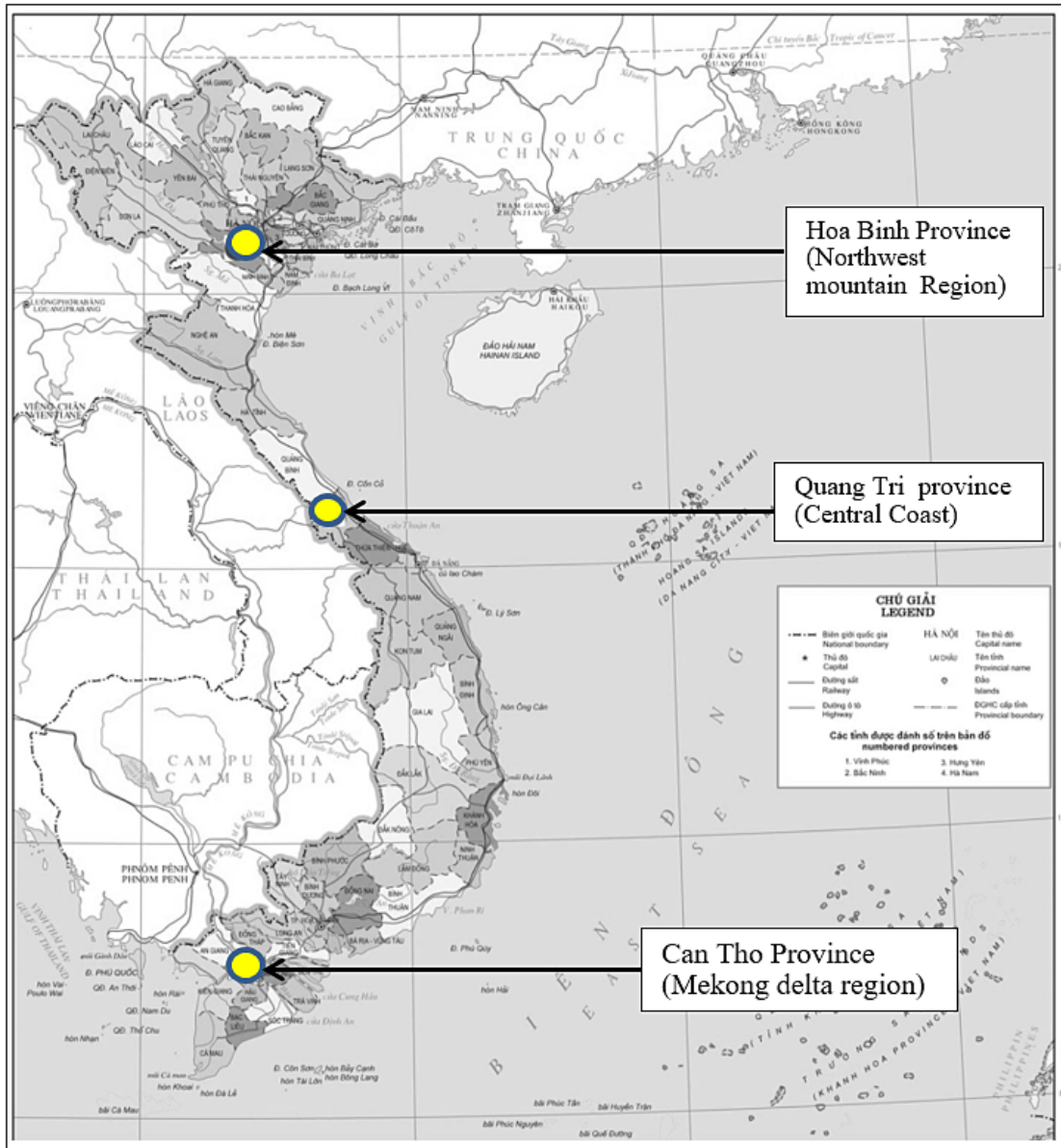


Fig. 1: The selected site for the surveys

In each district, the group discussions were organized with the district staff to select the communes for interviews. The selection criteria included ensuring that the chosen communes represented the district in term of agricultural practices, including both SLM and non-SLM approaches. Approximately 240-300 farm households were selected for face-to-face interviews in each district. The selection of farm households employed a stratified approach. Initially,

the farm households were divided in to two main groups: SLM adopters and non-adopters. From each group, sample households were randomly selected. The research team collaborated with district staff and commune or village staff to gain insights into the SLM adoption situation in selected districts and communes, and to identify the farm households for interviews. The number of adopter and non-adopter households in each study site is presented in

Table 1. The household survey was conducted in 2017. Subsequently, both primary and secondary data were collected, organized, and categorized for data analysis. Descriptive analysis and comparative analysis were primarily employed for data analysis purposes.

Table 1: Number of interviewed farm households

District/ Province	Total areas (km ²) ¹⁶	Total population (1000 persons) ¹⁶	Estimated adoption rate (%)	SLM adopted households	SLM non-adopted households	Total surveyed households
1. Da Bac district – Hoa Binh Province	779.77	54,985	30-40	181	119	300
2. Hai Lang district – Quang Tri Province	426.92	78,324	20-30	110	129	239
3. Co Do district – Can Tho province	310.37	116,576	10-15	123	164	287
Total	-	-	-	414	412	826

Results and Discussions

General Information on the Survey Households

A total of 826 farm households, including both those who had adopted sustainable practices and those who had not, were selected for direct interviews. The respondents had an average age of 47.7 years,

and the majority had completed secondary school.

On average, each surveyed households consisted 4.7 individuals, with 4.1 individuals above the age of 12. Furthermore, there were 2.2 agricultural laborers within each surveyed household (Table 2).

Table 2: General Information of respondents and survey households

		Age	Education level	No. of member	Member above 12 years	No. of agricultural labors
1. Hoa Binh province	Mean	45.7	1.7	4.4	3.6	2.4
	Std. Dev	10.9	0.7	1.2	1.0	0.9
- Adopters	Mean	46.0	1.7	4.5	3.6	2.4
	Std. Dev	10.8	0.7	1.2	1.1	1.0
- Non-Adopters	Mean	45.2	1.7	4.3	3.6	2.4
	Std. Dev	11.0	0.7	1.1	1.0	0.9
2. Quang Tri province	Mean	49.7	1.9	4.9	4.3	1.8
	Std. Dev	9.2	0.4	1.0	1.1	0.5
- Adopters	Mean	48.7	2.0	4.7	4.3	2.0
	Std. Dev	7.5	0.4	1.0	1.0	0.5
- Non-Adopters	Mean	50.6	1.9	5.0	4.4	1.7
	Std. Dev	10.5	0.5	1.0	1.1	0.6
3. Can Tho province	Mean	48.2	2.1	5.0	4.4	2.3
	Std. Dev	9.4	0.8	1.2	1.4	1.0
- Adopters	Mean	48.4	2.1	4.8	4.0	2.0
	Std. Dev	8.6	0.7	1.1	1.1	1.0
- Non-Adopters	Mean	48.0	2.2	5.0	4.6	2.5
	Std. Dev	10.0	0.8	1.3	1.5	1.0

4. Total	Mean	47.7	1.9	4.7	4.1	2.2
	Std. Dev	10.0	0.7	1.2	1.2	0.9
- Adopters	Mean	47.4	1.9	4.6	3.9	2.2
	Std. Dev	9.5	0.7	1.1	1.1	0.9
- Non-Adopters	Mean	48.0	2.0	4.8	4.2	2.2
	Std. Dev	10.6	0.7	1.2	1.3	0.9

(Note: For education level: Primary school = 1; secondary school = 2; high school = 3; college and university = 4)

(Source: Household Survey, 2017)

There was only a small difference in age, education, number of household members, and number of agricultural laborers between the adopters and non-adopter groups, and statistical tests indicated no significant difference in these indicators between the two groups. However, there were significant differences in age and education of respondents among the regions. On average, respondents in Hai Lang district were four years older than those in Da Bac district and 1.5 years older than the those in Co Do district. This difference in age was statistically significant at $p < 0.01$. Moreover, respondents in Co Do district had a higher level of education compared to those in Da Bac and Hai Lang districts, with the difference in education level between the districts being statistically significant at $p < 0.01$. While the surveyed households in Co Do district had the largest number of family members and the members above the age of 12, the surveyed households in Da Bac district had the largest number of agricultural members per household. This difference may be attributed to the fact that people in Da Bac district focused more on agricultural activities due to the difficulty of finding non-farm jobs. On the other hand, people in Hai Lang district had relatively easier access to non-farm employment opportunities.

SLM Adoption in the Survey Households

Due to the variation in natural and socio-economic conditions, the implementation of SLM practices differed across the regions. Even within the same region, there were different SLM practices observed.¹⁰ In the mountainous Da Bac district, SLM practices included the agroforestry models and crop rotation of maize and legumes.^{17,18} On the other hand, non-SLM practices involved the monoculture of crops such as two maize crop, two rice crops, cassava and sugarcane. Another non-SLM practice

was crop rotation with cassava or edible canna such as maize-cassava or maize-edible canna. These non-SLM practices in the region often resulted in the loss of soil organic matters and depletion of soil nutrients. The key characteristics of SLM practices in the region were their ability to maintain good land cover and improve soil quality. According to the survey, the majority of SLM households (62.5%) implemented agroforestry models, with the acacia with upland crops models being the most common. Other SLM practices included the styrax with cash crop model (13.3%) and the meliaceae with cash crop model (9.9%). In contrast, non-SLM practices consisted of maize monoculture (31.9%), intercropping of cassava and maize (19.4%), sole cultivation of cassava (24.4%) and other practices (14.3%).

In the coastal region of Hai Lang district, non SLM-practices consisted of, monocultures of rice, cassava, or sweet potato. These practice often led to the depletion of soil nutrients and loss of organic matter, primarily due to excessive use of chemical fertilizers or soil exposures to sunlight during the dry season. According to the survey, rice monoculture was the most prevalent practice in the non-SLM households, accounting for 54.6%. Single cassava plantation accounted for 21.8% while monoculture of sweet potato represented 19.3% (table 3). On the other hand, intercropping models that involved legumes such as mung bean, peanut, or soybean as well as chieves can be considered as SLM models in Hai Lang district. These models help maintain and balance soil nutrients, particularly due to the presence of legumes. Additionally, farmers in the district often practice mulching by returning crop residues from harvest and applying compost. This practice further aids in maintaining soil moisture,

enhancing soil organic matters, and decreasing soil surface degradation. The main SLM model observed in the survey households was chieives with cassava,

accounting for 27.3%. Other SLM models included Chieives + bean + cassava (22.7%), Cococynth + bean (21.8%), Cassava+bean-melon (19.1%).

Table 3: Type of SLM and non-SLM practice in survey households by regions

Region	SLM and non-SLM practices	No of adopted households	Percents	
Mountainous region	SLM practices	Styrax with cash crop	24	13.3
		Acacia with cash crop	118	65.2
		Meliaceae with cash crop	18	9.9
		Others	23	11.6
		Total	181	100.0
	Non-SLM practices	Maize – maize	38	31.9
		Cassava	29	24.4
		Maize and cassava (intercrops)	35	29.4
		Others	17	14.3
		Total	119	100.0
Coastal region	SLM practices	Maize+peanut -	10	9.1
		Maize+bean		
		Chieives + bean + cassava	25	22.7
		Chieives + cassava	30	27.3
		Cococynth + bean	24	21.8
		Cassava+bean-melon	21	19.1
		Total	110	100.0
	Non-SLM practices	Rice - rice	65	54.6
		Cassava	26	21.8
		Sweet potato	23	19.3
Mekong delta	SLM practices	Rice rotation with sesame	90	73.2
		Rice rotaltion with melon	4	3.3
		Rice rotaltion with bean	14	11.4
		Rice rotaltion with maize	15	12.2
		Total	123	100.0
	Non-SLM practices	3 rice	155	94.5
		2 rice	4	2.4
		Others	5	3.0

(Source: Survey data, 2017)

In the Mekong delta, the monoculture of rice, such as three rice crops per years or two rice crops per year, is regarded as a non-SLM practice. Continuous rice cultivation in paddy soils leads to degradation of soil quality due to long-term submergence and excessive mineral fertilizer application.¹⁹ Continuous rice cultivation over extended period has been observed

to result in rapid nutrient depletion, soil compaction and destruction of soil structure, porosity and aeration due to flooded conditions.²⁰ In the survey of non-SLM households, the practice of having three rice crops accounted for the majority, with 94.5%, while the practice of having two rice cops was only 2.4%. In the delta, a cropping rotation system

that includes upland crops, particularly legumes, is considered a SLM practice. This system helps improve soil fertility and nutrient levels, especially nitrogen, through return of biomass and nitrogen fixation. One common SLM practice observed in households is rice rotation with sesame, which accounted for the majority at 73.2%. Rice rotation with bean or maize, on the other hand, had small shares, around 11-12%.

Perception and Attitudes of the Households on Land Degradation

Perception on Land Degradation Occurrence

According to the survey results, more than 82.7% of the respondents reported that they observed land degradation on their own land. However, the perception of land degradation varied among

different regions. In the coastal and mountain regions, nearly all farmers (100% and 82.7%, respectively) acknowledged that land degradation was occurring on their land. On the other hand, in Mekong delta region, only a minority of farmers (30%) believed that land degradation was taking place on their land. This difference in perception can be attributed to the visibility of land degradation in each region. In mountainous and coastal regions, land erosion and reduced crop productivity make land degradation more apparent to farmers. They can observe these tangible signs of degradation. However, in the Mekong delta, where the manifestation of land degradation may be less obvious, farmers might find it more challenging to identify and acknowledge the occurrence of land degradation on their land.

Table 4: Occurrence of Land Degradation in respondents' households (%)

Province	Place of land degradation	Adopters	Non-Adopters	All surveyed households
1. Hoa Binh	In my own agricultural land	82.9	82.4	82.7
	In agricultural land of others	97.8	95.0	96.7
2. Quang Tri	In my own agricultural land	100.0	100.0	100.0
	In agricultural land of others	100.0	100.0	100.0
3. Can Tho	In my own agricultural land	4.9	44.5	27.5
	In agricultural land of others	8.1	44.5	28.9
Total	In my own agricultural land	64.3	72.8	68.5
	In agricultural land of others	71.7	76.5	74.1

(Source: Survey data, 2017)

The share of respondents who reported the occurrence of land degradation in their farming land was similar between SLM adopters and non-adopter groups in both the mountainous and coastal regions. Nonetheless, a notable distinction existed between the two groups of SLM adopters and non-adopters in Mekong delta region (table 3). Among the adopters, only 4.9% reported that land degradation was occurring on their land, whereas the figure for non-adopters was 44.5%. This suggests that the adoption of SLM practices clearly mitigates or prevent land degradation in Mekong delta region. The clear contrast in the reported occurrence of land degradation between two groups of adopters and non adopters highlights the effectiveness of SLM adoption in preventing land degradation in the

Mekong delta. This implies that the implementation of sustainable practice play the essential role in maintaining the health and productivity of agricultural land in this region.

Changes of Land Indicators by Respondents' Assessment

In the recent years, land degradation has occurred in many regions of Vietnam due to various reasons. A majority of the respondents have reported observing indicators of land degradation on their farm, such as changes in soil color, texture, fertility. A notable proportion of the respondents (35-45%) have noticed a deterioration in soil color, texture, thickness, and water quality on their land plots in recent years. Additionally, over 50% of farmers

have increased their fertilizer usage compared to five years ago.

There were notable differences between groups of farmers when assessing changes in land indicators. A substantial proportion of adopters (14-16%) reported improvements in soil color, texture, thickness and fertility on their plots whereas only a very small percentage of non-adopters

(4-6%) shared the same perception. Furthermore, the percentage of non-adopters who increased their fertilizer usage for crop production was higher compared to the adopters (as shown in Table 5). This suggests that the adoption of SLM practices made some contributions towards enhancing the land of the farm household and quality of surrounding waters.

Table 5: The changes of land indicators assessed by adoption groups

	Better or higher		Worse or lowers		No change	
	Adopter group	Non-adopter group	Adopter groups	Non-adopter group	Adopter group	Non-adopter group
Soil color	15.0	4.6	34.2	46.5	50.7	48.9
Texture	15.7	6.3	33.5	51.6	50.8	42.1
Thickness	13.9	4.3	37.2	51.2	48.9	44.5
Fertility	16.3	4.8	43.4	64.6	40.2	30.6
Water Quality	2.4	0.6	32.7	42.1	64.9	57.3
Crop Yield	19.6	11.5	28.2	43.0	52.2	45.6
Fertilizer use*	49.1	57.1	2.1	7.8	48.8	35.1
Water Quantity	4.5	0.7	54.2	51.6	41.3	47.7
Vegetative	8.8	1.7	41.3	38.8	49.8	59.5

(*) higher fertilizer use per unit of area)

(Source: Household Survey, 2017)

Indicators Reflecting Land Degradation

The recognition of diminishing land fertility serves as an indicator of land degradation by a majority of the respondents (81.7%). However, only a small percentage (7.2%) considered it as the most important indicator (as shown in Table 6). Approximately 80% of the surveyed farmers agreed that reduced crop yield was a reflection of land degradation, with 12.8% considering it as the most important indicator. Less than half of surveyed farmers viewed weed development, land salinity, and bare land as indicator of land degradation. The perceptions of respondents regarding land degradation indicators was also influenced by regional topography. In mountainous region, 87% of farmers considered land erosion as one of the indicators of land degradation, with half of them regarding it as the most important indicator. However, farmers in the coastal region and the Mekong delta region did not share this viewpoint. This discrepancy can be attributed to the flat nature

of the land in the coastal and mountainous region where land erosion is not as visibly evident.

There was a substantial disparity in perceiving land degradation indicators between the adopters and non-adopter groups. Among adopters, 87.4% recognized crop yield reduction as an indicator of land degradation, while only 72.3% of the non-adopter group shares this perception. Similar patterns were observed for other indicators such as soil erosion, weed development and land fertility decline. This indicates that adopters of SLM practices had a better understanding of land degradation indicators in comparison with non-adopters. The study results could also confirm that the farmers demonstrated awareness of their environment and its associated issues, particularly those impacting crop yields and causing noticeable landscape changes like erosion. These are similar to the findings by Saguye T. S. (2018) in West Shewa Zone in Ethiopia.²¹

Table 6: Indicators reflecting land degradation by farmers

	Yes, this is an indicator			Yes, it is the most important indicators		
	Adopters	Non-adopters	All surveyed households	Adopters	Non-adopters	All surveyed households
1. Crop yield reduction	87.4	72.3	79.9	19.8	5.8	12.8
2. Soil erosion	40.0	30.0	35.0	19.3	16.6	17.9
3. Weed development	60.7	33.3	47.0	8.3	1.2	4.8
4. Salinity/alkaline	55.9	41.4	48.7	3.0	3.0	3.0
5. Bare land	71.7	22.6	47.3	2.2	0.0	1.1
6. Decline in Land fertility	88.6	74.8	81.7	10.2	4.2	7.2
7. Rocky land	43.6	27.4	35.6	4.4	2.0	3.2
8. Decline in Animal yield	64.7	26.5	45.7	0.0	0.3	0.1
9. Poor water absorption	64.7	26.5	45.7	1.2	0.5	0.9
10. Stunted crop	58.0	54.7	56.3	4.1	1.0	2.6

(Source: Survey data, 2017)

Table 7: Land degradation as the local problem and national problems?

Province	Yes or No	Land Degradation as local problem?			Land Degradation as national problem?		
		Adopters	Non-Adopters	All surveyed households	Adopters	Non-Adopters	All surveyed households
Hoa Binh	- Yes	96.7	96.6	96.7	85.1	81.5	83.7
	- No	1.7	2.5	2.0	1.7	1.7	1.7
	- No opinion	1.7	0.8	1.3	13.3	16.8	14.7
Quang Tri	- Yes	100.0	100.0	100.0	99.1	100.0	99.6
	- No	0.0	0.0	0.0	0.9	0.0	0.4
Can Tho	- Yes	11.4	32.3	23.3	10.6	31.7	22.6
	- No	57.7	55.5	56.4	55.3	54.3	54.7
	- No opinion	30.9	12.2	20.2	34.1	14.0	22.6

(Source: Survey data, 2017)

The farmers demonstrated awareness of their environment and its associated issues, particularly those impacting crop yields and causing noticeable landscape changes like erosion.

Land Degradation as Local Problem or National Problems and its Causes

Land degradation was perceived as the local problem by 72.2% of the respondents and as a national problem by 67.1%. However, these rates

varied significantly across regions. In mountainous and coastal region, over 95% of the respondents believed that land degradation was a local problem, whereas only 23.3% of the farmers in Mekong delta shared this perception (as shown in Table 7). Conversely, in the coastal region, 99.6% of the respondents believed that land degradation as a national problem, while in mountainous and Mekong delta regions, the figures were 83.7% and only 22.6%, respectively. The diverse topographical characteristics of each region appeared to influence farmers' perceptions of this issue. In the mountainous and coastal regions, there was not much difference in perception between SLM adopters and non-adopters regarding whether land degradation was a local or national problem. However, in the Mekong delta, the percentage of non-adopters who considered land degradation as a local problem or national problem was significantly higher than of the adopters.

The Reason of Land Degradation

Most of the respondents (over 80%) identified inappropriate farming techniques as the major

cause of land degradation, followed by overuse of chemicals (approximately 80%), and lack of knowledge (over 70%). However, the policies and deforestation were considered as the primary reasons for land degradation by only 24.5% and 35.5% of the respondents, respectively (as shown in table 8). Notably, in mountainous region, 94.5% of farmers perceived deforestation as the major cause of land degradation and 36.9% of the respondents in this region regarded as the most important reason.

There was a notable difference in the perception of the main reasons contributing to land degradation between adopter and non-adopter groups. Adopters tended to emphasize the reasons for land degradation more than the non-adopters. For instance, 87.6% of adopters identified overuse of chemicals as one of the primary reasons for land degradation, whereas the figure for non-adopters was only 70.2%. This pattern is also observed for other reasons such as lack of knowledge and inappropriate farming practices.

Table 8: The main reasons of land degradation by farmers' assessment (%)

	Yes, this is			Yes, it is the most important reason		
	Adopters	Non-adopters	All surveyed households	Adopters	Non-adopters	All surveyed households
1. Policies	30.2	18.7	24.5	0.8	0.5	0.6
2. Lack of knowledge	80.0	60.4	70.3	9.5	1.2	5.4
3. Inappropriate farming practices	87.2	73.4	80.3	23.7	10.5	17.1
4. Deforestation	41.0	30.1	35.5	14.4	12.5	13.4
5. Overuse of agro-chemicals	87.6	70.2	78.9	16.6	6.6	11.6

(Source: Survey data, 2017)

When asked about the most important cause of land degradation, adopters displayed a clearer understanding compared to non-adopters. Approximately 71% of adopters were able to provide a response, while only 35.5% of non-adopters

were able to do so, with many others expressing uncertainty or being unable to answer. Among those who dis answer the question, the majority identified in appropriate farming practices as the primary factor contributing to the land degradation.

Perception on Land Degradation and Improvement Measures

To understand the perceptions of the respondents regarding land degradation and measures for land improvement, a series of related questions were posed. The answers provided by respondents indicate that majority had a correct understanding of the given statement (table 9). Around 95% or more of the respondents believed that soil erosion would lead to a reduction in crop yield. They also acknowledged that implementing organic measures and practicing crop rotation with beans would contribute to improving land quality, and that adopting land improvement cultivation techniques would help increase income. Furthermore, over 80% of the respondents recognized that excessive use of chemical fertilizers and pesticides could diminish land fertility. However, half of the respondents agreed with the statement that soil conservation measures should only be adopted when land degradation occurs, as long as the soil is still productive. This reflects some limitations in their knowledge and may hinder their proactive application of measures

to prevent land degradation. Instead, they tend to implement conservation measures only in response to visible signs of land degradation in their plots.

The responses from adopters revealed a stronger understanding of land degradation and measures for land improvement, particularly regarding the benefits of mulching, no tillage cultivation, and the appropriate time for adopting the soil conservation measures. Over 97% of adopters agreed that mulching would help improve land quality, while only 61.9% of non-adopters shared the same perception. Additionally, 36.4% of adopters believed that soil conservation measures should not be adopted as long as the soil was still productive, whereas the figure for non-adopters was 62.9%. This means that the respondents as a whole still have incomplete understandings. This findings aligns with the outcome of the research by Kassa *et. al.* (2013).²² Furthermore, adopters exhibited better perceptions of land degradation and measures for land improvement compared to non-adopters.

Table 9: The share of respondents saying “yes” to the statements

Statement	Adopters	Non-adopters	All surveyed households
1. Soil erosion reduces crop productivity	96.8	93.1	95.0
2. Soil conservation measures should not be adopted as long as the soil is still productive	33.8	55.2	44.1
3. Organic manures help improve land quality	94.7	90.7	92.8
4. Overuse chemical fertilizer reduce the land quality	84.3	82.6	83.5
5. Use of pesticide will reduce the land quality	80.1	79.2	79.6
6. Rotation with bean help improve land quality	86.5	84.9	85.7
7. Use terrace will reduce soil erosion	81.9	78.8	80.4
8. Mulching will help improve land quality	91.8	52.9	73.1
9. No tillage cultivation will help improve land quality	82.9	47.5	65.9
10. Agroforestry will help reduce soil erosion	87.9	74.5	81.5
11. Agroforestry need more time for getting benefit	84.0	83.8	83.9
12. Land Improvement cultivation help increase income	94.3	89.6	92.0

(Source: Survey data, 2017)

The Proposals for Raising Farmers' Awareness of Land Degradation and Enhancing the Adoption of Slm Practices

Based on the findings of aforementioned analysis, the measures for raising farmers' awareness of land

degradation and enhancing the adoption of SLM practices in study sites as well as in other regions in Vietnam with the similar natural and socio-economic conditions are proposed as follows

Since mass and local media play the important role in raising the perception of the farmers on the land degradation and the benefits of the adoption of SLM practices, designing additional radio bulletin and television news segments to introduce SLM practices and their region-specific benefit is essential. Those news and bulletins should be disseminated or broadcasted through the mass media or local media (such as provincial TV channels or provincial newspapers) so that the local farmers can easily be accessed to. The dissemination should also focus more on female farmers and older farmers (more than 45 years ago) through specific programs on TV or radio (such as women program) or through the community meetings. The contents of the broadcasted news should include compelling evidences of SLM benefits such as showcasing photos of successful SLM models or citing the opinions of specific farmers who have adopted SLM practices. This evidence-based approach can enhance persuasion and credibility, helping to convey the advantages and positive outcome of SLM adoption effectively.

As lack of knowledge on SLM practices are constraints for both adopters and non-adopters, and extension services were confirmed to be very important for SLM adoption, better extension services for farmers, especially on the technical guidance for SLM adoption are of very necessity. Hence, it is imperative for government authorities and policymakers to prioritize the enhancement of extension staff skills, alongside increasing their numbers and availability. This concerted effort is vital for the effective and organized dissemination of SLM practices in various regions, ultimately leading to a cascading impact on farmers. TOT training courses for extension workers with the focus on SLM adoption technology and dissemination should be organized. In parallel, the training courses for farmers on how to recognize the land degradation and how to adopt SLM practices should be provided. Furthermore, it is important to establish SLM demonstrations that farmers can visit, providing them with the opportunity to learn how to apply these practices effectively.

The credit program or financial supports for SLM farmers through providing loan with low interest rate or with simple procedures should be designed since a significant number of farm households reported that the application of SLM practices is impeded by

high costs involved, as well as the delayed returns from agroforestry model. Additionally, to facilitate the farmers' adoption of SLM practices, it is crucial to provide input support, such as offering crop varieties and fertilizers at reduced price during the initial stage of SLM adoption. Those supports should be made priority for the poor households and for the households in mountainous region.

Conclusion

Agriculture plays the very important role in the economy of Vietnam. However, the agricultural sector in Vietnam is currently facing with significant land degradation, with approximately 9.3 million hectare of agricultural land area being affected. The insufficient perception of farmers regarding land degradation has negative implications for SLM efforts. While farmers in the mountainous and coastal regions have demonstrated clear recognition of land degradation as a major problem, farmers in the Mekong Delta appear to have a different perspective. Overall, more than 85% of the farmer respondents reported observing various signs of land degradation on their farms. These indicators include changes in soil color, texture, thickness, soil fertility decline, reduced crop yields, degraded water quality, and loss of plant diversity and habitats. The perception of land degradation indicators also varied based on regional topography. Most respondents attributed inappropriate farming techniques, overuse of chemical, and lack of knowledge as the primary cause of land degradation. However, there is still room for improvement in their understanding of land degradation and the benefits of soil conservation measures. It is worth noting that adopters tend to have better perceptions regarding land degradation and measures for land improvement compared to non-adopters. The study also proposed major measures for raising the local farmers' awareness of land degradation and enhancing the SLM adoption. These measures include more dissemination on the land degradation and benefits of SLM practices, better extension services for farmers, and more financial supports for SLM farm households.

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Conflict of Interest

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