Investigating Factors Influencing Scores of the Sustainable Rice Platform (SRP) Standard in Rice Cultivation: A Case Study in An Giang Province, Vietnam

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Introduction

	Rice cultivation in the Mekong Delta, Vietnam	Rice cultivation in the Vietnam
Rice cultivation area	**55%**	100%
Farm households	**59%**	100%
Rice production	**56%**	100%
Rice export volume	**90%**	100%

However, rice cultivation in the Mekong Delta, Vietnam also uses 30-40% of freshwater of the area, accounting for 15% of anthropogenic greenhouse gas (GHG) emissions of the area, and uses more pesticides and chemical fertilizers than recommended levels[1]. Climate change impacts may already be reducing rice yields, and projections show that production could drop by over 6 % by 2030 and over 13 % in 2050[4]

To improve smallholder livelihoods and reduce the social, environmental, and climate footprint of rice cultivation, Loc Troi company (a member of SRP) signed a contract with farmers to practice SRP rice cultivation in Dong Thap province, An Giang province, and Kien Giang province in the Mekong Delta, Vietnam since 2016 [5]

After that, the Departments of Agriculture and Rural Development of the provinces coordinated with non-governmental organizations (NGO) and SRP experts to train and guide SRP rice cultivation for farmers in the Mekong Delta

Introduction

The Sustainable Rice Platform (SRP)			
Establish	**Purpose**	**Standard**	**Key benefits**
Originally co-convened in 2011 by: · The International Rice Research Institute (IRRI) · The United Nations Environment Programme (UNEP), · Research partners · Private sector partner.	· Improve the livelihoods of smallholder farmers · Reduce the footprint of rice production; protect the environment. · Enable an assured supply of sustainably produced rice · Help meets the growing global demand for rice. · Deliver high-quality, nutritious rice to consumers	· Farm management · Pre-planting · Water use · Nutrient management · Pest management · Harvest and postharvest · Health and safety · Labor rights	· 10 to 20% boost in farmers' net incomes · Up to 20% reduction in water use · Nearly 50% cut in methane emissions from flooded rice fields

SRP score is based on the total number of points a farmer has scored, divided by the maximum achievable number of points (132), multiplied by 100.

- 33 - 89 points: the farmer is working toward sustainable rice cultivation.
- 90 -100 points: the rice farming practices are considered "sustainable".

$$\text{Score Standard (0- 100)} = \frac{\text{Total numbers of points corresponding to actual performance x 100}}{\text{Maximum number of points possible}}$$

	Items	Score	%
1	Farm management	9	7
2	Pre-planting	18	13
3	Water use	15	11
4	Nutrient management	12	9
5	Pest management,	18	14
6	Harvest and postharvest	21	16
7	Health and safety	18	14
8	Labor rights	21	16
	Total	132	100

Source: compiled from the Standard for Sustainable Rice Cultivation Version 2.1[2]

Introduction

Evaluation of SRP

- After implementing SRP rice cultivation, score each of the 41 requirements.
- Basically, it is assessed at level 1 and level 2. 1)

Levels	Evaluator	SRP-Verified Label	Cost
Level 1	Self-assessment	✕	Free
Level 2	Second-party verification: A second-party verifier body linked to producers or producer groups	✕	Free
Level 3	Third-party verification: An independent third-party verification body with no affiliations to producers, producer groups, or implementation partners.	○ (90 - 100 point)	about 130 million VND/ 100 ha/1year 2)

Note: 1) Level 1 assessment helps farmers monitor whether the implementation of SRP rice cultivation meets standards, thereby providing measures to improve or promote positive factors.

Evaluation at level 2 is for the purpose of cross-checking and monitoring the implementation of SRP rice cultivation from units coordinating with farmers and farms. At level 2, if the results of pesticide residues reach the allowable threshold, the company will buy SRP rice 100 - 250 VND/1kg higher than the market of rice.

If the farmer is not sure that the SRP score is 90 points or higher, they will not perform a level 3 evaluation due to the high cost.

2) provided by Loctroi Company's SRP expert

Source: Compiled from the Standard for Sustainable Rice Cultivation Version 2.1

Introduction

SRP rice cultivation in Viet Nam		
Region	**Rice land area**	**Farm households**
Mekong Delta	15,000 ha	15,000 households
Other region	✕	✕

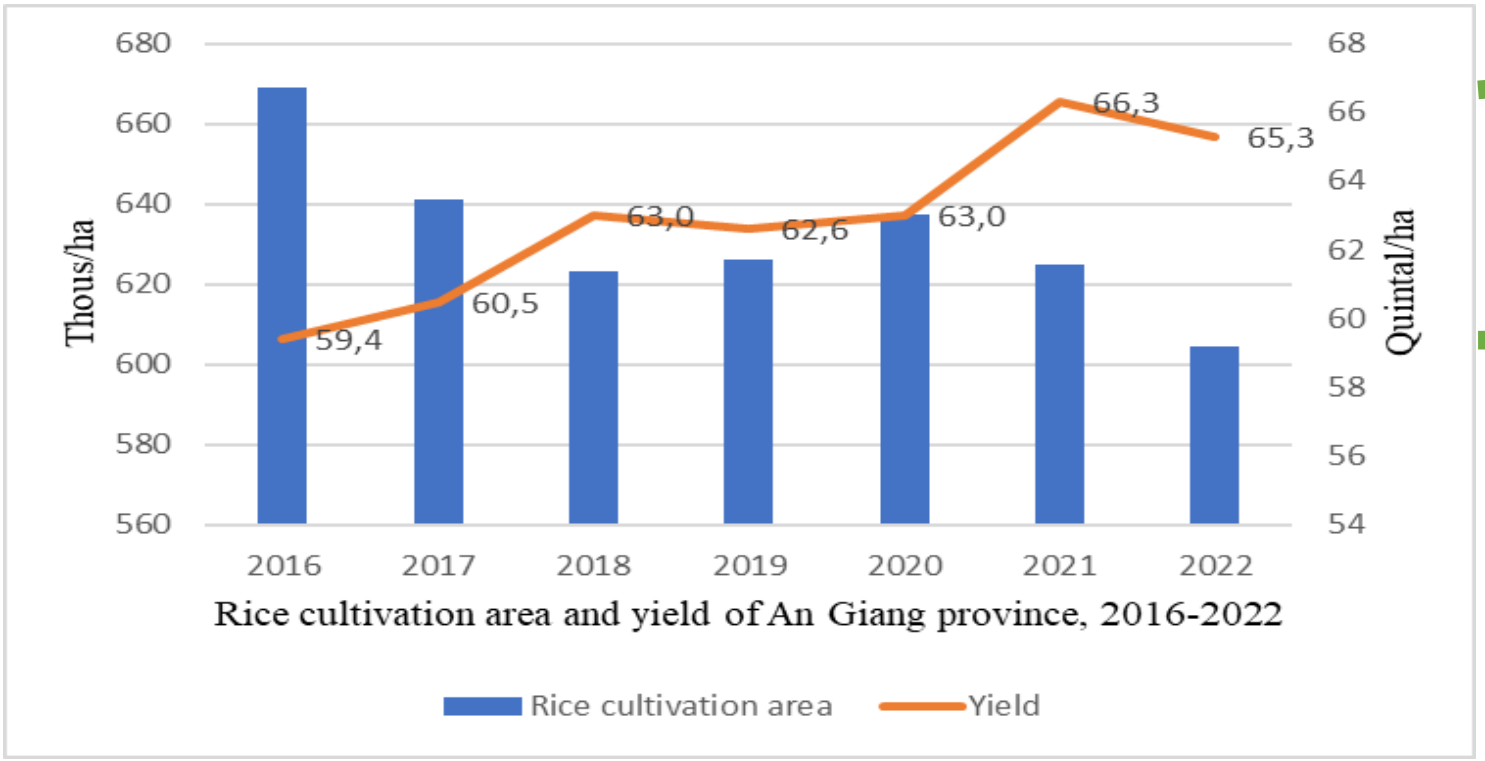
About 6.57% of the 426 surveyed households in the Mekong Delta could fully comply with the SRP standard (Dung & Tuan,2024).

→ Therefore, encouraging farmers to adopt higher SRP scores is crucial.

Methodology

Research selection An Giang province

Characteristics	Classification
Natural conditions	The first place where the Mekong River flows into Vietnam, being supplied with fresh water all year, almost unaffected by sea level rise or saltwater intrusion. → Vietnam's second largest rice production province
Economic	A province in Vietnam's Mekong Delta Key Economic Region



The rice cultivation area in An Giang will tend to decrease (about 9.67%), but yield will increase (about 9.93%).

Facing adverse impacts: environmental pollution, land degradation, and water scarcity, the negative effects of climate change

SRP stands out as a crucial strategy for the province to promote the sustainability of rice cultivation.

Methodology

- Research objects: Farmers SRP rice cultivating

- Spatial scope: Chau Thanh district, Thoai Son district, Tri Ton district, An Giang province, Vietnam 1)

- Temporal scope: 25/4/2023 – 23/5/2023

- Sample size: 207 (Chau Thanh district: 68, Thoai Son district: 87, and Tri Ton district: 52)

- Data Analysis: Using SPSS 22.0, we use factor analysis and regression analysis for analyzing data.

Note: 1)Reasons for selecting Chau Thanh district, Thoai Son district, Tri Ton district, An Giang province as research areas:

- ➢ *An Giang Province has the second largest rice cultivation area and rice production in the Mekong Delta.*
- ➢ *An Giang Province was among the first three provinces to implement SRP rice cultivation. Presently, An Giang remains unaffected by saltwater intrusion, a key factor directly influencing its SRP score.*
- ➢ *Many SRP rice cultivation training courses are being held for farmers in Chau Thanh district, Thoai Son district, and Tri Ton district.*

Methodology

Factor analysis: 13 questions in the form of Likert Scale about the perceived benefits of SRP rice cultivation were investigated . Reliability analysis showed acceptable reliability (Cronbach's α = 0.912). Exploratory factor analysis with results of a KMO value of 0.859 exceeds the cutoff value of 0.5, and Bartlett's Test of Sphericity is significant with p<0.001 is considered suitable for factor analysis.

No.	Question
1	Do you think SRP rice cultivation can increase net income?
2	Do you think SRP rice cultivation can increase labor productivity?
3	Do you think SRP rice cultivation can increase grain yield?
4	Do you think SRP rice cultivation can increase water use efficiency?
5	Do you think SRP rice cultivation can increase nutrient use efficiency: Nitrogen?
6	Do you think SRP rice cultivation can increase nutrient use efficiency: Phosphorous?
7	Do you think SRP rice cultivation can increase biodiversity?
8	Do you think SRP rice cultivation can reduce greenhouse gas emissions (NH4, CO2, NO2)?
9	Do you think SRP rice is food-safe?
10	Do you think SRP rice cultivation can ensure the health and safety of workers?
11	Do you think SRP rice cultivation can not use child labor?
12	Do you think SRP rice cultivation can increase youth engagement?
13	Do you think SRP rice cultivation can increase women's empowerment?

The 13 questions related to the perception of the benefits of SRP rice cultivation were reduced into 2 variables, including: X9 and X10

X9: Perceived benefits of the economic and environmental of SRP rice cultivation (take the average value of the scores for questions 1 to 8) and

X10: Perceived benefits of the social of SRP rice cultivation (take the average value of the scores for questions 9 to 13)

Methodology

Regression analysis

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + b7X7 + b8X8 + b9X9 + b10X10 + e$$

Varriables	Description
Y	SRP score (0–100)
X1	Educational level (years)
X2	Rice land area (ha)
X3	Experience in rice cultivation (years)
X4	Applied 1M5R (Yes=1, No=0)
X5	Membership in agricultural cooperatives (Yes=1, No=0)
X6	Experience in SRP rice cultivation (years)
X7	Multipartite contract farming (Yes=1, No=0)
X8	Use of drones (Yes=1, No=0)
X9	Perceived benefits of the economic and environmental of SRP rice cultivation
X10	Perceived benefits of the social of SRP rice cultivation

Results & Discussion

Respondents' characteristics

Characteristics	Classification	Quantity	Percentage
Educational level	Primary school	94	45%
	Secondary high school	85	41%
	High school	24	12%
	Vocational schools, College	4	2%
Rice land area	0~1 ha	19	9%
	1~5 ha	153	74%
	5~10 ha	24	12%
	10~15 ha	9	4%
	15~20 ha	2	1%
Experince in rice cultivation	<10 years	7	5%
	10~20 years	39	19%
	20~30 years	73	35%
	30~40 years	61	29%
	40 years ≤	23	12%
Experience in SRP rice cultivation	1 year	114	55%
	2 years	38	18%
	3 years	11	5%
	4 years	44	21%

The householders have a low level of education, with the majority having completed only primary school (45%) and secondary high school (41%)

The rice land area is small, mainly from 1~5 hectares (74%), and households focus on intensive rice cultivation

The Householder rice cultivation experience is concentrated in about 20-40 years (64%); however, the experience of SRP rice cultivation is mainly 1 year (55%).

Results & Discussion

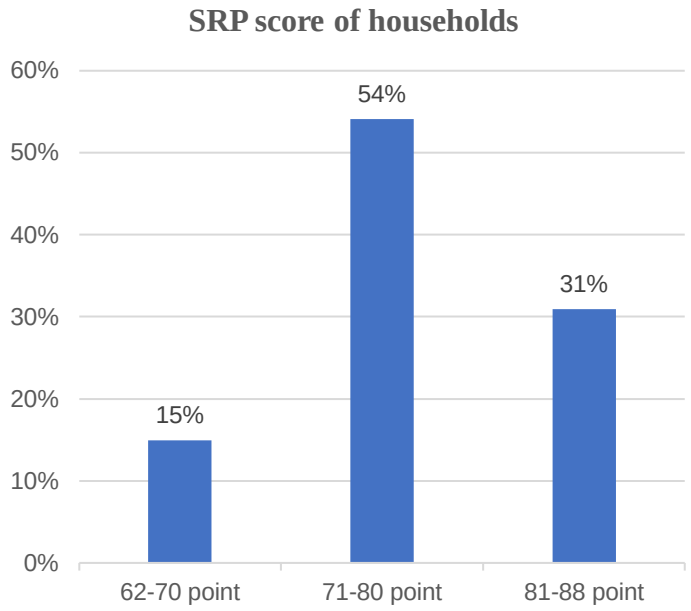
Respondents' characteristics

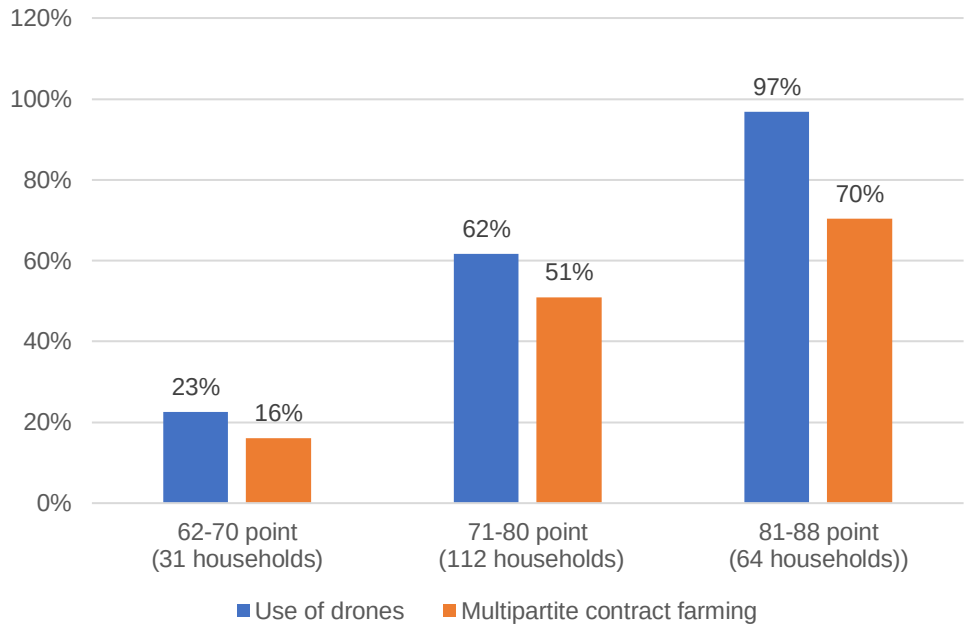
Characteristics	Classification	Quantity	Percentage
Applied 1M5R	Yes	203	98%
	No	4	2%
Membership in agricultural cooperatives	Yes	177	86%
	No	30	14%
Multipartite contract Farming	Yes	107	52%
	No	100	48%
Drone application	Yes	138	67%
	No	99	33%

To increase the value chain in rice production, many households have participated in production links such as cooperatives (86%) and consumption links through multipartite contracts farming (52%). Households also apply mechanization, such as combine harvesters, plows, and soil leveling machines at a rate of 100%, and smart agricultural applications, such as drone spraying (67%). Some sustainable rice cultivation techniques have also been applied by households, such as 1M5R (about 98%).

Results & Discussion

SRP score





- The household's SRP score is evaluated at level 2 (assessed by SRP experts of the An Giang province agricultural extension center).

- The household's SRP score is between 62 and 88 points, indicating that a farmer is working toward sustainable rice cultivation.

- Households with high SRP scores are likelier to use drones and have multipartite contract farming.

Results & Discussion

SRP score

The average score of themes		Use of drones			Multipartite contract farming		
		Yes	No	%	Yes	No	%
1	Farm management	5,97	5,93	0,72	5,94	5,98	-0,60
2	Pre-planting	10,21	10,18	0,24	10,14	10,26	-1,11
3	Water management	6,61	5,62	**17,44**	6,30	6,26	0,57
4	Nutrient management	6,72	6,75	-0,33	7,65	5,75	**33,00**
5	Integrated Pest management	12,28	11,58	**6,06**	12,23	11,85	**3,22**
6	Harvest and postharvest	5,33	5,30	0,67	5,47	5,16	**6,01**
7	Health and safety	13,52	8,45	**59,94**	11,90	11,75	1,28
8	Labour rights	16,02	16,30	-1,72	16,66	15,59	**6,85**

Table comparing the average score of SRP in the themes

- The households that use drones have a higher average score in the themes of health and safety (59,94%), water management (17,44%), and integrated pest management (6,06%) than those that do not.

- The household with multipartite contract farming has a higher average score in the themes of nutrient management (33%), labor rights (6,85%), harvest and postharvest (6,01%), and integrated pest management (3,22%) than a household without multipartite contract farming.

Results & Discussion

Results of regression model

Y (Dependent variable) = SRP total score (0–100) ($R^2 = 0.691$)

$Y = 46.439 + 0.265X1 + 0.215X2 + 0.045X3 + 0.286X4 + 1.268X5 + 0.579X6 + 3.850X7 + 5.152X8 + 2.724X9 + 2.267X10$

	Independent Variables	Unstandardized coefficient	Coefficient Standard Error	Standardized coefficient	P-value
X1	Educational level	0.265	0.092	0.126	0.004*
X2	Rice land area	0.215	0.090	0.114	0.017**
X3	Experience in rice cultivation	0.045	0.024	0.081	0.066
X4	Applied 1M5R	0.286	1.779	0.007	0.873
X5	Membership in agricultural cooperatives	1.268	0.849	0.080	0.137
X6	Experience in SRP rice cultivation	0.579	0.191	0.125	0.003*
X7	Multipartite contract farming	3.850	0.475	0.346	0.000*
X8	Use of drones	5.152	0.537	0.437	0.000*
X9	Perception benefits of the economic and environmental of SRP rice cultivation	2.724	0.751	0.208	0.000*
X10	Perception benefits of the social of SRP rice cultivation	2.267	0.666	0.153	0.001*
	Constant	46.439	3.047		0.000*
				*P<0.01, **P<0.05	

Results & Discussion

Results of regression model

7 of the following variables presented have a positive and significant effect on the SRP score: Educational level, rice land area, experience in SRP rice cultivation, multipartite contract farming, use of drones, perception of the economic and environmental benefits of SRP rice cultivation, and perception of the social benefits of SRP rice cultivation.

- Educated level of householders influences SRP scores: consistent with the findings of studies by Dung, L. C., & Tuan, V. Van, 2024
- Rice land area influences SRP scores: consistent with the findings of studies by Narat et al., 2021; Dung, L. C., & Tuan, V. Van, 2024
- Experience is believed to increase the level of skill and knowledge at a particular practice, which, in turn, increases the efficacy of the behavior (Jongeneel et al., 2008; Läpple, 2010). The knowledge gained after training sessions and experience practicing SRP rice cultivation helps farmers promote their strengths and improve their weaknesses, thereby improving their SRP scores.
- The household with multipartite contract farming has a higher score in the themes of nutrient management average (33%), labor rights (6.85%), harvest and postharvest (6.01%), and integrated pest management (3.22%) than a household without multipartite contract farming. This is consistent with research by Yanjun Ren et al., 2021, that contract farming can increase the probability of applying environmentally sustainable control technologies (56.7%), manual weeding (28.2%), and increased organic fertilizer (31.1%). By joining contract farming, farmers can sell rice at a fair price without being pressured through technical support, output product consumption, profit discounts, and quality assurance output, which have helped farmers increase their profits and reduce their rice production costs (Tien Dung Khong, 2022). Research by Dung, L. C., & Tuan, V. Van, 2024 also shows that contract farming affects SRP scores but does not specifically indicate which form of contract farming.

Results & Discussion

Results of regression model

- The households that use drones have a higher average score in the themes of health and safety (59.94%), water management (17.44%), and integrated pest management (6.06%) than those that do not. When spraying pesticides, there is no need to pump water into the field so that water can be saved and the harm to the environment reduced through water contaminated with pesticides; workers are not directly exposed to pesticides, thereby reducing the impact on workers' health. According to research by Viwat et al.,2020, drone use for rice production in central Thailand can reduce the loss of production by 10-15%, reduce water volume for chemical mixing by 10 times, and reduce the use of chemicals by 40%, can prevent insects by up to 90%. Environmental impact assessment research based on experimental data in Japan shows that using drones to spray pesticides will consume less energy and minimize environmental impacts than spraying pesticides deep with conventional machinery (Yuna Seo et al., 2023).

- The higher the householders' level of perception about the benefits of SRP, the higher the SRP total score; this is also reflected in the SRP themes score. Many studies show that perceiving the benefits helps farmers adopt new agricultural technologies (e.g., Adopt Sustainable Agricultural Practices - Amanjot Singh Syan and Vikas Kumar et al.,2019; the acceptance of new rice straw management practices in the Mekong River Delta - Connor et al., 2020; motivations, goals, and benefits associated with organic grain farming- Guang Han et al.,2021).

Conclusions

- The household's SRP score in rice cultivation in An Giang province has ranged from 62 to 88 score; the households are working toward sustainable rice cultivation.

- The econometrics model suggests 7 factors influencing SRP score, including 4 new factors, such as the use of drones, multipartite contract farming, perception benefits of SRP rice cultivation, experience in SRP rice cultivation added to previous studies (Narat et al., 2021; Dung, L. C., & Tuan, V. Van, 2024).

- The study recommends that there should be support policies, agricultural advisories, and extension services to support farmers in smart agriculture applications, creating a rice value chain sustainable with multipartite contracting farming (between rice trading companies and farmers through cooperatives acting as a bridge), and strengthening the implementation of linkages to create a "large sample field." In addition, there needs to be a training and propagation program to help the farmers understand the perception benefits of SRP rice cultivation, and encourage young people who have graduated from higher education to participate in sustainable rice cultivation. This helps farmers fully comply with the SRP standard and improve their SRP score to achieve sustainable rice cultivation.

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Thank you for your attention!