Unveiling and Evaluating Traditional Regenerative Agricultural Practices in Paddy Farming; A Case Study in Nochchiyagama DS Division Anuradhapura District

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Abstract

Regenerative Agriculture is a comprehensive approach to farming, focusing on continual innovation and improvement in environmental, social, economic, and spiritual aspects, going beyond traditional farming and sustainable agriculture. This study investigates traditional regenerative agricultural practices in paddy farming: A case study in Nochchiyagama DS division, Anuradhapura district, Sri Lanka. The objectives of this study encompass a comprehensive analysis of the farmers' knowledge and awareness, identifying current practices, addressing barriers and providing suggestions. A sample of 80 paddy farmers in Nochchiyagama DS division by using purposive sampling technique. Then, the data were collected through a structured questionnaire and analyzed by using descriptive and inferential statistical analysis methods. The findings demonstrate a significant correlation between demographic factors and the adoption of regenerative agricultural practices with substantial awareness and positive attitude, acknowledging its benefits for soil health and crop yield. The study also finds that socioeconomic factors, such as education level, occupation, and farm size, significantly influence the implementation of regenerative agricultural practices. The result informs a set of recommendations. The study emphasizes the need for educational programs in collaboration with agricultural bodies and institutions. This research enhances understanding of regenerative practices in paddy farming, providing insights for policymakers and supporting adoption in Anuradhapura district, Sri Lanka.

Keywords: Paddy farming, Regenerative Agriculture, Soil Health, Sustainability

Introduction

Agriculture has a significant environmental footprint which affects natural resources such as water, soil, and biodiversity. It is associated with approximately one-third of global land use and is a key driver of land use change globally, including across the biodiverse tropics. “Regenerative Agriculture (RA) as a holistic systems approach to farming that encourages continual innovation for environmental, social, economic and spiritual wellbeing conventional understandings of farming and sustainable agriculture”. RA is further popularized from circular economy (BatllesdelaFuente et al., 2022). Circular economy (CE) promotes sustainable production and consumption, which underlines the 3R principles such as Reduce, Reuse and Recycle. Agriculture is confined into two courts. conventional agriculture and organic agriculture. Regenerative agriculture exists as a distinct method, blending elements from both organic and conventional practices, yet belonging fully to neither

The study of regenerative agricultural practices in paddy farming holds immense significance as it offers a pathway to address pressing global challenges. It can promote environmental sustainability by mitigating the ecological impact of conventional agriculture, enhance the resilience of paddy farming systems in the face of climate change, strengthen food security through increased yields and reduced resource dependence, improve soil health and biodiversity conservation, all while safeguarding the health and well-being of farming communities (Ranasinghe, 2017).

Numerous research studies have been conducted regarding the regenerative practice context to forest management. Yet there is not research focused on unveiling and evaluating regenerative agricultural practices in paddy farming. It reprints a missed opportunity to address critical challenges associated with conventional paddy farming practices. This research gap is imperative to develop context specific regenerative strategies that can enhance soil health, water efficiency, and overall sustainability in Sri Lanka paddy farming.

The purpose of the present study was to identify potentials for RA practices and alternative practices used by paddy farmers and develop sustainable and environmentally friendly traditional farming techniques that promote soil replenish, biodiversity, while ensuring higher productivity.

Literature Review

Regenerative Agriculture

Regenerative agriculture, emerging as a promising alternative for food production, is acclaimed for its potential net positive environmental and social impacts. The concept of regenerative agriculture has been evolving since at least 1982 (Sampson, 1982). Further according to (Newton *et al*., 2020) The concept of "regenerative agriculture" is often interchanged with terms like “sustainable agriculture.”

Principles of Regenerative Agriculture

According to (Jaworski *et al*., 2023) the presented paragraphs focus on key aspects of sustainable soil management on UK farms. This indicates a significant recognition and adoption of sustainable soil management practices, particularly those aligned with regenerative agriculture principles. However, the cautious tone suggests that these positive findings should not lead to assumptions of overall progress in sustainable soil management in the United Kingdom.

Practices of Regenerative Agriculture

According to Jaworski *et al.,* (2023) the study explores sustainable soil management practices. A survey of current practices and how they relate to the principles of regenerative agriculture. These practices emphasize reduced soil disturbance, maintaining soil cover and promoting crop diversity. According to Rehberger *et al*., (2023) the research article delves into the multifaceted potential of regenerative agriculture practices in addressing climate change and environmental degradation. It argues that regenerative practices, ranging from no-till farming and cover cropping to integrated crop livestock systems.

Barriers in adopting Regenerative Agriculture

Regenerative agriculture highlights several barriers to its adoption and promotion. Common challenges faced by farmers, Certified Crop Advisers (CCAs), and others supporting the transition include low awareness and limited evidence demonstrating the viability of regenerative practices across various agricultural applications (Green *et al*., 2021).

Methodology

This study was conducted at *Nochchiyagama* DS division located in *Anuradhapura* district, Sri Lanka. The research was planned to identify potentials for RA practices and alternative practices used by paddy farmers and develop sustainable and environmentally friendly traditional farming techniques that promote soil replenishment and biodiversity, while ensuring higher productivity. Data was collected from a total number of paddy farmers among eight selected GN divisions in the *Nochchiyagama* DS division and was selected for the study using systematic sampling. Eighty paddy farmers were selected as the sample size using the purposive sampling technique. Before data collection, a pilot survey was done with several farmers to pre-test the questionnaire. Primary data were collected through interviewer administered questionnaire consisting of structured questions related to the individual's sociodemographic and knowledge and awareness level and types of regenerative and alternative agricultural practices and addressing issues, barriers and suggestions. Collected data was analyzed using descriptive and inferential statistical analysis methods. Microsoft Excel software package and interpreted by using descriptive statistics. The SPSS software package was interpreted in Wilcoxon sign rank test and Spearman's correlation coefficient to assess the strength and direction of relationships between variables using inferential statistical analysis. As the data preparation method, the reliability of collected data was tested by using Cronbach's Alpha value of Reliability test.

Data Presentation and Analysis

Identification of knowledge and awareness about regenerative agricultural practices in paddy farming.

The following figure shows the different categories of knowledge and awareness in Nochchiyagama DS division area. This study aimed to analyse the awareness of respondents regarding regenerative agriculture.

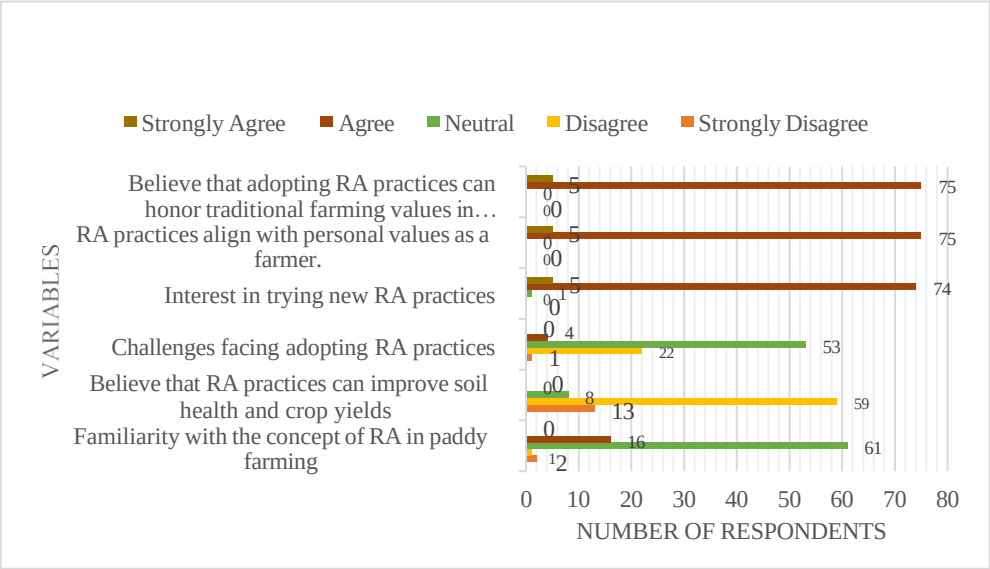

Figure 01: Identification of knowledge and awareness about regenerative agricultural practices in paddy farming ,Survey Data (2023)

According to the research findings, the respondents were neutral about their familiarity with the concept of RA (61); only 16 respondents who had sound knowledge were neutral about their familiarity with the concept of RA (61); only 16 respondents agreed with familiarity with the concept. The majority of respondents (59) disagreed that RA practices could improve crop yield and soil health. Most respondents (53) were neutral about facing challenges in adopting RA practices. Almost all respondents were expressed interest in trying new regenerative practices (74) agreed and all respondents were either agreed or strongly agreed that RA practices align with their personal values as farmers.

Currently practicing regenerative agricultural practices in paddy farming

Across these sub-points, the data consistently shows low adoption rates for techniques like plant cover crops, reduced tillage, and water-saving techniques, integrated pest and disease management techniques, and application of biochar. Notably, practices such as crop rotation and cultivating multiple crops appear to be more accepted. This suggests that some practices fit more naturally into existing agricultural routines than others. Engaging with local agricultural communities were also moderately prevalent, which could be leveraged to disseminate more sustainable practices. It was revealed 50 respondents an engage in other regenerative agricultural practices.

The use of local rice varieties such as ‘Pachcha Perumal’, ‘Kalu Heenati’, and ‘Suwadel’ is an excellent way to maintain biodiversity and ensure the crops are well-suited to local soil and climate conditions. Rotating these varieties can help in pest control and soil nutrient management. In-depth discussion of these practices. Holding water in the paddy fields for about two weeks serves multiple purposes. It aids in weed control and creates an optimal environment for rice growth. Effective water management can also be achieved using sluice systems in tanks. According to Dharmasena, (2007) revealed indigenous knowledge used to effective water management.

Livestock integration into the paddy fields can contribute organic waste which serves as a natural fertilizer, thus enriching the soil. Their urine also contains nutrients beneficial for soil health. Pest and Disease Control as several traditional methods like using "Kem" methods, lighting candles to ward off rice flies, and using coir ropes for protecting the oil from flies have been proven effective. Kohomba seed juice and crop residues are also used as natural pest controls. Restoring natural habitats by minimizing the use of synthetic products fosters biodiversity. Practices like growing ‘Gamsuriya’, 'Albisia', and ‘Mee plant’ can attract beneficial insects and birds that naturally the focus on small-scale systems allows farmers to maximize on farm inputs like rice straw, which fixes nitrogen in the soil. It also makes management more straightforward and less resource intensive and Control pests.

These practices are ecologically sustainable and promote long term soil health. Many of these methods are cost effective, reducing the need for external inputs. Local varieties and traditional knowledge are emphasized, empowering local communities and these practices are often more resilient to climate variability.

Barriers and issues for adoption of the regenerative agricultural practices

To determine the issues as majority of responses on concern about yield reduction. According to the observed results, the majority of respondents were represented (34) preference for concern about yield reduction and a preference for traditional methods (28) were main reasons to be addressed and others were lack of knowledge and more time consuming compared to conventional practices. Majority of the respondents were revealed that poor adoption of practices stands out as the primary reason for lower yields (61) and pest and disease challenges (11).

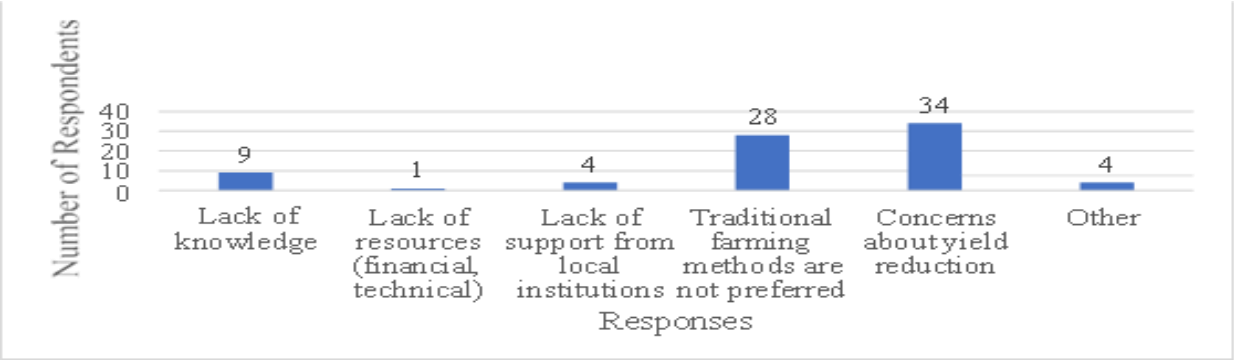

Figure 02: Barriers and issues for adoption of regenerative agricultural practices
Source: Survey Data (2023)

This study used non-parametric analysis to test the research hypothesis. The study hypothesis was tested by using Wilcoxon signed rank test. When tested value is greater than the table value (1.96) the study can reject null hypothesis or if not, the study can retain null hypotheses. According to first hypotheses was analyzed four sub hypotheses were tested whether they have sufficient knowledge and awareness of adopting RA practices. Familiarity with the concept (Test value= 7.378, Mean=3.14, farmers' perception about get more benefits (Test value=8.189, Mean=3.94), challenges faced in adopting regenerative practices (Test value=7.856, Mean=3.74), paddy farmers' attitude (Test value=8.656, Mean=4.05. According to hypothesis testing, there is sufficient awareness of RA practices. According to second hypotheses all the respondents perceived that they believed to achieve positive economic output adopting RA practices (Test value= 8.699, Mean= 4.060), null hypotheses were rejected. It means they believed to achieve positive economic output. As in this study, third hypotheses were suggestions help to overcome barriers of adopting RA practices. Null hypotheses were rejected and proved that farmers were believed organizing educational workshops and training sessions overcome the barrier of lack of knowledge (Test value= 8.344. Mean= 4.05), offering financial incentives such as subsidies for seeds and equipment (Test value=8.412, Mean=4.05), providing farmers with time efficient regenerative practices integrate well with their schedules (Test value= 8.406, Mean= 4.3), research and extension services should focus on demonstrating successful cases of high yield regenerative practices to counter the concern of low yields (Test value=8.445, Mean=4.04), farmers' cooperatives and community groups can play a vital role in overcoming multiple barriers to adopting RA practices (Test value=8.412, Mean=4.05).

The intention of this study was to determine the relationship between variables. The results of the analysis were supported the alternative hypotheses for each of the examined factors. The P value for educational level, occupation, size of farm, resource availability, irrigation facilities are less than significant level ($p<0.005$). As a result, the null hypotheses (H0) are rejected in each case, confirming significance correlation between these factors. Based on the findings statistically significant correlation between education level and currently implementation of RA practices (Correlation coefficient=-0.248, Significance level (2-tailed)=0.028) , positive significant correlation between occupation category and currently implementation of RA practices (Correlation coefficient=0.357, Significance level (2-tailed)=0.001), Highly significant and strong positive correlation between irrigation system and currently implement RA practices (Correlation coefficient=0.543, Significance level (2-tailed)=0.000), Significant correlation between size of farm and currently implement RA practices (Correlation coefficient=0.281, Significance level (2- tailed)=0.012), Significant correlation between irrigation facilities and currently implement RA practices (Correlation coefficient=0.391, Significance level (2-tailed)=0.000).

Conclusion

The results of this study have some interesting research implications. The findings, strongly supported by statistical evidence, indicate a thorough understanding and receptivity among paddy farmers towards regenerative agricultural practices.

Moreover, farmers perceive regenerative agriculture as beneficial for both soil health and crop yield interest to adopt new practices. It reveals that not only are farmers knowledgeable about RA, but they also perceive its economic benefits. According to socio economic factors educational level, occupation, and other factors such as the irrigation system and size of the farm significantly correlate with RA practices. These outcomes suggest that socioeconomic factors play a critical role in either enhancing or hindering the implementation of RA. Traditional farming methods are not preferred, because of laziness of farmers but educated farmers and small farm size owners who are knowledgeable these methods are cost effective & reducing the need of external inputs, towards the sustainability

The research also tapped into the barriers and challenges that farmers face, which range from a lack of awareness and financial and time constraints. The study has provided strong evidence to prove that it is essential to overcome the barriers to the improvement of extension services and the need for support from AI officers in the district. The agricultural department can integrate GAP certification into its programs by providing training and support for sustainable and safe agricultural practices. This study has also shown the need for immediate action to eliminate barriers such as the lack of awareness and resources to adopt regenerative agricultural practices by introducing certain policy reforms in the agricultural sector.

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