INTENSIFICATION OF ACTIVE PADDY LAND USE IN LOW COUNTRY WET ZONE

Youth and Organic as Missing Factors

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FOREWORD

One of the major concerns in agriculture and especially paddy cultivation has been declining labor availability with a marked reluctance of youth to take up the vocation preferred or else engaged in by earlier generations due to lack of alternatives. This issue has exacerbated problems related to organic paddy cultivation which is by nature relatively more labor-intensive. This has also constituted a stumbling block in efforts to improve the efficiency, productivity and profitability of paddy cultivation in the Low Country Wet Zone (LCWZ).

This study has assessed, in part, the strategies aimed at bridging knowledge gaps, attracting youth to paddy cultivation and promoting organic practices. The research team has taken into account a number of factors related to these issues including shifts among rice varieties, duration of particular varieties, labor, degree of mechanization, fertilizer application, seed quality, management of pests and diseases and problems related to marketing.

The study has yielded a number of interesting insights which deserve the close scrutiny of relevant authorities and institutions. It is disturbing that close to 90 percent of youth farmer societies were not functioning, a situation that has at least in part something to do with ineffective communication strategies. There is however reason for optimism, since a considerable proportion of the farmers interviewed were interested in taking up the challenge of returning to less toxic practices.

As has been revealed over the past two seasons, such a shift requires many institutional, technical and political economic problems to be addressed and resolved. This study in fact has anticipated these issues and recommended necessary interventions. The twin issues of attracting youth as well as shifting to organic paddy cultivation obviously requires fortitude, innovation, a comprehensive inventory of available biomass, testing and certification of alternative inputs and awareness creation at all levels, including enhancing awareness of the benefits for both producer and consumer. The authors have also pointed out that policy intervention with regard to pricing might be necessary.

Although the study is limited to the LCWZ and therein paddy cultivation the insights would be invaluable for more comprehensive research on other crops and other agricultural zones in a policy environment where received truths regarding inputs and productivity as well as the non-consideration of nutritional factors are being revisited and challenged.

Malinda Seneviratne
Director/Chief Executive Officer

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EXECUTIVE SUMMARY

The Low Country Wet Zone (LCWZ) has a particular significance in that it is a rain-fed rice-growing area which has a unique ecosystem. However, it has been subjected to various land use transformations such as abandonment, frequent fallowing and conversion to other uses, agricultural and non-agricultural.

Given the significance of this agro-system, it is important to find appropriate strategies that help improve the efficiency, productivity and profitability of paddy cultivation in the LCWZ to prevent further abandonment of active paddy lands, which are distinguished from abandoned lands by dint of having been cultivated at any time over the previous nine seasons. The main objective of this research was to identify knowledge gaps in paddy cultivation in the LCWZ, and to explore the power of youth and organic approach to arrest the continuing problem in the region, given policy priorities. Relevant information was collected from 100 farmers from the LCWZ districts and 81 youth farmer societies in the region via telephone conversations.

The study assessed the level of awareness and adoption of 12 best practices that enhance the efficiency, profitability and productivity of paddy cultivation in the LCWZ, practices by the sample farmers. *Yaya* cultivation, seasonal change of rice varieties, long duration paddy varieties, use of hired labour, degree of mechanization, balance use of machinery and labour, fertilizer application at the required time, application of urea, use of quality seed, application of recommended rate of seeds, pest and disease management and market-oriented paddy production programmes were the practices that were considered.

Inefficiencies in the dissemination of knowledge pertaining to best practices were observed with the primary source of information being non-official sources. Officers assigned such talks proved to have been hampered by conventional communication methods which were slow. Overall coverage of the targeted community was also poor. Educating the farming community, especially disseminating information obtained from socio-economic research to bridge the knowledge gap remains essential and expeditious.

Almost 89 percent of the Youth Farmer Societies (YFSs) were not functional. Youth participation in agriculture is an idea that is frequently articulated but is rarely obtained due to several factors. The study revealed that traditional farming may not be the answer for attracting youth in farming; practical and structural solutions are more crucial to overcome the challenges faced by youth trying to engage in farming and earn a living in rural areas. Strengthening of YFSs by overcoming the weaknesses associated with the current setup is very important in this regard.

The high demand for organic rice in the region due to the need to consume non-toxic rice, ability to achieve the same yields as conventional farmers and a higher selling price for organic rice provide the basis for promoting organic paddy production in the region. However, 59 percent of the farmers remain committed to conventional

farming. This of course indicates that a sizable proportion (41 percent) are potentially convertible to organic farming. Nevertheless, the availability and the accessibility to quality organic inputs are the main issues inhibiting adoption of organic paddy farming. Reluctance to change, production and scale related issues are other constraints.

The study recommends that there should be a proper mechanism to bridge the knowledge gap of farmers by establishing a freely accessible knowledge repository updated seasonally with the intervention of research and extension agencies, especially with respect to social and economic factors. Moreover, streamlining of in-service training for extension personnel, use of innovative communication tools and strengthening farmer organizations as focal points for information dissemination are all prerequisites for bridging the knowledge gap of farmers.

Focusing on youth participation in agriculture the study stresses the fact that group approach has many benefits. Therefore, it is proposed that strengthening YFSs should be re-considered in many ways such as recruiting and maintaining the membership by targeted programmes, updating and upgrading the YFS to re-align their needs to existing opportunities, promotional campaigns, enhanced use of ICT, building YFSs as resource hubs providing access to land and credit, more efficient and innovative state intervention and designing customized educational and training programmes.

The stumbling blocks should be identified and resolved before promoting organic agriculture. Therefore, awareness and sensitization campaigns, pilot programmes, ensuring the access to raw material and quality organic manure as well as price regulation are imperative for successful promotion of organic paddy cultivation.

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ABBREVIATIONS

ADO	Agrarian Development Officer
AI	Agriculture Instructor
ARPA	Agricultural Research and Production Assistant
ASC	Agrarian Service Centre
CBSL	Central Bank of Sri Lanka
DAD	Department of Agrarian Development
DCS	Department of Census and Statistics
DoA	Department of Agriculture
FO	Farmers' Organization
GCE	General Certificate of Examination
HARTI	Hector Kobbekaduwa Agrarian Research and Training Institute
ICT	Information Communication Technology
KII	Key Informant Interview
LCWZ	Low Country Wet Zone
MoA	Ministry of Agriculture
MoF	Ministry of Finance
PandD	Pest and Diseases
RRDI	Rice Research and Development Institute
SLCARP	Sri Lanka Council for Agricultural Research Policy
SMA	State Ministry of Agriculture (State Ministry of Paddy and Cereals, Organic Food, Vegetables, Fruits, Chilies, Onion and Potato Cultivation Promotion, Seed Production and Advanced Technology Agriculture)
SPSS	Statistical Package for the Social Science
YFS	Youth Farmer Society

CHAPTER ONE

Introduction

1.1 Study Background

The importance of paddy-based ecosystems is greater than paddy production. As multi-functional systems, paddy-based ecosystems deliver many services to mankind and the environment such as storm water drainage, flood detention, biodiversity reserves and providing comfort and recreation (Agus *et al.*, 2006; Dhanapala, 2005; Yoshihiro, 2013). Due to this significance, the cultivation of all paddy lands has always been at the forefront of the agenda of the Ministry of Agriculture (MoA) in Sri Lanka. In light of the country's food security during drought periods of years, paddy cultivation in Low Country Wet Zone (LCWZ) has a particular significance as a rain-fed rice-growing area which can act as a buffer zone, in addition to its inherent ecosystem services (Warnakulasooriya and Athukorale, 2016). Despite the said significance, the paddy based ecosystem in LCWZ has been subjected to various land-use changes. It manifests itself in several ways such as abandonment[1], frequent fallowing[2], and other uses both agricultural and non-agricultural. All these land-use changes appear to have threatened the prolonged existence of this ecosystem thus its significance is declining.

The asweddumized extent in the region exists either active or abandoned. The key focus of this study is on active[3] paddy lands in LCWZ. It is therefore important to define 'what are active paddy lands?' Although active paddy lands are not clearly defined, it is possible to provide an operational definition using the definitions of asweddumized and abandoned paddy lands. Department of Census and Statistics (DCS) defined Asweddumized paddy lands as lands that have been prepared for paddy cultivation by the construction of bunds to control water whereas abandoned paddy lands are defined as paddy lands that have not been cultivated consecutively for the last five years (DCS, 1999). Accordingly, the active paddy lands can be left uncultivated for up to nine cultivation seasons without being categorized as abandoned. Further, cultivation in the tenth season would prevent them from falling into the abandoned category. As such, active paddy lands may be left uncultivated for several seasons. Perhaps, they may become impossible to bring back to the status of being re-cultivable with paddy after several seasons of non-cultivation. Then, abandonment might be the last resort which is a serious land-use problem in the region. Contrary to the country situation, LCWZ marks a decline in asweddumized extent and the sown extent over time. Thus it is proven that active paddy land use in the region is sub-optimal whereas it has been stressed that the best option is to prevent further

[1] Abandoned paddy lands are asweddumized lands that have not been cultivated consecutively for the past five years (DCS, 1999).

[2] Fallowing refers to time to time non-cultivation of paddy lands.

[3] The study only focuses on active paddy lands in LCWZ, please refer to the parallel HARTI working paper on "Reversing Abandonment: Success of re-cultivation efforts in abandoned paddy lands in LCWZ" for abandoned paddy lands.

abandoning of active paddy lands (විකාරණ, 2016). This study looks into the alternative means of preventing further abandonment of LCWZ paddy lands.

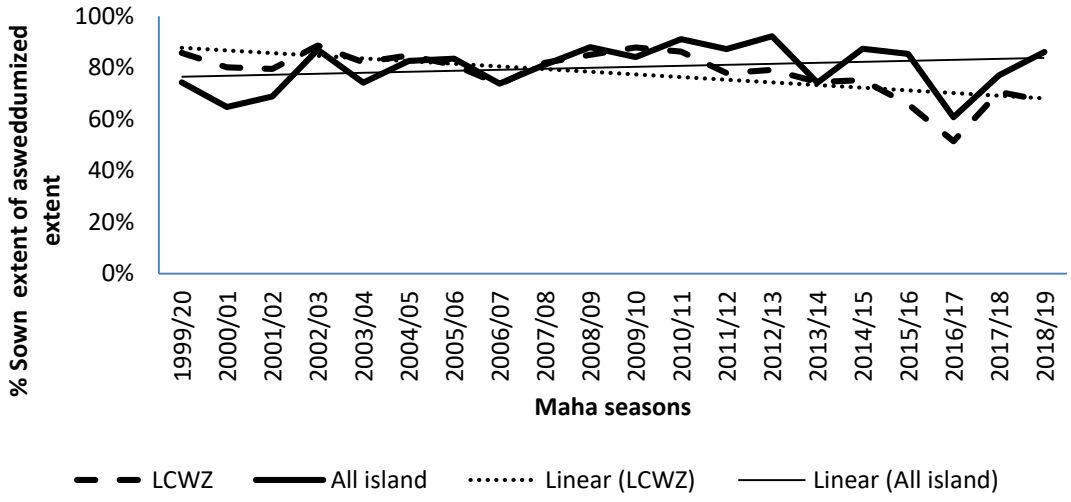
1.2 Research Problem

According to DCS (2020), the extent of active paddy lands in the country accounts for 1,802,056 acres (729,266 ha) during the 2015/16 *Maha* season which is 92 percent of the total asweddumized extent in the country (Table 1.1; See Appendix 1 for detailed distribution of active paddy lands by districts island wide). However, the situation in LCWZ is unsatisfactory as only 203,093 acres (82,189 ha) remain active paddy lands accounting for 69 percent of the total paddy extent in the region. At the district level, Colombo occupies the least extent (61%) whereas the corresponding figures for other LCWZ districts are 65 percent in Kalutara, 66 percent in Galle, 68 percent in Kegalle, 71 percent in Ratnapura, 74 percent in Matara, and 76 percent in Gampaha. The data depict that the situation in the region is relatively unfavorable compared to the situation in the country as a whole. Therefore, it is important to look at strategies that can help improve the efficiency, productivity and profitability of paddy cultivation in LCWZ.

Table 1.1: Percentage of Extent and Number of Active Paddy Lands in LCWZ Districts during 2015/16 *Maha* Season

District	Extent of Active Paddy Lands (acres)	% of Active Paddy Lands	District	Number of Active Plots	% of Active Paddy Land Plots
Sri Lanka	1802056	92	Sri Lanka	1640500	90
LCWZ	30352	68	LCWZ	36765	71
Colombo	11664	61	Colombo	18993	62
Kalutara	34759	65	Galle	47464	71
Galle	31749	66	Kalutara	47235	71
Matara	41764	74	Matara	69125	72
Gampaha	31826	76	Gampaha	60584	78

Source: DAD (2020 - http://www.agrariandept.gov.lk)



Source: DCS, 2020

Figure 1.1: Percentage of Sown Extent by Asweddumized Paddy Extent in *Maha* Seasons (1999/2000 - 2018/2019)

The highest extent under paddy is reported in *Maha* season. During the water-scarce *Yala* season, some paddy fields are left uncultivated or used to grow less water demanding crops. In the 1999/2000 *Maha* season, the sown extent under paddy accounts for 549,246 ha, which is 74 percent of the total asweddumized extent in the country (Figure 1.1). Correspondingly, the LCWZ occupies 89,997 ha of sown extent while sustaining a difference of 189,801 ha or 86 percent of the asweddumized extent in the region (DCS, 2020). However, by 2018/19 *Maha* season, the sown extent under paddy increased to 748,027 ha, which is 86 percent of the total asweddumized extent in the country whereas the corresponding extent in LCWZ declined to 62,201 ha, which is only 67 percent of the asweddumized extent in the region (DCS, 2020). This means that a considerable extent of active paddy lands is left unutilized. If paddy cultivation in the region is allowed to continue in the same manner, active paddy lands are at risk of further abandonment, fallowing and being used for other activities; however, alternative strategies to intensify the use of active paddy lands in the LCWZ is yet to be realized.

Dhanapala (2005) categorizes the reasons or the root causes for abandoning paddy lands as technological and non-technological. Hence, reclaiming abandoned paddy lands by way of resolving technological issues alone is insufficient to restore this agro-eco system. Thus, addressing non-technological issues is equally important. Non-technological reasons are mostly of social and economic nature, for instance, issues relating to inputs and services such as scarcity and high cost of labour, seeds and planting material, agro-chemicals and extension information, marketing issues including price instability, and financial issues such as poor access to credits and loans (Dhanapala, 2005). As a result, paddy cultivation in the region is labeled as less productive, inefficient and unprofitable (Dhanapala, 2005; Epasinghe *et al.*, 2008; Wijesinghe and Hapuarachchi 2016; Wijesinghe and Wijesinghe, 2015). These are the immediate causes or gaps stemming from the root causes for the abandonment of paddy lands.

Experts interpret the adverse effects of these gaps from different angles. 'Farmers are reluctant to engage in paddy farming as a source of least income-generating opportunity' and 'if non-technological issues are not looked into immediately, the abandoning of paddy fields by farmers and the farming community and moving away from paddy cultivation is inevitable' (Dhanapala, 2005); unfavourable attitudes towards paddy farming among the farmers in the region (Epasinghe *et al.*, 2008; Wijesinghe and Hapuarachchi, 2016).

Wijesinghe and Wijesinghe (2015) identify several reasons of non-technological nature that lead to inefficiency in input use in the region. Included are negligence in land levelling, failure to apply the required amount of fertilizer on time and failures in pest and disease control. Therefore, farmers should be capacitated to face those issues with knowledge, skills and other resources. Given the situation, scientific knowledge must be generated and disseminated to the farmers and employed in the farm fields to overcome these immediate causes. However, literature does not reveal the extent to which these needs have been met. Therefore, it is required to examine the performances of generation, dissemination and application of knowledge that address the immediate causes of abandonment of active paddy lands and to identify appropriate strategies to prevent further abandoning of the same.

Furthermore, there is also a widely shared but untested opinion that one key reason for the survival of paddy cultivation in the LCWZ is fertilizer subsidy. The recent policy decision on banning fertilizer imports would further limit the opportunity the LCWZ had for paddy cultivation. The high land value in the region coupled with land-related potential opportunities would be incentives for further abandoning of active paddy lands in LCWZ. Therefore, paddy cultivation in the LCWZ is being carried out amid many such obstacles however, the feasibility of other practical strategies to further sustain lowland paddy cultivation has not yet been realized.

The State Ministry of Paddy and Cereals, Organic Food, Vegetables, Fruits, Chilies, Onion and Potato Cultivation Promotion, Seed Production and Advanced Technology Agriculture henceforth referred as State Ministry of Agriculture (SMA) sets a number of priorities in achieving its goals where promoting organic food production and consumption and attracting youth[4] into agriculture are two such priorities (SMA, 2020). The potential demand for organic rice and youth farmer organizations in the region are great opportunities to fit those priorities. Perhaps, it could also be economical to address immediate causes or gaps leading to the abandonment of active paddy lands with these opportunities in line with policy priorities of the state ministry. One of the reasons why young farming communities in the region are rather inactive is due to scarcity of land and land ownership, and the active paddy lands in the region are also less productive. Labour scarcity is a key constraint for paddy cultivation though this can be supplemented with manpower attached to young farmer societies in the region. Furthermore, paddy cultivation is seen as a loss-making

[4] In Sri Lanka, youth defined as a person between 15 and 29 years old (UNDP, 2014). For convenience of operationalization, members in the youth farmer societies are considered as youth in this study.

enterprise (Dhanapala, 2005) despite the high demand for organic rice prevalent in the region which has a potentially higher income. There is further scope for the promotion of the desire of the people in the region to consume non-toxic rice (Rambukwella and Priyankara, 2016). Against this background, the intervention to incentivize youth into paddy cultivation, with or without an organic approach has not been investigated.

Further, such interventions are likely to fail if not innovative and attractive to youth. Especially, the youth show less/lack of interest towards the conventional labor-intensive way of paddy cultivation and as a less profitable venture (Damayanthi and Rambodagedara, 2013). As well-known, the youth expect modern, mechanized and profitable farming. Given this, a mechanized and modernized way of paddy cultivation backed by technological interventions is seen as imperative. Furthermore, there could be certain institutional and policy measures that hamper such interventions. Overall, it is important to explore how active paddy lands in the region can be effectively used and prevented from further abandonment with policy, technology and institutional interventions.

1.3 Research Questions

1. Whether sufficient scientific knowledge has been generated, disseminated and employed to improve the productivity, efficiency and profitability of paddy cultivation in the LCWZ?
2. What are the opportunities and barriers for attracting youth into paddy cultivation in active paddy lands in the region and how youth can be incentivized for the same?
3. What are the opportunities and barriers for organic paddy cultivation in active paddy lands in the region and how can organic paddy cultivation be incentivized?
4. What policy, technology and institutional interventions are required to prevent further abandoning of active paddy lands?

1.4 Objectives

The main objective of this research is to identify knowledge gaps in paddy cultivation in LCWZ and to explore the potentials of youth and the organic cultivation to prevent the abandonment of active paddy lands in the region.

1.4.1 Specific Objectives

1. To assess the extent to which scientific knowledge has been generated, disseminated and employed in paddy cultivation in the LCWZ.

2. To identify the opportunities and barriers to attracting youth into paddy cultivation in LCWZ and determine of scheme incentives needed to encourage youth to take up farming in the area.
3. To identify the opportunities and barriers for organic paddy cultivation in LCWZ and how farmers/youth can be incentivized for the same.
4. To explore other alternatives that would contribute to achieving the overall objective through participatory approaches.

1.5 Significance of the Study

The scope of this study includes several important points highlighted in the national policy framework 'Vistas of Prosperity and Splendor' (MoF, 2019) and the Saubagya agricultural development programme 2021 of the State Ministry (SMA, 2020). Included in the national policy framework are; agriculture to be developed through advanced technology[5]; harnessing the power of youth[6]; and reducing the impact on the land[7]. In light of the national policy framework, the SMA endorses its policy priorities under seven special categories. Among them, the relevant categories to this study are; healthy safe foods[8]; increasing agricultural yields[9]; and innovative technology[10].

This study will reach a synergic output through exploration of several key aspects that leads to restoration of the paddy-based ecosystem in LCWZ. They would help bridge the knowledge gap of paddy cultivation in LCWZ; promote youth participation and/in organic paddy production and derive the marketing potential for organic rice in the region. The findings will be of significance to policy formulation in addition to instinctive achievements in eco-system restoration through intensified use of active paddy lands in the region.

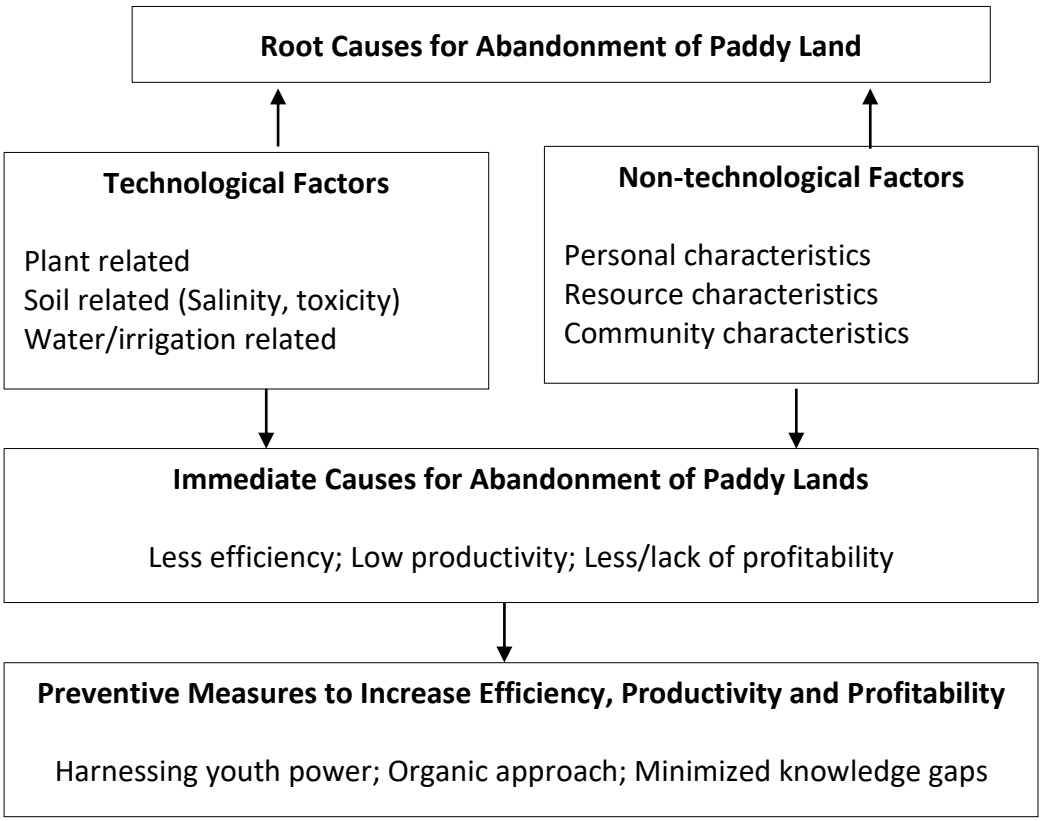
1.6 Methodology

1.6.1 Conceptual Framework

Figure 1.2 illustrates the conceptual framework of the research component. Paddy lands are abandoned on technological and non-technological grounds (Dhanapala,

[5] Small producer using small extents of land producing high quality outputs using modern technological methods.
[6] The country's youth who will be one fourth of the total population will be engaged as proactive partners of the country's sustainable development process. We will identify their aspirations and develop an effective programme to enable young people to reach their full potential.
[7] Scientific methods to improve sustainable agriculture to achieve maximum financial gains while reducing the impact on land.
[8] Starting organic food projects; Production and promotion of Good Agricultural Practices (GAPs).
[9] To strengthen the young farming societies and to increase productivity by providing the necessary facilities to start anew and turn them towards agriculture.
[10] Conducting a survey on research results to introduce research results to farmers; Developing methods to make land use more efficient, motivating people to use land as many times as possible.

2005). Solving both types of issues associated with active paddy lands are essential to prevent them from being abandoned. Solving technological problems is a burden to individual farmers due to high costs incurred and poor capacity. This has made state intervention a must. Non-technological factors look at socio-economic causes. All the technological and non-technological reasons finally end up with less efficiency, low productivity and less/lack of profitability in paddy cultivation. Hence they are the immediate causes for abandonment; existing solutions to these immediate causes and their practicality should be examined. The practicality of potential strategies should also be tested using the adoption of recommendations, participation in youth farmer societies and adoption of organic farming. That is the scope of this study.



Source: Authors' formulation based on the literature review (Section 1.5)

Figure 1.2: Conceptual Framework

1.6.2 Study Locations

This study was carried out in the coastal LCWZ region i.e. in Colombo, Gampaha, Kalutara, Galle and Matara districts. These locations were chosen based on the vulnerability of paddy lands in the region to abandonment from active status. Abandoned paddy lands are largely located in Sri Lankan coastal districts and in which these five districts have a prominent place because of their location and characteristics (විතාරණ, 2016).

1.6.3 Sample Selection

Active membership of farmer organizations such as Youth Farmer Societies (YFS), and Farmers' Organization (FO) were the units of data collection to achieve study objectives as specified under each objective.

Selection of YFSs

Table 1.2 illustrates the distribution of YFSs in the study location across selected districts. All 81 YFSs were selected as the sample because the non-existence of many YFSs was revealed at the pre-testing stage.

Table 1.2: Distribution of Youth Farmer Societies across Districts

District	DoA registered YFSs*
Colombo	10
Gampaha	12
Kalutara	28
Galle	21
Matara	10
LCWZ	81

Source: *DoA unpublished data, 2021

Selection of Sample Paddy Farmers

Initially two Agrarian Service Centres (ASCs) with the highest re-cultivated extent of abandoned paddy lands during the last five years were selected. Based on the database at ASCs and the directives by the Agrarian Development Officers (ADO) and Agrarian Research and Production Assistant (ARPA) in ASCs, 10 farmers from each ASC were selected for the survey (Table 1.3). A questionnaire survey was conducted remotely via telephone conversation (amidst travel restrictions).

Table 1.3: Distribution of Sample Farmers

District	Selected ASC	Number of farmers
Colombo	Kosgama	10
	Kesbewa	10
Gampaha	Dompe	10
	Ja-ela	10
Kalutara	Panadura	10
	Pamunugama	10
Galle	Paragoda	10
	Labuduwa	10
Matara	Deiyandara	10
	Madawiyangoda	10
Total		**100**

Source: Authors' Construction

1.6.4 Data Collection Methods

Primary data required for the study was gathered through a literature survey, Key Informant Interviews (KIIs) and case studies.

- **Documents and Records**

Research reports, research papers, journal articles and thesis were studied to extract the findings and recommendations to achieve objective 1.

- **Questionnaire survey**

Structured questionnaires were employed with active membership of FOs to gather individual information of farmers to identify the relationship between socio-economic status and adoption of scientific knowledge generated as well as individual opinion on organic farming to understand whether farmers have the potential of conversion into organic farming from conventional farming practices.

- **KIIs**

KIIs were conducted with the key informants from DoA and DAD; Agricultural Instructors (AIs) and Agricultural Research and Production Assistants (ARPAs) in the study locations respectively.

- **Case Studies**

Case studies were carried out among YFSs to achieve objectives 2 and 3.

- Dynamic Programmes Keep Youth Farmer Society Active
- Youth Mobilities and Migration for Occupation
- Poor Commitment of Relevant Official
- YFS as a Resource Hub
- Youth Aspirations towards Organic Paddy Cultivation

1.6.5 Operationalization of Variables

Objective One

Objective One: To assess the extent to which scientific knowledge has been generated, disseminated and employed to improve the efficiency, productivity and profitability of active paddy lands.

Table 1.4 first captures different dimensions or the variables to achieve the objective one and then selects relevant indicators describing those aspects. Measures and sources of data are also specified.

Table 1.4: Operationalization of Variables to Achieve Objective One

Dimensions	Elements/ Indicators	Measures	Source of Data
Characteristics of sample	Socio-economic characteristics	Age, gender, marital status, educational level, household size, employment, years of farming experience	Active membership of FOs via questionnaire survey
Generation of scientific knowledge	Key research findings and recommendations made	List of research findings and recommendations made	Literature survey of documents and records and KIIs of knowledge sources
Dissemination of scientific knowledge	Means of Dissemination to farm level	Qualitative data on dissemination efforts 1. Types of means available 2. Types of means used to disseminate	Secondary data from knowledge sources and extension agents through KIIs
Contribution from Scientific knowledge	Awareness among farmers	Whether farmer aware or not	Active membership in farmer organizations via a questionnaire survey
	Adoption of recommendations	Farmers and AIs on adoption 1. Whether farmer adopting or not 2. AIs overall opinion on the level of adoption of recommendations	Active membership in farmer organizations via questionnaire survey and extension agents - KIIs
	Effectiveness of recommendations	Ratings by farmers on the effectiveness 3 point Likert scale 1. Level of the effectiveness of recommendations	Active membership in farmer organizations via a questionnaire survey
	Constraints associated with the adoption of recommendations	Qualitative data gathered limiting factors and capacity development needs for the adoption of recommendations	Active membership in farmer organizations via a questionnaire survey and extension agents via KIIs

Source: Authors' construction based on literature review and KIIs.

Objective Two and Three

Objective Two: To identify opportunities and barriers to attract youth into paddy cultivation in LCWZ and how they can be incentivized for the same.

Objective Three: To identify opportunities and barriers for organic paddy cultivation in LCWZ and how farmers/youth can be incentivized for the same

Table 1.5 first captures different dimensions or the variables to achieve objective two and three and then specify relevant indicators, measures and sources of data.

Table 1.5: Operationalization of Variables to Achieve Objective Two and Three

Dimensions	Elements/Indicators	Measures	Source of Data
Strengths and weaknesses of YFSs	Engagement in YFSs	Qualitative and quantitative data on attitudes towards engagement in youth societies, years of active participation, activities involved, benefits received, constraints to participation	Active membership of FOs via questionnaire survey Case studies
Potential and barriers for organic rice production	Opinions and aspirations of youth towards paddy farming with or without an organic approach and difficulties they face and incentives sought	Qualitative and quantitative data on factors that influence to adopt of organic farming Qualitative data on attitudes, opinions, limiting factors and capacity development needs for organic rice production	Active membership of FOs through questionnaire survey Case studies
	Conversion to organic from conventional	Qualitative data on criteria that influence to make decision for converting to organic farming (Figure 1.3)	Active membership of FOs through questionnaire survey

Source: Authors' construction based on literature review and KIIs.

Objective Four

Objective 4: To explore other alternatives that would contribute to achieving the overall objective through participatory approaches. Table 1.6 illustrates the information needs and sources for achieving objective four.

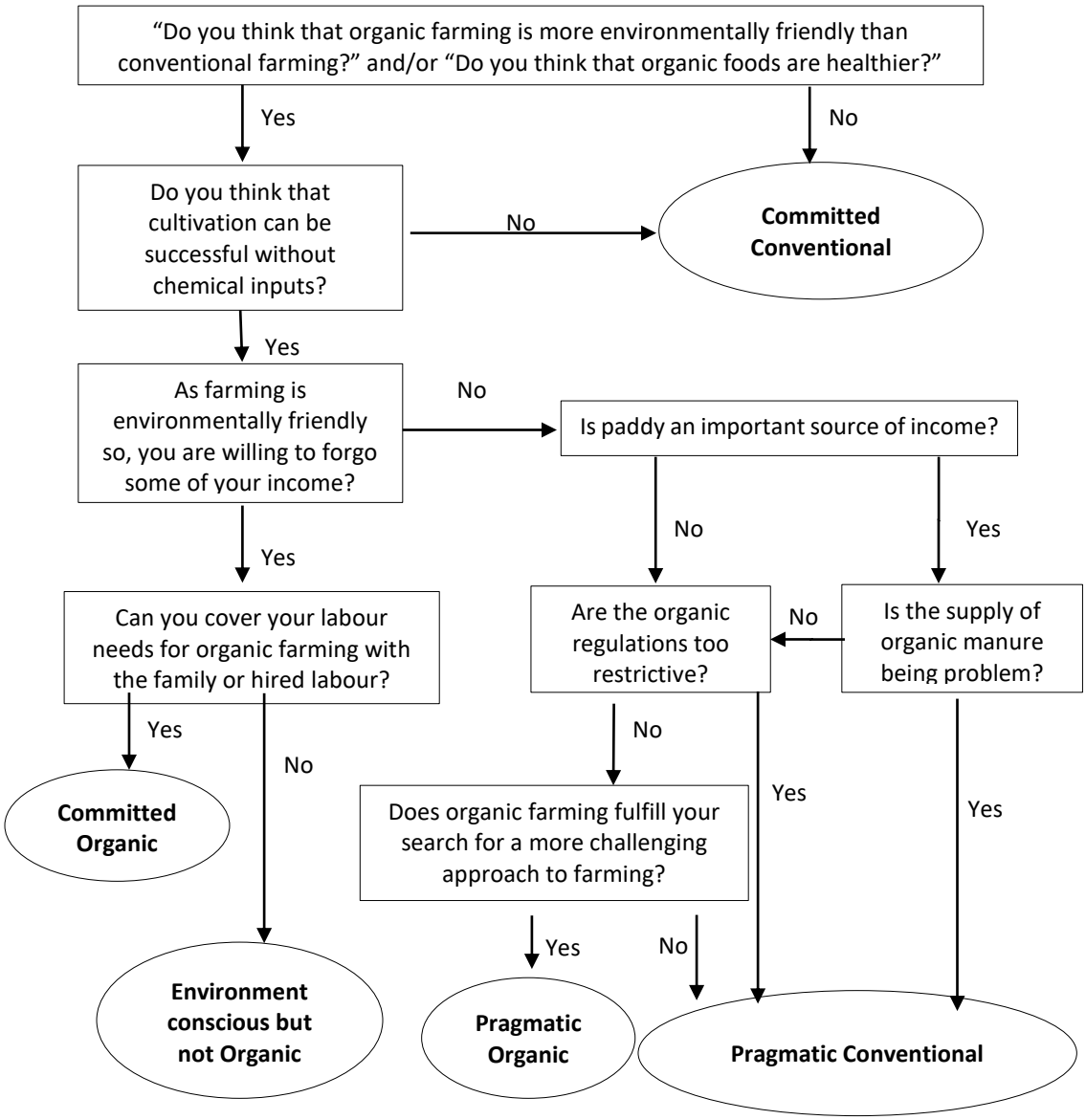
Table 1.6: Operationalization of Variables to Achieve Objective Four

Dimensions	Elements/Indicators	Measures	Source of Data
Alternative means of intensifying the use of active paddy lands	Policy, technological and institutional aspects	Qualitative data as proposed by diverse stakeholders	KIIs

Source: Authors' construction based on literature review and KIIs.

1.6.6 Data Analysis and Presentation

All the data gathered were analyzed using the SPSS (Statistical Package for the Social Sciences) and Microsoft Excel as appropriate. Data analysis was in descriptive terms and presented using graphs, charts and tables in addition to chi-square tests.



Source: Adopted from Darnhofer *et al.* (2005)

Figure 1.3: Decision-tree Criteria for Choose of Organic and Conventional Farm Management

Apart from that, the decision-tree approach of Darnhofer *et al.* (2005) was used to identify the farmer types (Figure 1.3) and to understand whether they like the conversion to organic from conventional. The farmers were identified by the five types i.e. the committed conventional; the pragmatic conventional; the environment-conscious but not organic; the pragmatic organic; committed organic (Darnhofer *et al.*, 2005).

1.7 Limitations

The questionnaire surveys and KIIs were conducted remotely over the phone, however they were problematic as farmers were reluctant to discuss at length via telephone conversations. Lockdown, travel restrictions, isolation, and work from home arrangements for officials also prolonged the period of data collection. It was also difficult to locate certain YFSs as many were non-exist with the internal weaknesses in the implementation and external factors aforementioned.

1.8 Organization of the Occasional Publication

The report is organized into six chapters. Chapter One consists of study background, objectives, significance and methodology. The literature review is presented in Chapter Two. The next chapter is devoted to discuss the awareness and adoption of scientific knowledge for paddy cultivation in LCWZ. Chapter Four presents the opportunities and barriers to attracting youth into paddy cultivation. In the same way, opportunities and barriers for organic paddy cultivation are deliberated in Chapter Five. Finally, Chapter Six concludes the publication with findings, conclusions and recommendations.

CHAPTER TWO

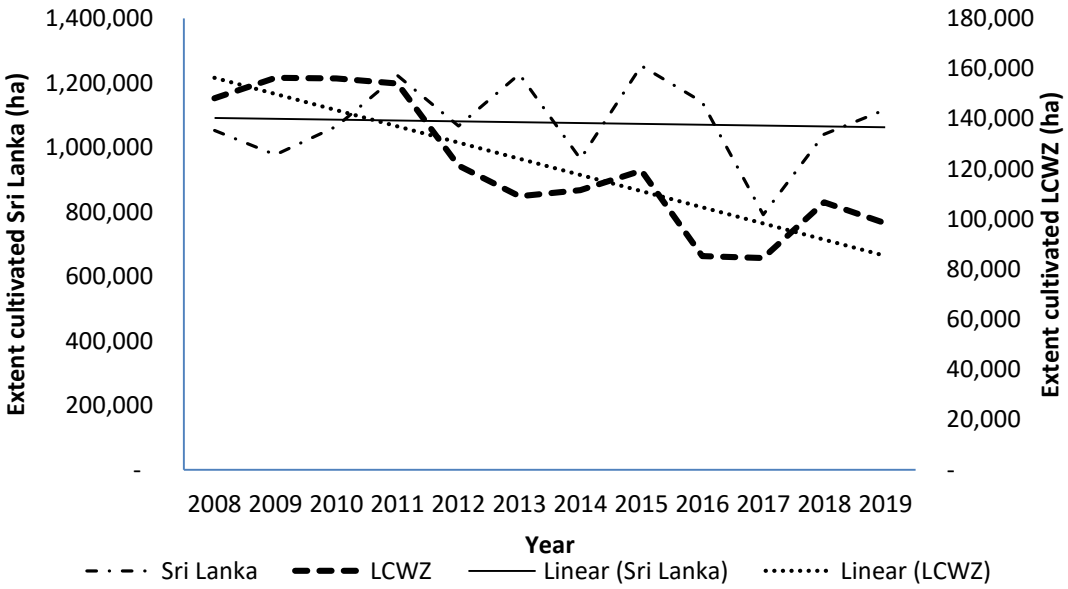
Literature Review

2.1 Introduction

This chapter reviews the literature relating to the achievement of study objectives. Since the main focus of this study is to look at the possibility for the prevention of further abandoning of active paddy lands in LCWZ through youth participation and organic farming, it begins with a review of statistics of current status of active paddy lands in the area along with the root causes and immediate causes for paddy land abandonment. Then the focus is on the scientific knowledge generated relating to the paddy cultivation in the area. The final section is a search for opportunities and barriers to attract youth into wet zone paddy cultivation and organic farming.

2.2 Current Status of Active Paddy Lands in the Country and LCWZ

Since traditional paddy lands in the LCWZ are subjected to massive population pressure amidst various institutional arrangements, emphasis was placed on the various strategies to intensify the use of active paddy lands in the region. The results of the study conducted by Fernando *et al.* (2010) revealed that the highest production stability of paddy was recorded in the wet zone and therefore it could be utilized to augment regional food security and the supply of seed paddy for other regions. Therefore, it is very important to maintain LCWZ as a buffer zone of paddy production (Fernando *et al.*, 2010; Wijesinghe and Wijesinghe, 2015).

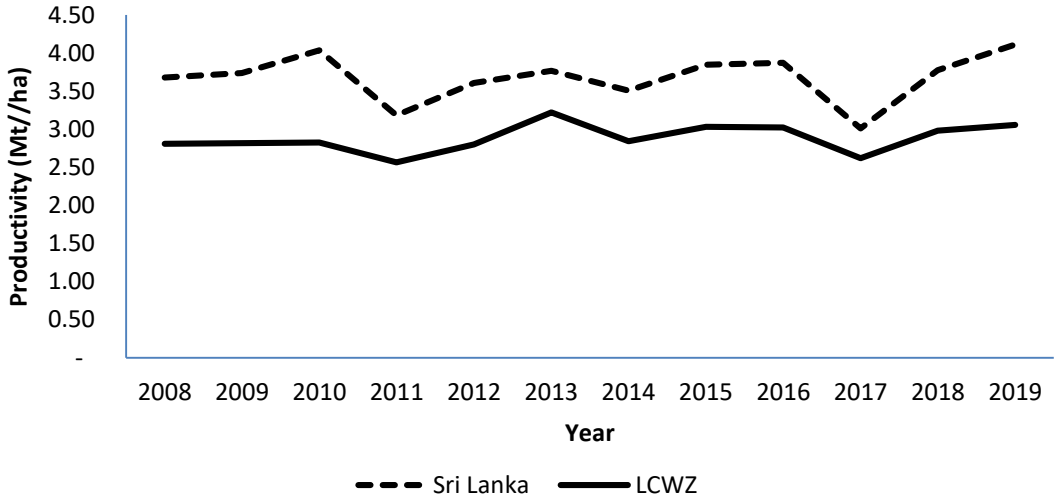


Source: DCS, 2020.

Figure 2.1: Paddy Extent Cultivated in Sri Lanka and LCWZ, 2008-2019

Figure 2.1 shows the extent cultivated so as to understand the variation and trend over time in the whole country and LCWZ. The LCWZ has a clear declining trend concerning the extent of cultivation in abandoned land despite the many changes in the country as a whole with the policy to re-cultivate in the fallow lands from time to time. It indirectly indicates the increase of abandoned lands in LCWZ.

Land productivity of the LCWZ is shown in Figure 2.2 and it depicts that even though productivity fluctuates over the years the average productivity almost remains the same (3 Mt/ha). It further confirms that lower productivity in the LCWZ compared to the whole country (4 Mt/ha).



Source: DCS, 2020

Figure 2.2: Paddy Productivity in Sri Lanka and LCWZ, 2008-2019

2.3 Root Causes and Immediate Causes for Abandonment of Paddy Lands

Abandonment of paddy lands is not a recent occurrence. According to Dhanapala (2005) it began in the 1980's. The reasons behind paddy land abandonment are many and varied. Included are; scarcity of water (DCS, 1999), floods (Bentota *et al.*, 2010; DCS, 1999; Dhanapala, 2005; Epasinghe *et al.*, 2008; Perera *et al.*, 2017), seawater intrusions (Bentota *et al.*, 2010; DCS, 1999; Perera *et al.*, 2017; Wijesundara and Piyadasa, 2015), soil related issues (Bentota *et al.*, 2010; Dhanapala, 2005; NAO, 2020), water logging (Bentota *et al.*, 2010) land disputes and development projects (DCS, 1999; NAO, 2020), scarcity and high cost of input such as labour, seeds and planting material, agro-chemicals (Dhanapala, 2005; Epasinghe *et al.*, 2008; Wijesundara and Piyadasa, 2015; NAO, 2020), wildlife damages (Dhanapala, 2005; Epasinghe *et al.*, 2008; NAO, 2020), poor maintenance of drainage system (Epasinghe *et al.*, 2008; NAO, 2020), financial issues such as poor access to credits and loans (Dhanapala, 2005), lack of cultivation of adjacent plots in the *Yaya* by others (Epasinghe *et al.*, 2008; NAO, 2020), alternative employment opportunities and time unavailability (Dhanapala, 2005; Epasinghe *et al.*, 2008; NAO, 2020), marketing issues including price instability (Dhanapala, 2005; Epasinghe *et al.*, 2008).

Epasinghe *et al.*, (2008) while studying the reasons behind the declining trend of paddy cultivation in the wet zone of Sri Lanka identified 38 single reasons of which nine are the most influential. They are; blockage of irrigation waterways, climate-related reasons such as flooding, high cost of paddy production, labour scarcity, poor returns from paddy cultivation, damage caused by animal, issues relating to access roads, time unavailability due to employment, lack of cultivation of adjacent plots in the *Yaya* by other farmers. The study further finds that each farmer faces more than a single problem which includes both technical and non-technical reasons. Dhanapala (2005) emphasizes 'farmers have much more burning issues than technical ones, such as irrigation related problems, timely availability of inputs and cost of inputs, agricultural loans, credits and subsidies, damage by wild animals, specifically wild boar and marketing issues and paddy prices'. Dhanapala (2005) categorizes root causes for the abandonment of paddy lands into technological and non-technological reasons.

The identified root causes then lead to immediate causes for paddy land abandonment. Studies reveal that they are less productive, inefficient and less profitable (Wijesinghe and Wijesinghe, 2015; විකාරණ, 2016; Warnakulasooriya *et al.*, 2008). The study conducted by Wijesinghe and Wijesinghe (2015) reveals that productivity in LCWZ paddy cultivation is comparatively less amounting to 905kg/ac while the cost of production is as high as Rs. 30.25/kg without imputed cost while technical efficiency is 72 percent. High variability in paddy yield and decreasing returns to scale is also evident in LCWZ from the same study. 2018/19 Maha season data reveals that under rainfed condition profit without imputed cost for acre was Rs. 32,995 for Gampaha and Rs. 21,382 for Kalutara (DoA, 2019). On the contrary, it was Rs. 42,809 for rainfed and 52,507 for irrigated in Kurunegala while Rs. 46,778 for Anuradhapura under irrigated conditions (DoA, 2019). This shows the lack of profitable paddy farming in LCWZ districts. As such, the root causes and the immediate causes for the abandonment of paddy lands have being identified.

2.4 Scientific Knowledge relating to Paddy Cultivation in LCWZ

The country is blessed with the existence of a well-organized institutional structure for the generation and the dissemination of knowledge and technologies which hamper crop productivity, efficiency and profitability. In particular, the DoA is involved in the generation of rice technologies through its key arm, Rice Research and Development Institute (RRDI) at Bathalagoda and several other regional centres located across the country. The regional centre within LCWZ is located at Bombuwala where there is a generation of knowledge and technologies specific to the LCWZ paddy cultivation. The extension division of the DoA is responsible for the dissemination of knowledge to the end-users at the grassroots level. A number of research studies have been conducted aiming at the improved efficiency, productivity and profitability of rice cultivation in the region and the findings are disseminated to the farming community as listed below.

1. *Yaya* Cultivation Systems Approach

The study conducted by Thibbotuwawa *et al.* (2012) points out that increasing land size, irrigation water and ownership enhance the technical efficiency of paddy lands. They have suggested that the cultivation systems approach (*Yaya* system) should be promoted to organize small scale cultivations into comparatively larger organized collective systems with the collaboration of the government, farmer organizations and the private sector to achieve economies of scale. At present the agriculture sector consists of a large number of small farms and tenant cultivators. They also emphasized that existing tenurial and land legislations should be reviewed to find a better solution for inefficiencies associated with land fragmentation and tenancy.

2. Change of Rice Varieties Seasonally

The technical efficiency of farmers who cultivated by changing rice varieties between seasons has proved to be efficient compared to farmers who cultivate the same variety in all seasons, therefore changing rice varieties seasonally may lead to enhancing the efficiency of resource use in paddy farming (Wijesinghe and Wijesinghe, 2015).

3. High Efficiency with Increased Age Group

Especially in the LCWZ, the use of paddy varieties aged 3.5 months such as BG 358, BG 350, BG 360, LD 355, LD 356, AT 362 and BW 361 have proved to have the higher yields than the 3 months varieties such as BG 300, BW 272-6B (Wijesinghe and Wijesinghe, 2015). Nevertheless, Jayawardena *et al.* (1983) argue that the poor dissemination of high-yielding varieties in the LCWZ is mainly due to the failure of the new varieties to show field stability over a wide range of soil and climatic conditions such as submergence and iron toxicity. They also found that tolerant varieties such as BW 272-6B and BW 267-3 were the most suitable replacements for indigenous rice varieties in Kalutara and Galle districts.

Walisinghe (2017) also identified that the rice varietal group has a strong positive relationship with the level of technical efficiency as dry matter accumulation increases with the increase in age group resulting in relatively higher rice production. However, exceptionally the 5-6 month group is the least efficient as it consumes a fair amount of input and the grain yields tend to decrease after a certain threshold level. The study suggested that the 4-4.5 month age group was the most efficient category followed by the 3.5 and 3-month groups respectively.

4. Increased Technical Efficiency with Hired Labour

The results of the study conducted by Walisinghe (2017) revealed that family labour contributes to reduced technical efficiency while hired labour increased the level of efficiency as a family to hired labour ratio also had a significant but

negative relationship with farm-level efficiency. The argument was based on the level of skills i.e. family labour is an unskilled input often used at a subsistence level of rice production while hired labour, which is more specialized, is engaged extensively in commercial-scale rice cultivation that leads to efficient production.

5. Degree of Mechanization

The study conducted by Wijesinghe and Wijesinghe (2015) shows that the degree of mechanization positively correlates with production. Although they suggest that mechanization when and where appropriate would enhance the paddy yield in the region, small machinery is preferable due to the water logging nature of paddy fields.

6. Balanced Use of Machinery and Labour

Overuse of machinery reduces farm technical efficiency while more machinery usage enhances allocative efficiency, therefore the correct balance between applying machinery and labour in small land plots is essential (Thibbotuwawa *et al.*, 2012).

7. Fertilizer Application at Correct Time

According to extension officials, farmers do not apply fertilizer at the required time since priority is given to other employment opportunities which give them an additional income, but fertilizer application at the required time improves the technical efficiency (Wijesinghe and Wijesinghe, 2015).

8. Application of Urea

The study conducted by Kanthilanka and Weerahewa (2016) reveal that resource use pattern in paddy cultivation is characterized by decreasing returns to scale, and urea application has positive and significant effects on paddy productivity: suggesting that further application of urea would result in higher yields.

9. Use of Quality Seed

The use of quality seed is important to improve the efficiency of paddy lands, thus increased involvement of the private sector and if self-seed rice production, sufficient extension services and training should be encouraged (Thibbotuwawa *et al.*, 2012).

10. Seed Application

Kanthilanka and Weerahewa (2016) argue that seed rate also has positive and significant effects on paddy productivity and therefore applying the recommended seed rate will lead to higher efficiency, productivity improvement and profitability.

11. Pest and Disease Management

Pest and disease management is necessary practice to prevent yield losses. The study conducted by Wijesinghe and Wijesinghe (2015) proved that pest and disease control improves the technical efficiency of paddy cultivation.

12. Market Oriented Paddy Production Programmes

Introducing market-oriented paddy production programmes may increase the efficiency such as the production of traditional varieties for niche markets, export-oriented paddy production, organic paddy (Wijesinghe and Wijesinghe, 2015).

The SMA related to paddy has rightly identified the need for addressing the efficiency, productivity and profitability issues relating to paddy cultivation by providing research results to the farmers expeditiously and conducting a survey on research results for this purpose (SMA, 2020). The forthcoming chapter discusses the awareness and adoption of the above recommendations by the sample farmers of this study.

2.5 Opportunities and Barriers to Organic Paddy Cultivation in LCWZ

Environmental benefits associated with organic paddy cultivation are apparent, and economic feasibility has been proved by many empirical studies. A global meta-study revealed that organic farming systems produce lower yields, but they are more profitable and environmentally friendly in terms of soil quality, minimized energy use, biodiversity and minimized water pollution, compared with conventional agriculture (Reganold and Wachter, 2016). Contrary to the common belief that yields in organic farming are inevitably lower compared to inorganic farming, several studies conducted in Sri Lanka shows that organic paddy farmers achieved the same yields as conventional farmers (Rambukwella and Priyankara, 2016; Rodrigo, 2015). Previous studies also found that organically produced traditional rice achieved a higher selling price than conventionally produced rice demonstrating the high price premium in organic rice production (Horgan *et al.*, 2017; Rambukwella and Priyankara, 2016). In addition, export market opportunities are higher for organic rice with escalating global demand for healthy alternatives. The world market share of organic products amounted to 96.7 billion Euros in 2018, which is six times higher than that of the year 2000, indicating a faster-growing demand for organic food (IFOAM, 2019). Hence, the shift towards organic paddy cultivation in active paddy lands will not only yield safer rice to the consumers but also higher profits to the producers as well in line with the priorities of the state ministry that show interest towards initiating organic food production projects, certifying organic food and providing them with fixed prices, promotion and distribution of good agricultural practices (SMA, 2020).

2.6 Opportunities and Barriers to Attract Youth into Paddy Cultivation in LCWZ

Representation in economic activities by youth is lower in Sri Lanka that is reflected by more than 20 percent of unemployed youth (CBSL, 2020). Nevertheless, the presence of organized groups of youth groups either employed or not is an underived opportunity in the area to reclaim the abandoned paddy lands and to prevent further abandoning of active paddy lands.

Horgan *et al.* (2017) claim that the organic paddy production system is threatened by the aging population. Damayanthi and Rambodagedara (2013) recommend establishing and strengthening youth farmer organizations, establishing corporate industries and businesses for youth to attract them for farming. The SMA also stresses the need for enhancing production by strengthening young farmer societies and providing necessary facilities to start new young farmer societies and encouraging them to pursue agriculture (SMA, 2020).

It is found that both formal and informal youth farmer societies are there at the ground level. The Department of Agriculture (DoA) runs the movement of young farmers' societies to organize youth for agricultural activities. Meanwhile, the DAD promotes youth involvement in re-cultivation of abandoned paddy lands. Perhaps, these young farmer societies could be suitable platforms to tap the potential of the region for organic paddy production in line with the priorities of the SMA.

Youth Farmers' Society (YFS) was started in the early 1950s and the responsibility to establish YFSs was assigned to the Extension and Training Centre of the DoA at the beginning (DoA, 2021 Unpublished). Later, headquarters of the YFSs were established to carry out the programme. Their vision is to create citizens who contribute to the economic, social and political development of the country and their mission was to uplift the living standards of youths through the movement of YFSs. By setting up sustainable YFSs at the village level, their goal is mental, physical and spiritual development among youths, producing a young generation that can sustain with self-effort, developing the entrepreneurial skill of youths and alleviation of unemployment through agriculture. YFS conducts various activities to achieve these goals such as conducting quiz programmes, exposure to television and radio programmes, campaigns, exhibitions, seminars, field trips, camping and supporting to establish shops. There are around 600 YFSs established, among them 77 organizations registered within LCWZ (DoA, 2021 Unpublished).

However, it is the general trend that the young people are interested in non-agricultural careers even though there are considerable employment opportunities in the agriculture sector. Farming has become less attractive to youth due to many reasons such as limited access to land, resources, technology, infrastructure, marketing, credit and finance as well as poor earnings prospects and risk involved in the conventional way of farming (Damayanthi and Rambodagedara, 2013). Therefore, new technologies and innovative farming practices should be in place in addition to addressing other issues to attract youth to agriculture as their engagement is crucial

for a robust and sustainable agricultural economy. Wijesinghe and Wijesinghe (2015) also point out that particularly in LCWZ paddy cultivation is at risk with the aging population and youth undesirability to engage in farming activities.

CHAPTER THREE

Awareness and Adoption of Scientific Knowledge for Paddy Cultivation in Low Country Wet Zone

3.1 Introduction

Whilst there is criticism that technology transfer to the farming community is weak, there is no proper understanding of the degree to which the farmers are aware of and have adopted new knowledge or best practices relating to paddy cultivation in LCWZ. Therefore, there is no proper estimate of the extent to which the immediate causes of abandonment have been addressed through scientific research and investigation and thus preventing further abandonment of active paddy lands. This chapter elaborates those aspects based on the primary data gathered from the sample farmers along with their socio-economic characteristics and finally estimating the nature and the strength of the links between demographic characteristics and adoption of best practices.

3.2 Socio-Economic Characteristics of Study Sample

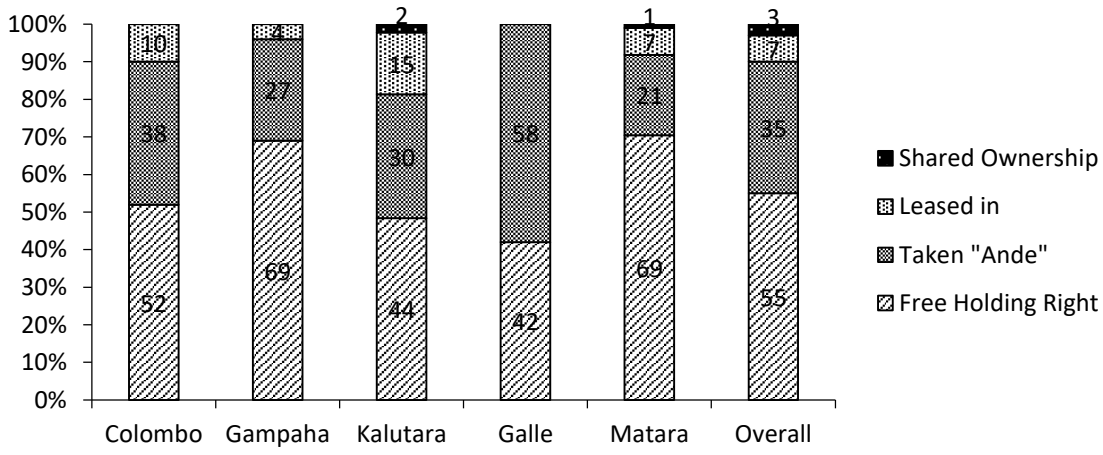
Farmers who engage in paddy cultivation were purposefully chosen from the study locations to address the objective of assessing the extent to which scientific knowledge has been generated, disseminated and employed to improve the efficiency, productivity and profitability of active paddy lands. Table 3.1 shows the distribution of gender, age, education and employment and farming experience of the study sample in all five districts.

Table 3.1 is indicative of several predominant characteristics of sample farmers including male dominance, aging community, poor youth representation, higher educational attainment, off-farm income sources and thereby part time farming. Dhanapala (2005) also affirmed that paddy cultivation is low remunerative occupation in the wet zone compared to other income earning sources, thus primary employment is not farming for many.

Table 3.1: Demographic Characteristics of the Study Sample

Characteristics	Colombo (n=20) %	Gampaha (n=20) %	Kalutara (n=20) %	Galle (n=20) %	Matara (n=20) %	Overall (n=100) %
Gender						
Male	100	85	85	80	85	87
Female	0	15	15	20	15	13
Age (Years)						
<45	15	20	5	35	20	19
45-60	35	50	80	45	60	54
>60	50	30	15	20	20	27
Educational Level						
Up to GCE O/L	60	40	55	65	55	55
Up to GCE A/L	20	30	35	30	45	32
Above GCE A/L	20	30	10	5	0	13
Primary Employment						
Farming	20	5	25	40	30	24
State sector	30	50	15	40	30	33
Private sector	40	20	25	5	20	22
Labourer	10	15	30	5	15	15
Self-employment	0	10	5	10	5	6
Farming Experience (Years)						
<20	25	20	55	45	25	34
20-40	30	60	25	35	55	41
>40	45	20	20	20	20	25

Source: HARTI Survey Data, 2021



Source: HARTI Survey Data, 2021

Figure 3.1: Distribution of Land Tenure Arrangements by Districts

Figure 3.1 illustrates different tenure arrangements under which paddy lands are used for paddy cultivation by the sample farmers. The majority (55%) have full ownership except Galle district where tenancy predominates. In Kalutara and Colombo districts, a considerable percentage of plots were leased in. It is a researchable fact that limited land ownership is linked to less productivity and profitability of LCWZ paddy cultivation.

3.3 Dissemination of Scientific Knowledge on Paddy Cultivation in LCWZ

Table 3.2 summarizes the best practices derived from the scientific knowledge generated to improve efficiency, productivity and profitability of paddy production in the LCWZ region.

Table 3.2: Best Practices Improving the Efficiency, Productivity and Profitability of Paddy Cultivation in LCWZ

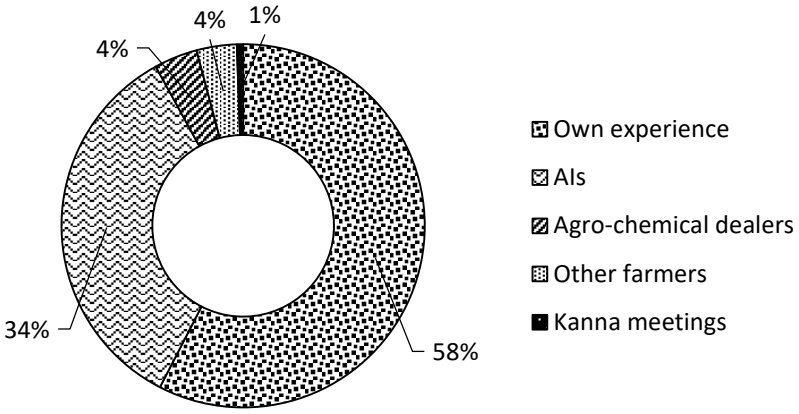
	Practices	Reference
1	*Yaya* cultivation	Thibbotuwawa *et al.* (2012)
2	Seasonal change of rice varieties	Wijesinghe and Wijesinghe (2015)
3	Higher age varietal group	Walisinghe (2017); Wijesinghe and Wijesinghe (2015)
4	Use of hired labour	Walisinghe (2017)
5	Degree of mechanization	Wijesinghe and Wijesinghe (2015)
6	Balance use of machinery and labour	Thibbotuwawa *et al.* (2012)
7	Fertilizer application at the required time	Wijesinghe and Wijesinghe (2015)
8	Application of urea	Kanthilanka and Weerahewa (2016)
9	Use of quality seed	Thibbotuwawa *et al.* (2012)
10	Application of recommended rate of seeds	Kanthilanka and Weerahewa (2016)
11	Pest and disease controlling	Wijesinghe and Wijesinghe (2015)
12	Market-oriented paddy production programmes	Wijesinghe and Wijesinghe (2015)

Source: Author's compilation based on cited literature

The key extension personnel including subject matter officers and AIs were questioned to find out whether they were aware of all those 12 practices and how they disseminated those practices among farmers. All the extension personnel were well-aware of nine practices except for the three practices which were unpopular among them. Included were; seasonal change of rice varieties, high technical efficiency with long varieties and the balanced use of machinery and labour. Most of them agree that training programmes, seasonal meetings (*Kanna* meetings), individual visits and word of mouth were the main sources of dissemination of the knowledge among the farming community.

3.4 Sources of Information of Scientific Knowledge to Farmers

It is also important to examine how this knowledge is accessed by the farming community and Figure 3.2 illustrated the results of the farmer survey. Accordingly, the own knowledge and experience is the predominant source of knowledge for the farmers whereas the next prominent source being AIs. AIs are the proper source of information though many farmers depend on unconfirmed sources for information.

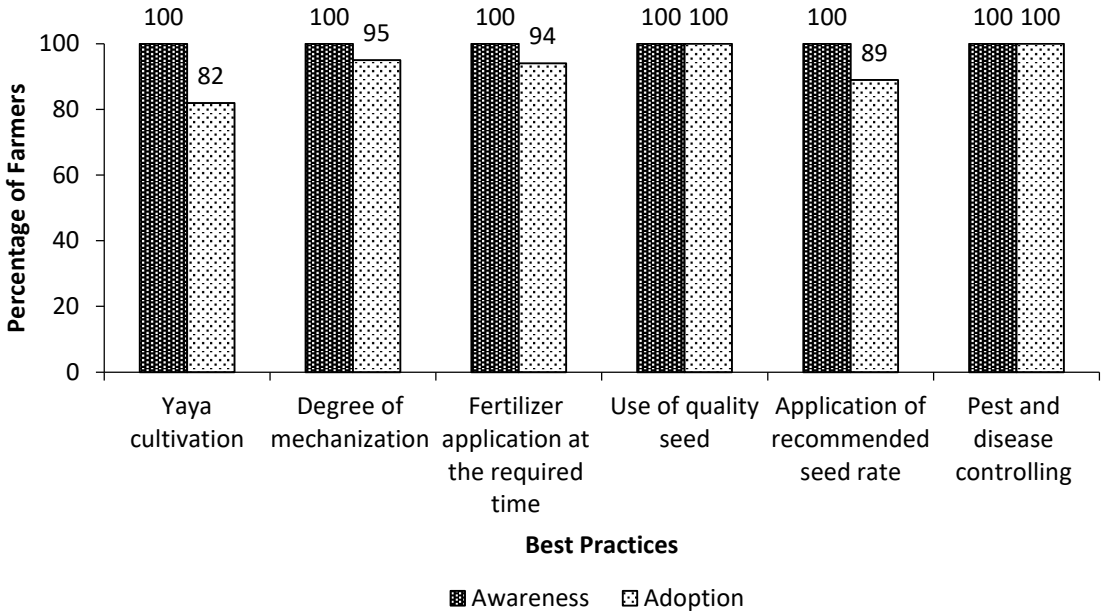


Source: HARTI Survey Data, 2021

Figure 3.2: Distribution of Source of Information

3.5 Awareness and Adoption of Scientific Knowledge by Farmers

Figures 3.3 demonstrate that the farmers in the region are fully aware of and mostly use a few pieces of knowledge and technologies in paddy cultivation. These include the most essential practices that ensure a good crop such as *Yaya* cultivation, level of mechanization, quality seeds at recommended rates, and pest and disease control.



Source: HARTI Survey Data, 2021

Figure 3.3: Distribution of Farmers by Awareness and Adoption of Scientific Knowledge – I

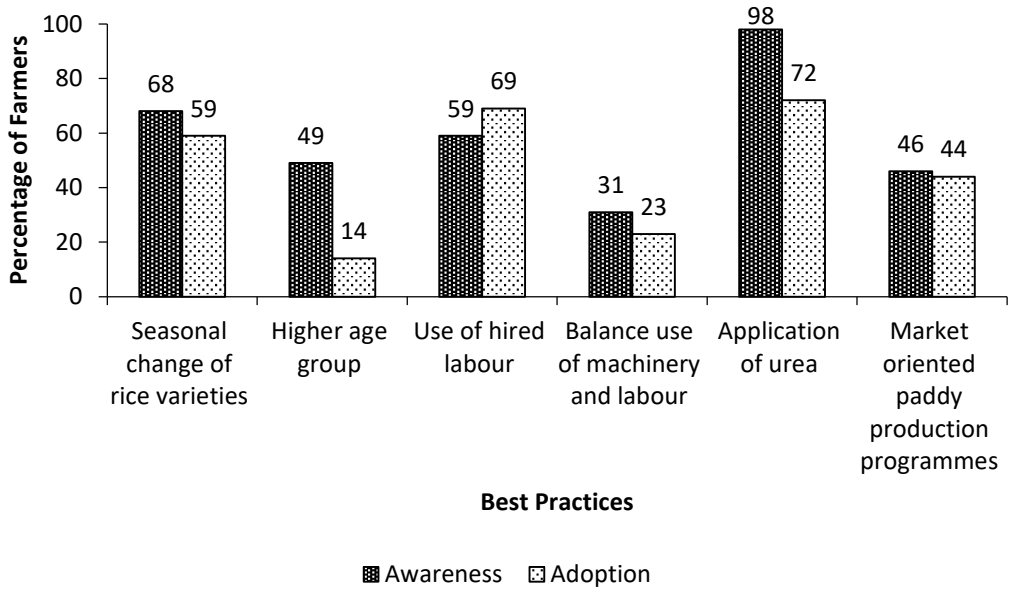
It is not an easy task for farmers to follow these practices. Difficulty in finding quality seed paddy, soaring prices, poor quality mixed seed paddy and unavailability of quality seeds which are tolerant to iron toxicity are the main concerns in the use of quality seed paddy. According to officials, the recent policy changes have caused scarce availability of pesticides and weedicides, subsequent price hikes and non- adherence to recommended guidelines for PandD management. Further, poor access to machinery, dilapidated access roads due to lack of renovation for a long time, submergence in bog soils and high cost of machinery are among other constraints.

It is said that the majority (94%) of the sample farmers apply fertilizer on time; however, delays in receiving the subsidy is a common occurrence, according to officials. Additionally, climatic variability and farmers' usual practice to use excessive amounts of fertilizers contribute to non-adoption of fertilizer recommendations.

Broadcasting is a common practice in LCWZ paddy cultivation. In addition, unpredictable rains wash away seeded fields requiring re-seeding. Birds and wildlife also pick up seeds. All these contribute to the fact that the seed rate will exceed the given rate.

Despite many advantages, *Yaya* cultivation is constrained due to a number of reasons. Timely unavailability of machinery, fertilizer and irrigation water are all constraining factors whereas the quantity of fertilizer is sometimes inadequate. The pandemic has constrained the holding seasonal (*Kanna*) meetings which decides the time of issuing irrigation water that ensure *Yaya* cultivation. Financial, personal and job related problems as well as less cooperation among farmers, cultivation of paddy varieties of

different age groups and difficulty with sourcing labour when required were the other causes of non-adoption.



Source: HARTI Survey Data, 2021

Figure 3.4: Distribution of Farmers by Awareness and Adoption of Scientific Knowledge – II

Figure 3.4 illustrates both less known and less adopted knowledge and technologies relating to LCWZ paddy cultivation. The issues with the urea application were; non availability of subsidized fertilizer at the right time and the poor quality due to presence of sand.

As revealed in Wijesinghe and Wijesinghe (2015) both the use of long varieties (varieties aged 4-4.5 months) and different seed varieties by seasons leads to enhanced technical efficiency of paddy production in LCWZ. Nevertheless, farmers have shown less interest towards both the practices due to many reasons; scarcity of new varieties, available stuff is mixed up, poor awareness of the said benefits, incompatible soil conditions, climate change effects in particular water scarcity, poor interest of farmers, lengthy life time and practical difficulties in adopting in *Yaya* cultivation system when other farmers are not interested.

Balanced use of machinery and labour is another aspect that enhances technical efficiency of paddy cultivation in LCWZ though the adoption was constrained due to high cost of labour, poor productivity of hired labours, need of supervision and difficulty in finding labourers.

Market-oriented paddy production programmes such as the production of organic rice, traditional rice and export-oriented rice production was not popular among many due to difficulty in achieving quality standards for several reasons; damages from heavy rains and diseases, lack of access to produce markets, adverse weather

conditions leading to less yield obtained due to lodging of plants and shattering of seeds, less yield and longtime taken by traditional varieties to get harvest, limited demand for traditional rice due to high cost, the prevailing fertilizer crisis, difficulty to source quality seed paddy of traditional varieties and poor awareness among farmers about the current market strategies because of lack of training programs.

Farmers lack the scientific knowledge that there is a reduced technical efficiency due to overuse of machinery and increased allocative efficiency with machinery usage and the need for balanced use of machinery and labour. The latter was not adopted due to the high cost of machinery in the absence of a price control mechanism and their incompatibility with swampy soils on one hand and due to shortage of labour, on the other hand.

3.6 Relationship between Socio-economic Factors and Adoption of Best Practices

The relationship between socio-economic factors and adoption of practices mentioned in Figure 3.2 were analyzed using the chi-square test and the results are presented in Table 3.3.

Table 3.3: Relationship between Socio-economic Characteristics and Adoption of Practices

Socio-economic factors	Seasonal change of rice varieties	Higher age group	Use of hired labour	Balanced use of machinery and labour	Application of urea	Market oriented paddy production programmes
Age	1.740	1.299	1.998	1.628	1.732	6.648**
Education	3.405	1.512	2.048	0.058	2.517	0.062*
Farming experience	3.135	1.632	1.826	0.913	0.058	0.978
Cultivation loans	0.330	0.766	0.362	0.493	3.388*	0.073
Labour	0.763	0.06	18.078**	1.492	0.094	4.730**
Land tenure	0.998	1.472	0.028	0.017	0.028	1.854

** Significant at 0.05% level

* Significant at 0.01% level

Source: HARTI Survey Data, 2021

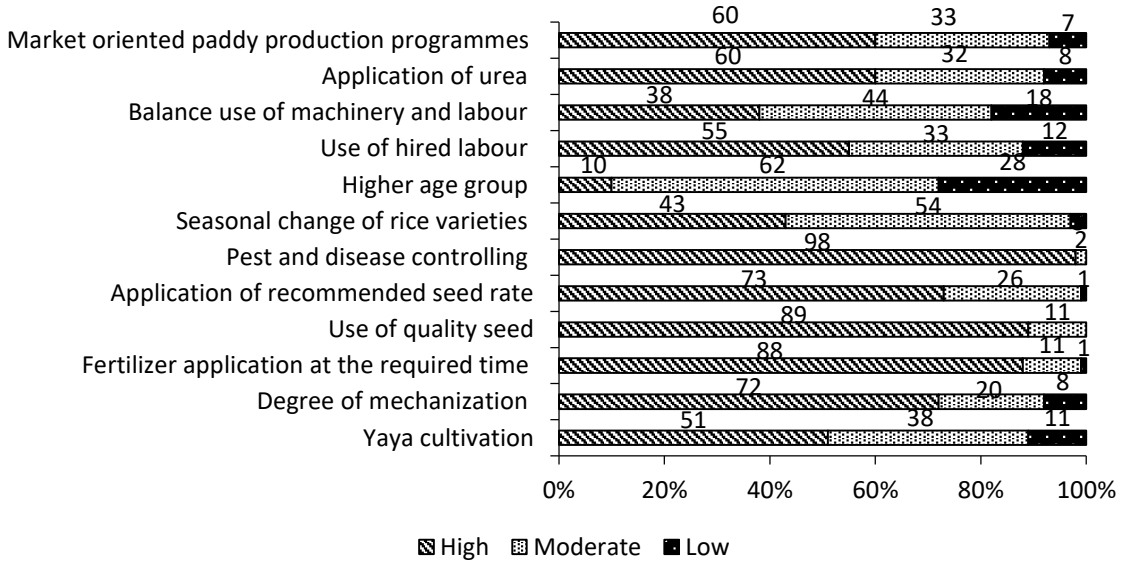
A significant relationship was found between age and the adoption of market-oriented paddy production programmes. In particular, the farmers in the 45 to 60 age category adopted organic farming and cultivated traditional rice varieties more than those who were above 60 years. This shows that farmers who are in the economically active period are willing to deviate from conventional farming to market oriented production.

The level of education is also significantly related to the adoption of market-oriented paddy production programmes. Interestingly, farmers who attained General Certificate of Education (Ordinary Level) have shown higher adoption. Use of hired labour and market-oriented paddy production programmes also related at 0.05 significance level, showing many who used hired labour preferred market-oriented initiatives. Cultivation loan was significantly related to the adoption of application of urea.

No significant relationships were found between above-said practices and land ownership i.e. free holding right or other tenure types and farming experience.

3.7 Effectiveness of Scientific Knowledge in Paddy Cultivation in LCWZ

Figure 3.5 illustrates the results of the analysis of the overall effectiveness of scientific knowledge generated to improve the efficiency, productivity and profitability of paddy cultivation in LCWZ was rated high, medium and low by farmers. Accordingly, pest and disease management is the most effective practice. Use of quality seed, fertilizer application at the correct time is also mentioned by the majority of farmers as effective. The use of high age group rice varieties is the least effective due to scarcity of quality seed paddy varieties.



Source: HARTI Survey Data, 2021

Figure 3.5: Distribution of Level of Effectiveness of Practices

3.8 Reasons for Abandoning Active Paddy Lands in LCWZ

Like any other crop production system, high technical efficiency, productivity and profitability are prerequisite for the sustainability of the paddy cultivation system in LCWZ. Otherwise, paddy lands are left uncultivated. There are many root causes why active paddy lands in LCWZ particularly become inefficient, unproductive and

unprofitable. In the study districts, key officials were interviewed from sample areas to understand the grounds for the abandonment of paddy lands and both common and specific issues were identified.

Common issues indicated were; labour scarcity, availability of high income earning profitable opportunities than farming, difficulty in using machinery in the paddy lands, blockage of water canals, swampy soil condition, land ownership issues, land owners residing away from the village, less priority given to paddy farming, poor drainage of paddy fields, seawater intrusion to the paddy lands, construction of roads and building especially for the expressway, wild-life damages, floods leading to water logging, lack of insurance covering adverse weather events leading to crop losses, dilapidated irrigation infrastructure including anicuts, poor maintenance of and difficulties encountered in the reconstruction of irrigation infrastructure, delay in the supply of state subsidized chemical fertilizer, paddy price fluctuations, weak access roads to paddy fields, dumping of waste into paddy lands and waterways.

There were a few district specific reasons too. Included were; severe extraction of clay from paddy lands for pottery in Gampaha, abandonment of certain paddy lands in Matara after the Nilwala project, iron toxicity in soils in Matara and Galle, less interest among youth in Matara towards paddy cultivation than marine fishing industry being lucrative.

The study confirms that both technological and non-technological reasons have caused abandoning of paddy lands in the LCWZ. Nevertheless, it is imperative that the available extent of active lands should be preserved without being abandoned. Given the fact that the most farmers currently involved in paddy farming are relatively older, the next chapter explores the possibility for attracting youth into paddy framing in this area.

CHAPTER FOUR

Youth Participation in Paddy Cultivation in Low Country Wet Zone

4.1 Introduction

At the present, the younger generation does not see a future for themselves in farming as the rural youth see many obstacles in their path to achieving a better livelihood in the agriculture sector. To be economically independent, youth require a package of goods and services; however, they often have no access to land, credit, and many other productive resources. Technological advancement becomes an indispensable demand of the agriculture sector though older farmers are less likely to adopt the new technologies than young farmers (Buhary *et al.*, 2021). These facts imply how important it is to re-engage youth in agriculture with an innovative approach. Yet, there is a gap of knowledge about the existing opportunities and barriers for youth who could play an important role in improving the efficiency, productivity, and profitability of active paddy lands available in LCWZ. Along these line, YFSs established by DoA to attract and retain youth in agriculture also have prospects for the same. This chapter discusses the current status of YFSs, opportunities and barriers for YFSs to attract youth into farming.

4.2 Status of YFSs

From the sampling framework of 81 YFSs in all five districts, the majority (92%) were registered from 2005 to 2015 (Table 4.1). Among them, only 29 (36%) YFSs were functioning while the rest were non-functioning at the time of survey and only 9 YFSs were functioning actively. All YFSs in Colombo were inactive, whereas the number of active societies in the rest of the districts was also low. The total number of members ranged between 20-25 in 12 (41%) YFSs. It was understood that the process of establishing the YFS was mostly carried out through an announcement in other community-based organizations and members were recruited from those who visited the first meeting. Members were also recruited randomly most of the time.

Table 4.1: Characteristics of Youth Farmer Societies by Districts

	Colombo (n=10)	Gampaha (n=12)	Kalutara (n=28)	Galle (n=21)	Matara (n=10)	Overall (n=81)
Year of Registration						
Before 2005	0	0	0	3	0	3
2005-2015	10	9	28	18	10	75
After 2015	0	3	0	0	0	3
Access to YFS						
Able to contact	2	5	10	7	5	29
Unable to contact	8	7	18	14	5	52
Functioning Status						
Active	0	1	4	2	2	9
Inactive	2	4	6	5	3	20
Total Membership						
>25	1	1	3	2	1	8
20-25	1	2	4	4	1	12
<20	0	2	3	1	3	9

Source: HARTI Survey Data, 2021

Case Study 1: Dynamic Programmes Keep Society Active

Weediya Bandara YFS in Kalutara was established in 2009. It has been an active society for more than a decade and currently there are around 35 members. The success of keeping the YFS dynamic attractive programmes that were conducted by the society. In addition to training programmes like food technology and mushroom cultivation, home gardening competition, quiz competitions and field visits to Kananwila and Ambepussa were carried out in recent years. These programmes provided the opportunity for members to actively engage in the society. Even though they are self-funding to cater their society's need, they also indicated that there were some weaknesses such as no provisions, lack of programmes guidelines and poor supervision by officials were some of the challenges, which obstructed better performance.

Judgment: The reason for the success of the society is conducting more interactive and attractive events for active participation of the membership.

4.3 Opportunities for YFSs

There is no argument that the concept is commendable to attract and retain youth in agriculture when youth migration from farming to other sectors is a very notable factor. However, when there is an organized way of gathering, it will be a platform for youth to gain knowledge and get trained in various skills. If youth are retained and

organized, they are the most active building blocks of the community, who could support agriculture programmes in the future as well. YFS is also a platform, which provides training opportunities for youth. The YFSs can be also used for such activities i.e. organic paddy cultivation in active paddy lands, re-cultivation of abandoned paddy lands and various extension work. Recent incidents demonstrated how spirited is the collective power of youth particularly when coupled with mass media and social media influences. Ideal examples are the trend or 'Ralla' evidence in the wall painting and re-cultivation of abandoned paddy lands by youth. Therefore, it is through the media that one keeps youth energy in agriculture.

Box 4.1 Interview Extract "Access to credit and access to land as a group"

"When youth are organized in societies such as the YFS, it generates various benefits and opportunities. They can achieve many things as a group such as access to land, access to credit, voice in the main platforms and influencing national policy framework. For instance, YFS can serve as a guarantor when a member needs credit, thus lowering the risk. Most of the youth do not have their own lands and as a group they can collectively lease land from land owners as there are plenty of active lands that could be abandoned if not cultivated. Therefore, there should be a mechanism in place to obtain such lands from the owners to YFSs by an agreement with the contract period. Then at the end of the agreement period both parties will benefit. There are many land owners, who are not dwelling in the village, and there are many who don't even want to grant their abandoned land for re-cultivation. There have been instances when abandoned lands are obtained for re-cultivation, there are threats from other land owners. The problem is there is no legal procedure to obtain such lands for re-cultivation. Therefore, laws and regulations should be drafted to grant youth i.e. YFS access to land in a systematic way."

KII, Galle (09.07.2021)

4.3.1 Activities Carried out by YFS

A variety of activities have been so far undertaken by the YFSs in the region. Broadly categorized, they were training, awareness and other events such as; re-cultivation of abandoned paddy lands, *Shramadhana* campaigns, alms giving, home gardening competitions, distribution of seedlings, radio quiz programmes, *Bodhi Pooja*, agri fairs, stalls for agri-products, narcotic prevention awareness programmes, training programmes, repairing two-wheel tractors, bee keeping, mechanical transplanting, compost production, nursery management, anthurium cultivation, and organic paddy farming.

The list of activities conducted shows that most of the programmes were traditional and outdated. Therefore, the priority should be given to demand driven activities for the success of the YFSs.

4.3.2 Training Needs of YFSs

Among the training needs identified by the active members in the YFSs were; Value addition of fruits and vegetables, Value addition of rice, Entrepreneurship training, Mushroom cultivation, Digital marketing, Compost Production, Food processing technologies. The needs identified affirms that the training offered does not suit youth expectations.

4.4 Drawbacks of YFSs

YFSs in all study locations face many issues, which hinder the smooth functioning of the organization. Those barriers are discussed below with case studies and interview extracts.

Inactive in Nature
There are no structured programmes; rather ad-hoc events that are directed from DoA to YFSs from time to time. That is the main reason the majority of societies were idling without proper guidance.

Poor Retention of Membership
A high dropout rate of youth from YFSs was evident from all the districts as most of the young people quit the YFS when they migrate to urban areas for jobs or higher education opportunities. Members also move to other organizations in the village, when they see those societies offer more benefits than YFSs (Case study 2).

Case Study 2: Youth Mobilities and Migration for Occupation

Colombo, Samagi YFS was established in 2005 and active until 2018. Initially, youth below 30 years were granted membership; however, at present almost everyone in that age category has found employment and moved away from the area. With their departure the next generation did not take over the organization. After 13 years of existence, the Samagi YFS is now dormant. The total membership even reached 50 when it was functioning well. Training programmes such as seed paddy production, clearing bunds, home gardening and floriculture were conducted through the organization. Also, they had the opportunity to participate in training programme conducted in Gannoruwa as well.

Judgment: Youth mobility and migration for occupation is likely, therefore giving membership to the next generation in advance and keeping them active is important for the sustainability of the society.

Availability of Other Opportunities
According to KIIs, establishing and sustaining YFSs is not realistic in urban areas due to the availability of other opportunities and income-generating sources for the youth. It is common to see that many young school leavers with a lower level of school

education either become gig workers or three-wheel drivers seeking quick profit. Garments are also their next alternative to farming.

Negative Perception and Attitude

Youth believe that farming is an unprofitable venture. It is one of the reasons youth depart from farming resulting in poor interest of youth to engage in the YFSs. This is reflected from the reluctance of the next generation not taking over the organizational responsibilities once the existing membership gets older. Therefore, attitudinal change is required to make them aware of the benefits of farming (Box 4.2).

Box 4.2 Interview Extract "Don't blame the youth, try to change the perception"

"I have been engaged in farming for 20 years, after my retirement from the job. We cannot blame youth for not being involved in farming as they may have several other better options nowadays. I think the main reason for youth's unwillingness for farming is urbanization. As parents we are the example for our children and we guide them on what to choose as a vocation. In addition, television, social media and advertisements portray agriculture related to poverty, poor farmers, rural livelihood and highlight numerous problems in the sector, therefore why do youth want to take a risk. This results in negative perceptions about farming among the youth. We cannot blame them. There are many other reasons also why many youths do not desire farming. Therefore, positive perception should be developed among youth through mass and social media by visualizing success stories of farming. Practical training should be provided and field visits to agriculture industries should be arranged for members in YFSs to show how lucrative the sector is."

Farmer Survey, Galle (08.07.2021)

Poor Gathering

Gathering youth for activities is very difficult as their priorities are mostly poles apart. In recent times, people are reluctant to work together as a team due to the Covid-19 pandemic and the socio-economic situation in the country is also a barrier to the sound functioning of YFSs.

Implementation Problems

When YFS is directed to re-cultivation of abandoned paddy land, youth gather in their full capacity. However, once it is completed, attendance to meetings by youth reduces to a great extent as many believe that YFSs only exist for the cultivation of paddy lands.

Lack of Benefits

Members in the organizations expect tangible benefits in a shorter time. Also, lack of funds, provisions, programmes and in-kind support through YFSs were identified as issues existing at almost all YFS to retain youth in their organization. Therefore, resources and financial support by the DoA is necessary for organizational activities.

At least providing youth with an YFS t-shirt will give them some confidence and identity of YFS.

Poor Coordination, Dedication and Commitments of Officials

At present, AI is the one who handles the matters related to YFSs, but their motivation is minimal. There are diploma holders and graduates among the AIs and whenever they find better opportunities, they are ready to move on, so that the dedication towards work is also minimal (Case study 3).

Case Study 3: Poor Commitment of Officials

Dilenatharu YFS in Gampaha was established in 2016, but it was short-lived only for a maximum of 2 years. Initial membership was five, but at the latter stage it increased to 25. Many members were from poor backgrounds. They engaged in floriculture, mushroom cultivation and plant nursery. They were disappointed as they did not receive any in-kind or cash assistance. There is no provision and official support extended to the society to date. Also, members' engagement in the organizational activities were poor, at the same time extension support also limited as the officer, who was responsible for the YFS in the area, was transferred. It was the main reason for the failure of the society to function. Further, it was difficult to gather members, as from time to time they left the village for job opportunities and an additional determent was the Covid-19 pandemic. Training programmes such as compost preparation and planting and growing bonsai were conducted by the organization. They are willing to make it function again, with the proper guidance from officials.

Judgment: Commitment of officers determines the success of the YFSs. Coordination failure between youth and the official will result in disappointments and lead to failure in keeping the society active. Therefore, officers should be appreciated and motivated to expect their obligation towards the success of the YFS.

Poor Recognition of Officials

The tasks done by officials were poorly appreciated by the top management and not recognizing their duty was a disappointment to officers (Box 4.2).

Box 4.2 Interview Extract "Celebrate the successes and appreciate the officers"

"Organizing a youth group particularly related to farming is not an easy task. Even though it is established, it is still a struggle between youth and officers to keep them active. The one lament is that "no one appreciates the tasks we accomplish and no one recognizes". Therefore, celebrating small successes of YFSs along the way is very important. Officers like us also should be given proper credit for what we have done on behalf of the YFS. It will keep the spirit of the members of the organization as well as the motivation of officers. This will ultimately lead to successful and sustainable YFS from both ends."

KII, Matara (06.07.2021)

Lack of Business Support for Youth

Engaging in the business is the priority of the youth though there does not exist a business enabling environment (Case study 4).

Case Study 4: Need YFS as a Resource Hub

Mahasen YFS in Kalutara was started in 2008 and registered in 2009. It was active until 2012 with 18 members. Re-cultivation of abandoned paddy lands and home gardening were carried out by the society. In the meantime, members were directed to various training programmes such as Anthurium cultivation, budding grafting technique, bee keeping, nursery management as well as fruit and vegetable cultivation. There were many issues faced by the YFS including youth leaving the society for jobs and education, there is no enabling environment such as land, credit, technology for youth to start the business even if they are trained. No financial and physical provision granted by the government for youth to start self-employment were some of the main issues.

Judgment: Issue for many rural youth is lack of access to land, financial services and other resources. Therefore, making facilities, providing resources to the YFS as a resource hub will enable the youth to become entrepreneurs.

CHAPTER FIVE

Organic Paddy Cultivation in Low Country Wet Zone

5.1 Introduction

The steady and growing demand for organic food is becoming more evident in recent years. Environmental degradation and prevalence of non-communicable diseases predominates among the reasons which question the chemical-based farming system. Along this line, the Corona virus pandemic is the latest addition to boost the demand for organic products. It has led people to realize the importance of food quality and it is spontaneously raising public awareness on consuming healthy foods to either improve immunity or prevent disease conditions. Organic food is always considered healthier and safer because of the toxic free nature of cultivation with lack of the use of agrochemicals including chemical fertilizers and pesticides. Those best practices prevent soil and water contamination by toxic chemicals, especially in crop production. This chapter highlights the opportunities and barriers for organic paddy cultivation in LCWZ.

5.2 Opportunities for Organic Paddy Cultivation in LCWZ

It has become a great opportunity that to promote organic paddy cultivation as rice is the staple food and consumed by the nation in large quantities. Although the price of organic rice remains higher, urban consumers are still willing to pay more for a healthier alternative as price premium is not an issue for healthy choices compared to the health crisis. In addition to the health concern, the sustainability of agro-ecosystem is well protected through organic rice cultivation and if farmers' choice of cultivation is considered, it will lead to higher income with premium prices. Even though the conventional paddy cultivation predominates in the LCWZ, there is a promising trend towards adopting organic farming due to higher prices prevailing for rice of traditional varieties grown without chemical inputs.

Case Study 5: Youth Aspirations towards Organic Paddy Cultivation

In Galle YFS called Dilena Tharu was established in 2008, but it is not an active society at present. However, there is a separate YFS named as Ruhunu, which was started in 2019 with 50 members including the members from previous YFS and at present there around 30 active members. It is not registered under DoA, but the organization seize the opportunities from all sources including government, private and NGOs when they are available. Specifically, activities such as training on organic fertilizer production and turmeric cultivation were carried out by YFS recently. Also as a youth and organic initiative, they have cultivated organic rice in a paddy land offered by a well-wisher as no youth members have owned paddy lands. It was a successful effort cultivating organic paddy with the help of youth in the village (Figure 5.1). As YFS also already enrolled with other community development centres in the village, by and large they are funded by NGOs to perform the activities. This YFS is a role model for youth and to attract youth into farming.

Judgment: When YFS has various linkages and access to resources such as land and finance, it can attract youth and retain them in the society and magnetize them for organic paddy cultivation as well. Therefore, the youth group approach is an excellent example to promote organic farming as well.

Source: HARTI Survey Data, 2021

Figure 5.1: Successful Organic Cultivation by a Youth Farmer Society in Galle

5.3 Barriers for Organic Paddy Cultivation in LCWZ

Even though organic paddy farming appears to be a promising strategy to be promoted in the active paddy lands in LCWZ, there are diverse opinions that discourage extensive adoption by the farmers.

Farmers are of the opinion that, the production of organic fertilizer themselves is difficult due to scarcity of raw material, time-consuming process, inadequate space, financial restrictions, Lack of suitable machinery to prepare a large amount of organic fertilizer, high cost and shortage of animal dung and health issues such as risk of rat fever. Also it is unrealistic to produce a large quantity of organic fertilizers at the expense of extra effort and money. They are also of the understanding that the plants require much longer time to absorb the nutrition from organic fertilizers meanwhile those nutrients could be washed away in the case of heavy rains and from run-off water.

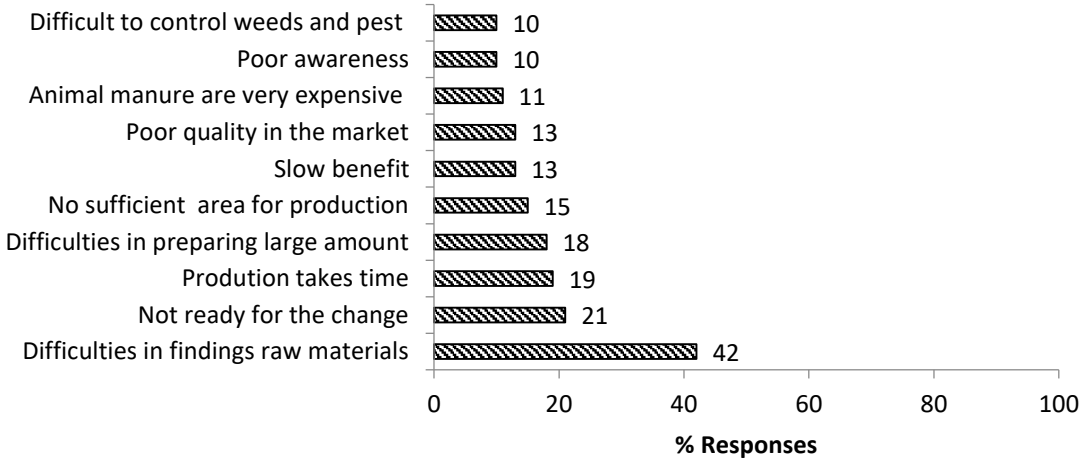
There is inadequate awareness among farmers regarding production, usage in terms of the rates and the time of application coupled with poor access to information and lack of awareness creation opportunities. Overall it is said to be difficult to change the negative attitudes of the people towards organic farming.

The poor quality organic fertilizers available in the markets which sometimes they contain glass and polythene pieces are said to be some of the reasons which deter farmers from converting to organic cultivation. It was also observable that the farmers are not ready for the swift and drastic conversion from inorganic to organic.

In particular, the scarcity of labour experienced in the LCWZ is a key constraint for organic farming which requires more labour than conventional farming. Transportation of large quantities also poses an additional burden.

Government's lack of vision on managing the fertilizer crisis and delay in providing organic fertilizer in required quantities have created negative perception among the farmers. More importantly, the farmers perceive that organic fertilization leads to decline in yield owing to a number of reasons. Whilst the small particles in organic fertilizer are blown away by the wind, there is no suitable marketplace to buy good quality organic fertilizers. Nutrients are not in recommended standards and the farmers do not know the available quantities of nutrients in the organic fertilizer they purchased. Moreover, the organic fertilizers are not suitable for all the soil conditions and weed and pest control become difficult. Limited possibility for using in bog/swampy soils is common in LCWZ.

Out of the barriers stated by farmers, ten major problems are illustrated in Figure 5.1, where the key problem is difficulties in finding raw material. Most of the farmers are not yet ready to convert to organic farming. Farmers are used to inorganic methods for which inputs are readily available in the market and give quicker results. Therefore, they see conversion to organic farming as a burden in many terms.



Source: HARTI Survey Data, 2021

Figure 5.2: Major Issues Challenging Organic Paddy Cultivation

5.4 Farmers' Choice between Organic and Conventional Paddy Farming

Darnhofer *et al.* (2005) decision-tree approach was used to identify the five types of farmers based on their insights into the values and beliefs underlying farmers' choices between organic and conventional farm management. The five types of farmers are committed conventional, pragmatic conventional, environment-conscious but not organic, pragmatic organic and committed organic.

Table 5.1: Distribution of Agreed Criteria for Decision Tree

Criteria	Agreed %
Organic farming is more environmentally friendly than conventional farming	97
Organic rice is healthier	100
Cultivation can be successful without chemical inputs	41
As farming is environmentally friendly, willing to forgo some of income	25
Paddy is an important source of income	24
Ability to cover labour needs for organic farming with the family or hired labour	52
The supply of organic manure is a problem	51
The organic regulations are too restrictive	23
Organic farming fulfill the search for a more challenging approach to farming	50

Source: HARTI Survey Data, 2021

Out of the total sample, 83 percent of farmers were not ready for the conversion from conventional to organic due to barriers in organic farming. ''Committed conventional'' is the farmer category who believes that organic farming is more environmentally friendly than conventional production methods and the healthiness of organic food however, they do not perceive that organic production is economically and technically

practicable (Table 5.3). The rest 41 percent is interestingly, the potential converters to organic farming as illustrated in Table 5.4. Therefore, the government decision towards organic conversion cannot be underestimated and hence appropriate action should .be put in place.

Table 5.2: Distribution of Farmer Types based on Choice between Organic and Conventional

Farmer Type	Number and %
Committed conventional	59
Pragmatic conventional	11
Environment-conscious but not organic	13
Pragmatic organic	13
Committed organic	4
Total	**100**

Source: HARTI Survey Data, 2021

CHAPTER SIX

Conclusions and Recommendations

6.1 Introduction

Finding strategies to prevent the abandonment of active paddy lands in LCWZ is important in many ways. To this end, the policy priorities of the Ministry of Agriculture are to adopt marketing strategies such as promoting organic paddy cultivation for niche markets, utilizing scientific knowledge to enhance the technical efficiency, productivity and profitability of paddy cultivation, and encouraging youth participation. Therefore, the main focus of this study was to examine the practicability of implementing those strategies and this chapter summarizes the findings of the study while deriving conclusions and recommendations.

6.2 Conclusions

Despite several studies that reveal the reasons behind the abandonment of paddy lands, this study further confirms that the problem persists for the same reasons. Low productivity and low profitability of paddy cultivation are the immediate reasons for abandoning of paddy fields by the farmers. From the systematic analytical view point, paddy cultivation in LCWZ is technically less efficient, though it is somewhat far from the understanding of the ordinary people. All these immediate causes are due to various root causes that make it impossible for farmers to cultivate paddy.

Whatever the immediate reasons for abandonment of paddy lands, it is worth noting that LCWZ has generated sufficient scientific knowledge to address issues related to technical efficiency, productivity and profitability of paddy cultivation in the region.

Nevertheless, knowledge generation alone is insufficient to address those issues and therefore socialization of scientific knowledge is equally important. The study affirms that the level of knowledge of officials about the best practices in paddy cultivation is not that satisfactory whilst they have had no access to information on certain best practices. Of the 12 best practices that considered for this assessment, they were aware of several common best practices such as *Yaya* cultivation, high efficiency with the use of hired labour, degree of mechanization, fertilizer application at the required time, application of urea, use of the quality seed, application of recommended rate of seeds, pest and disease management and market-oriented paddy production programmes. Seasonal change of rice varieties, use of long paddy varieties, and the balanced use of machinery and labour were unpopular among them. It is therefore evident that there exist inefficiencies in the knowledge dissemination process of research findings and recommendations to extension agents from the point of generation.

Extension officials conduct training programs and seasonal meetings (*Kanna Rasweem*) and visit individual farms and do word-of-mouth dissemination of new knowledge among the farming community. It is important to note that in a time when fast and effective communication methods are widely used, all the methods used are traditional slow communication methods having poor coverage. This implies that the process of transmitting knowledge and technology to the farming community must be innovative and fast-paced.

Nevertheless, farmers are well aware of and follow the best practices such as *Yaya* cultivation, mechanization, timely application of fertilizers, use of quality seeds, recommended seed rate and pest and disease management. All these practices can be categorized under technical research knowledge and farmers tend to eagerly adopt them seeking for higher yield.

What are lesser known and/or less adopted are the best practices that have been derived from socio-economic research. Another important point is that the basic source of information for knowledge is the own experience of farmers. Therefore, educating the farming community, especially socializing socio-economic research knowledge to bridge the knowledge gap is essential and expeditious.

The level of awareness and adoption of rest of the practices were comparatively low as certain practices are beyond the control of the farmers, for instance, application of urea at recommended quantities at the correct time due to issues relating to distribution of fertilizer subsidy and poor quality of fertilizers sometimes due to being mixed with sand.

Unfortunately, certain farmers and the officials are unaware of the high technical efficiency associated with long paddy varieties. In the midst of the climate change facing farmers today, it is a challenge to keep crops such as long-lived paddy varieties in the field for long periods of time. Also, swampy soil conditions are not suitable for the cultivation of such varieties. If different varieties are cultivated by different farmers in the same *Yaya*, they are inconsistent with the fundamentals of the *Yaya* cultivation system. Farmers also face difficulties in finding long varieties of paddy. They are also incompatible with mechanized harvesting. Therefore, it is difficult to apply some of the recommendations made in the research findings at the field level. Such practices should be socialized through targeted programmes.

Despite the socio-cultural significance of traditional labor relations such as family and *Attam* labor use, labor use efficiency is not high. Compared to traditional labor relations, technical efficiency can be increased with hired labor (Wijesinghe and Wijesinghe, 2015). Knowing these efficiencies, many farmers adopt them. The limiting factors are the high cost, the apparent inefficiency that farmers have to monitor, and the shortage of hired labor.

Farmers have little understanding of some of the best practices, otherwise there is a question of their inefficiency. Increased technical efficiency with increased use of

machinery and increased separation efficiency with the use of machinery and the need to balance the use of machinery and labor; Market-oriented paddy production programs such as organic rice production, traditional rice production and export-oriented rice production are such best practices. This situation again highlights the problem of non-popularization of research findings and the importance of popularizing them in a formal manner as the predominant source of information for the knowledge for the farmers was unconfirmed sources.

It is reasonable for farmers to abandon paddy cultivation in a situation where they do not know the options to increase the productivity and profitability of paddy cultivation. In such a situation it cannot be expected that the youth will engage in farming. This may be the reason why young farmers' organizations are not a reality at the grassroots level. This study reveals that 89 percent of them are inactive. There are other reasons for this. The active YFSs have conducted more interactive and attractive activities which have helped to retain the membership. Although young farmers' organizations have been suggested as an alternative to bringing back young people to agriculture (Damayanthi and Rambodagedara, 2013), the reality is that it is often limited to a concept owing to poor retention of membership, poor interest of youth, negative perception and attitude, poor gathering, implementation problems, lack of benefits, poor coordination, poor dedication and commitments of officials, lack of appreciation for officials involved in, lack of business support for youth, youth mobility and migration for occupation and education.

Therefore, traditional farming may not be the answer for attracting youth into farming, but what is required is involving them in modern agriculture and agribusinesses. Practical and structural solutions are more crucial to overcome the challenges faced by youth trying to engage in farming and earn a living in rural areas. A supportive environment that enables the youth to find ground-breaking ways to create a future for themselves, and also contribute to the other young generation in rural areas is necessary. In this view, attempting to attract youth in agriculture through a group approach over individual effort can offer tremendous benefits and opportunities to rural youth and the community at large. Therefore, strengthening of YFSs by overcoming the weaknesses associated with the current setup is crucial.

Another option suggested towards sustaining the paddy cultivation in LCWZ is to promote market oriented programmes such as organic paddy production. Studies reveal the basis for this suggestion is the great demand for organic rice prevalent in the region as there is a preference for non-toxic rice, ability to achieve same yields as conventional farmers and organically produced traditional rice fetches higher selling price than conventionally produced rice (Rambukwella and Priyankara, 2016; Rodrigo, 2015).

This assessment categorized farmers into five types based on their insights into the values and beliefs underlying farmers’ choices between organic and conventional farm management. The decision tree yielded 59 percent of committed conventional,

11 percent of pragmatic conventional, 4 percent of committed organic and each 13 percent of environment-conscious but not organic as well as pragmatic organic farmers. The results suggest that, even though many believe that organic farming is more environmentally friendly than conventional production methods and the health benefits of organic food, they do not perceive that organic production is economically and technically practicable. Results also revealed that the majority of farmers (83%) were not ready for the conversion from conventional to organic due to barriers in organic farming.

According to farmers, the major problem encountered in organic farming is in finding raw material (42%). Yet among other issues are reluctance to change (21%), time consuming process of organic fertilizer production and the large scale production is not an easy task. Overall the availability and the accessibility to quality organic matters is the main issue in the adoption of organic paddy farming.

6.3 Recommendations

The following recommendations are made to bridge the knowledge gap of farmers that leads to abandonment of active paddy lands.

i. A mechanism should be established to ensure that the farmers are freely accessible to scientific knowledge gathered in a repository which collects and updates the site with new research findings and recommendations physically and/or virtually on a seasonal basis. Both the Department of Agriculture and Sri Lanka Council for Agricultural Research Policy (SLCARP) could play a significant role in this regard. To a large extent, the department takes steps to incorporate the best practices derived from technical research. However, the findings of socio-economic research seem to have been overlooked in this process. Although SLCARP is actively involved in streamlining the research process in the agricultural sector, the effectiveness of disseminating new knowledge gained through such research is questionable. Therefore, taking another step, SLCARP should explore the possibility of creating a platform for researchers and extension personnel to work together to incorporate research findings, especially socio-economics, into the expansion program.

ii. The in-service training programmes that educate extension officials of the Department of Agriculture should be subject to drastic changes by using innovative methods (electronic media, ICT tools, relevant local official agriculture websites and mobile applications) to ensure rapid dissemination of knowledge and that they are regularly updated (biannually/annually) with new knowledge and be constantly monitored to ensure that new knowledge has been passed to farmer level.

iii. Strengthening of farmers' organizations as most of the time that's the focal point where information is rapidly disseminated to the farmers.

The following recommendations are made to enhance youth involvement in agriculture in general and specially in paddy farming as an alternative to prevent the further abandoning of active paddy lands.

i. In an organization, membership matters for success and sustainability. Even youth-based organizations cannot have a random number of youth to make it a success. Therefore, establishing YFSs with the collaboration of the Ministry of Education to recruit students from schools is also one way of solving the membership issue. Further, targeted programmes should be implemented to maintain the retention rate of members. More interactive sessions and field visits will keep the spirit of the society. Whilst need assessment should be performed before setting the activities to be conducted via the YFSs, the objectives of YFSs should also be re-aligned to present agriculture related needs and opportunities. Orientation programmes should be conducted for new members to educate them on the values and opportunities of YFSs.

ii. Regrettably, no one knows the existence of YFSs and their success stories. The promotion campaigns and media interventions and sponsorship and social media platforms would lead towards changing youth perception and attitude which could attract the attention of youth towards agriculture. Conducting pilot projects with YFSs as demonstration sites for best practices appears to be a promising alternative. YFS also can be introduced with various activities such as training on organic farming-related skills, field visits to organic farms and engaging with an organic farm family.

iii. YFSs should be used as a resource hub for many of the programmes of the Ministry of Agriculture by providing access to credit and land which are among the constraints for youth participation in agriculture. Facilitating youth's access to credit through YFS is supposed to be a less risky option for youth and it will assist them to develop as entrepreneurs and thrive in rural areas. Further, the government can encourage abandoned paddy landowners to lease their lands to YFSs subject to an agreement to encourage young farmers themselves to invest their labour in paddy cultivation.

iv. It is said that officials responsible for YFSs are overloaded with other official commitments. Therefore, issuing a circular by the Department of Agriculture for assigning specific tasks for responsible officers related to duties of YFSs to ensure better involvement by the responsible officials in YFS related duties.

The study makes the following recommendations to promote organic paddy production as an alternative to prevent abandoning of active paddy lands in LCWZ.

i. Practicing organic farming is not an easy task due to the challenges in the industry. Nevertheless, the expected change is not without a group of potential translators to look forward to and therefore the challenges identified in this study should be addressed beforehand for extensive practice. These include; sensitization and awareness creation campaigns to correct the wrong perception about organic

farming through mass media and social media by presenting success stories; ensuring access to raw materials for organic fertilizer production, ensuring the quality standard of available organic fertilizer in the market, and price regulation.

Amongst the other alternatives for intensification of active paddy lands in LCWZ are;

i. Addressing the irrigation related issues in paddy cultivation by the Department of Agrarian Development including reconstruction of anicuts, canals, gates and side bunds of irrigation canals, constructing and repairing of agricultural roads.

ii. GPS related real-time information on the status of cultivation in LCWZ paddy will be useful in tracing the uncultivated lands and directing them for cultivation.

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APPENDICES

Appendix 1.1: Extent and Number of Active Paddy Lands with Percentage in 2015/16 Maha Season

District	Extent of Active Paddy Lands (ac)	Total Paddy Lands (ac)	% of Active Paddy Lands	District	Number of Active Plots	Total Number of Paddy Plots	% of Active Paddy Land Plots
Sri Lanka	1802056	1965563	91.68	Sri Lanka	1640500	1827003	89.79
LCWZ	30352	246656	68.46	LCWZ	36765		70.80
Colombo	11664	19024	61.31	Colombo	18993	30452	62.37
Kalutara	34759	53599	64.85	Kegalle	40710	59356	68.59
Galle	31749	48054	66.07	Rathnapura	40297	58008	69.47
Kegalle	18850	27786	67.84	Kandy	49053	69922	70.15
Kandy	33031	48591	67.98	Galle	47464	67326	70.50
Rathnapura	32481	45681	71.10	Kalutara	47235	66444	71.09
Matara	41764	56146	74.38	Matara	69125	95397	72.46
Gampaha	31826	42047	75.69	Mullativu	14702	19910	73.84
Jaffna	23239	29735	78.15	Gampaha	60584	78082	77.59
Vavuniya	46683	54006	86.44	Vavuniya	19717	23130	85.24
Mullativu	37663	43278	87.03	Killinochchi	19562	22137	88.37
Puttalam	55385	62200	89.04	Puttalam	48295	52215	92.49
Mannar	48201	54056	89.17	Nuwaraeliya	31066	33437	92.91
Killinochchi	69180	74769	92.52	Matale	68467	71417	95.87
Nuwaraeliya	17111	18390	93.05	Trincomalee	48144	50065	96.16
Trincomalee	88355	92512	95.51	Mannar	23130	23719	97.52
Badulla	61972	63773	97.18	Batticaloa	52297	53556	97.65
Battcaloa	178033	182974	97.30	Kurunegala	333573	340771	97.89
Matale	53582	54759	97.85	Badulla	89100	90442	98.52
Hambanthota	63910	65252	97.94	Hambanthota	47998	48468	99.03
Kurunegala	204800	208905	98.03	Ampara	76682	77160	99.38
Ampara	180892	181925	99.43	Jaffna	52946	53181	99.56
Anuradhapura	248193	249185	99.60	Anuradhapura	234477	235436	99.59
Moneragala	96885	97068	99.81	Moneragala	68943	69032	99.87
Polonnaruwa	91848	91848	100.00	Polonnaruwa	37940	37940	100.00

Source: DAD (2020-http://www.agrariandept.gov.lk)

Appendix 3.1: Relationship between Socio-economic Characteristics and Adoption of Practices

	Seasonal change of rice varieties	Higher age group	Use of hired labour	Balance use of machinery and labour	Application of urea	Market oriented paddy production programmes
Age	1.74	1.299	1.998	1.628	1.732	6.648**
Education	3.405	1.512	2.048	0.058	2.517	0.062*
Farming experience	3.135	1.632	1.826	0.913	0.058	0.978
Cultivation loans	0.33	0.766	0.362	0.493	3.388*	0.073
Labour	0.763	0.06	18.078**	1.492	0.094	4.730**
Land ownership	0.998	1.472	0.028	0.017	0.028	1.854

Source: HARTI Survey Data, 2021