

Production and Marketing of Traditional Rice Varieties in Selected Districts in Sri Lanka: Present Status and Future Prospects

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FOREWORD

The 'green revolution' of the early 1960s, supported by agricultural policies such as fertilizer subsidies, placed Sri Lanka on the fast track to become a production economy. With subsidized fertilizer and the establishment of irrigation schemes, farmers were given the motivation to be more production oriented. Following 1950, over six dozen new rice varieties were released to the Sri Lankan rice market, and thereafter, the country lost many of the traditional varieties. With the current trend and global awareness on the benefits of consuming organic foods and the dangers of using chemical fertilizer and pesticides, traditional rice is gradually making a comeback. Hence, the government has identified the importance of expanding the traditional rice production in the country with the increasing demand at the moment. Therefore, it is a timely requirement to conduct a study on the present situation, constraints and future prospects of the traditional rice sector in Sri Lanka. For this purpose, this study was conducted using 300 farmers in Anuradhapura, Colombo, Kurunegala, Kegalle and Galle districts and 100 consumers in Colombo district.

According to the survey, there is a good demand and good trend of consuming traditional rice varieties and mostly the consumers suffering from non-communicable diseases tend to consume traditional rice. The literature and the study also revealed that traditional rice farming is still economically viable and farmers receive a higher net return for a kilo of traditional rice than that of other rice varieties. Since we cannot meet the total rice requirement only with traditional rice varieties, high yielding rice varieties and traditional rice varieties together can fulfill the requirement.

I congratulate the team of researchers for successfully undertaking this study and hope the findings and suggestions of the study are useful to policymakers and the key players of the traditional rice sector to improve and develop the sector.

Haputhanthri Dharmasena
Director

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EXECUTIVE SUMMARY

Sri Lanka cultivated more than 1000 traditional rice varieties in early 1960s. However, with the increase of population, the “H” series of rice varieties were introduced in the 1950s and with the move, the country lost many of the traditional varieties. The main objective of this research is to study the present situation, constraints and future prospects of promoting the traditional rice sector in Sri Lanka. The specific objectives are, to understand the present status of traditional paddy cultivation and constraints faced by the growers, to identify the available marketing channels of traditional rice varieties and the potentials and constraints associated with promoting their marketing and to identify the consumer preference and the buying behavior towards traditional rice varieties. The study was conducted in five districts: Colombo, Kurunegala, Kegalle, Anuradhapura and Galle for surveying 300 of farmers and in Colombo district a survey was conducted on 100 consumers.

According to the our research, there is a good demand and a trend of consuming traditional rice varieties and consumers suffering from Non- Communicable Diseases tend to consume traditional rice mostly. The literature and our study also revealed that the traditional rice farming is still economically viable and farmers receive higher net returns for a kilo of traditional rice than the other rice varieties. Though certain ministries, non-government organizations, farmer organizations, companies and individuals interested in traditional rice cultivation are actively participating in promoting traditional rice cultivation in Sri Lanka, non-integration of their efforts is a main hindrance to develop this sector. Traditional paddy farming emerged around five years ago and 81% of the farmers have turned to traditional paddy cultivation during the last five years. Suwandel (49%), Kuruluthuda (29%), Pachchaperumal (27%) and Kahawanu (18%) were most popular varieties among the sample farmers as well as consumers. Poor organization in extension service was observed and nearly 30% of the sample had not received significant knowledge about cultivation practices. Poor extension (24%), low yield (15%) and scarcity of genuine seeds (11%) were the three major problems faced by the traditional paddy farmers.

This study recommends that Sri Lankans’ rice requirement can be met with the contribution of both high yielding and traditional rice varieties. Achieving this target, promotion of traditional paddy cultivation in abandoned paddy lands especially in the Western Province and paddy lands in minor irrigation and rain-fed areas where average yield is largely similar to the yield of traditional paddy, is also recommended. Extension service should be strengthened through the partnership of public and social organizations. A mechanism to identify genuine traditional seeds is very important and integration of various organizations and institutes related to traditional rice is also vital. More research on nutritional and medicinal value of the traditional rice varieties should be promoted. Proper rules and regulations should be imposed track the malpractices and the corruption in the traditional rice marketing process.

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ABBREVIATIONS

CBA	-	Community Based Adaptation
CKD	-	Chronic Kidney Diseases
DS	-	District Secretariat
EFL	-	Excluding Family Labour
IFL	-	Including Family Labour
MTSF	-	Movement for Traditional Seeds and Farmer's Heritage
NGO	-	Non Governmental Organizations
NVQ	-	National Vocational Qualification
TC	-	Total Cost
VTA	-	Vocational Training Authority

CHAPTER ONE

Introduction

1.1 Introduction

Traditional rice varieties have been conserved, developed and used by Sri Lankan farmers for over 3000 years. The varieties of rice passed down from preceding generations are known as 'traditional', 'indigenous' or 'inheritance' rice varieties of Sri Lanka. Once, renowned as the Granary of the East, Sri Lanka cultivates more than 1000 traditional rice varieties. These traditional paddy varieties have strong characteristics that help them survive climate change impacts such as droughts, heavy rains, and floods, compared to newer varieties used in chemical intensive paddy cultivation. This vigor is based on certain characteristics unique to traditional paddy varieties. Even though these new improved paddy varieties were short in terms of age and high yielding, they depend on chemical fertilizer and are labour intensive, thus pose a negative externality to the environment (Wiggins and Brooks, 2010). Traditional agriculture practices coupled with endogenous paddy varieties have proven to be more successful in facing climate change events such as droughts and floods, through continuous rigorous research. In light of this, a discussion was initiated on whether paddy cultivation should focus more on a traditional avenue, as opposed to one that is chemical intensive (Sharma and Rai, 2010). Experts say that, in nutritional content, texture, appearance, and aroma and most importantly in terms of taste, traditional rice unlike any other rice is much more resilient to Sri Lanka's increasing extreme weather and can offer higher incomes to growers and health benefits to their consumers ([http://www.ulpotha heritage Sri Lanka](http://www.ulpothaheritage.org)). The traditional rice cultivation was environmentally friendly, thus successfully grew in natural conditions. Until recently an estimated 8-10% of farmers still grow traditional rice varieties in full or in part in their lands. Traditional rice farming involves low external inputs. It does not need chemical fertilizer, as the technology harnesses the natural forces to its maximum potential by using natural sources of fertilizer such as compost. The technology itself looked after the pests and diseases and no agrochemical (pesticides, herbicides etc.) was necessary. Traditional water conservation practices ensured efficient use of rainwater and irrigation water.

However, with the increase of population, the "H" series of rice varieties were introduced in the 1950 along with the use of chemical fertilizer to increase the yield. The 'green revolution' of the early 1960s, supported by agricultural policies such as fertilizer subsidies, placed Sri Lanka on the fast track to becoming a production economy. With subsidized fertilizer and the establishment of irrigation schemes, farmers were given the motivation to be more production oriented. These heavy production agricultural methods in the paddy sector were supported by the new and improved high yielding varieties. Even though these new improved paddy varieties were short term and high yielding, they were chemical fertilizer and labour intensive and posed a negative externality to the environment (Wiggins and Brooks, 2010).

After 1950, over six dozen new rice varieties were released to the Sri Lankan rice market. Today, about 15 hybrid varieties dominate Sri Lanka's rice harvest. Hence, many of the traditional varieties of Sri Lankan rice known to be containing higher amounts of Glutamic acid, higher concentrations of vitamins, richer in fiber, having a lower Glycemic index that were instrumental in nurturing a healthy society were lost to the country (http://www.sundaytimes.lk/111023/Plus/plus_16.html).

Currently, out of the total paddy land extent, 98.8% of lands are cultivated with new improved rice varieties and less than 2% consists of traditional rice varieties. With the current trend of global awareness of the benefits of eating Organic food and the dangers of using chemical fertilizer and pesticides, traditional rice is gradually making a come-back, and rightly so considering the longevity and the fitness of pre-colonial generations. Now-a-days, there are several programmes launched in Sri Lanka regarding the promotion of traditional rice cultivation. The internal trade authorities in Sri Lanka plan to promote traditional varieties of rice to be sold in the country from January 2014. The Central Provincial Economic Development Centre has also commenced a project to increase and strengthen the distribution of traditional varieties of rice with a higher nutritional value throughout the country. It has been widely publicized that traditional rice varieties are cultivated without the use of any agricultural chemicals or pesticides and are therefore of higher quality than the new rice varieties sold in the market.

The Ulpotha organization carefully collected rare indigenous rice seeds for their taste and high nutritional value from small traditional farmers all over Sri Lanka and a small seed bank has been established. In this way Ulpotha has, over the last several years, developed quantities of very rare, pure strains of high quality, indigenous rice for distribution and planting in outlying organic farms under its supervision. As a result this rice is now more widely available than it has been in many generations and in quantities that allow some to be exported in limited quantities. The Ministry of Agriculture aims to cultivate paddy in 100,000 acres throughout the country in the Maha season (2013/14) using organic fertilizer. The programme to prevent kidney disease will encourage the Sri Lankan farmers to produce and use organic fertilizer. Paddy has been planted without the use of chemical fertilizer in an extent of 100 acres in the left bank of Rajanganaya and plans are underway to plant traditional paddy varieties in 5,000 acres in the right bank also. The Department of Agriculture, through its regional offices, has started programmes to create awareness among farmers on the importance of adopting traditional paddy cultivation. More emphasis is placed on the promotion of traditional paddy cultivation as a health commodity. In order to promote traditional paddy cultivation as a potential business opportunity among farmers, the Department of Agriculture has implemented an educational programme to teach traditional farmers on how to identify markets and develop their cultivation as a profit oriented business. At the same time, it is making attempts to establish partnerships among traditional farmers and private businesses, so that farmers can sell their produce for a guaranteed price in their locality. Finally, the Department of Agriculture, in collaboration with Vocational Training Authority (VTA) of Sri Lanka, has established a National Vocational Qualification (NVQ) on

traditional farming practices for the younger generation as a way of motivating them to adopt traditional paddy cultivation. Furthermore, in addition to the Department of Agriculture, there are many NGO/INGOs that are working with farmers to promote traditional paddy cultivation, as a means of Community Based Adaptation (CBA) programmes. The Agriculture Ministry has cultivated traditional paddy varieties in 5,000 acres in 11 districts, under the *Thirasara Yaya* development programme, and through this programme, the Ministry plans to bring a larger number of paddy lands under the cultivation of traditional rice varieties thereby increasing the consumption. The aim is to enhancing consumption of traditional rice varieties with medicinal value as a solution to control the spreading of Non Communicable Diseases and add to the country's rice production. The Ministry also plans to promote the cultivation of traditional rice varieties targeting the export market. The government spends a large amount of money for the import of Basmati rice, especially for the tourism industry. Thus, the ministry plans to promote local rice varieties in place of Basmati rice.

1.2 Justification and Significance of the Study

Excessive use of agrochemicals has caused major health hazards to the humans, specifically to the farmers in dry-zone North Central province where major irrigation prevails. In a study by Bandara et al. 2008 explore the problems of people affected by kidney failure in the dry zone of North Central province and the possible link with phosphate fertilizer and weedicides. The study states: "The overall pollution, especially with cadmium of water, freshwater fish as well as their staple food (rice) and other food items such as milk and vegetables would be the main reason for the present Chronic Renal Failure in the North Central Province". The Government of Sri Lanka pursued several policy measures to accelerate agricultural growth. These policy measures covered only the approval of National Seed Policy in 1996 the enactment of the seed act in 2003, the privatization of selected government seed farms and the fertilizer subsidy program for high yielding rice varieties. The seed act was primarily intended for high yielding varieties and does not accommodate traditional seeds. These policies, Acts and plans contain many gaps that curtail promoting traditional rice farming in Sri Lanka.

In actuality, there is a growing demand for traditional varieties, being a healthy choice and many tests have been performed now in Sri Lanka to prove that many nutrients have been found in all traditional rice varieties of Sri Lankan rice (http://www.sundaytimes.lk/111023/Plus/plus_16.html).

There are possible economic gains from traditional paddy cultivations. In the market place, traditional rice varieties cultivated using traditional methods fetch a higher price. This price is close to three times higher than the price of other rice varieties cultivated under chemical intensive paddy farming. Hence, farmers have a price incentive to supply traditional rice to consumers.

At the same time, consumers today (both locally and globally) are more health conscious and there will be a higher interest in traditional rice, as opposed to new rice varieties. Therefore, the government should provide motivation and incentives for farmers to engage in traditional paddy cultivation, as the demand from the consumers will rapidly increase in future. Even though traditional paddy farming has many benefits which are environmental, economic, and social, there are several key challenges when promoting and implementing this in Sri Lanka. Unless proper markets are established, traditional paddy farming will not generate adequate income to encourage farmers to switch. Ensuring a market place is a difficult task, since traditional paddy varieties are attractive only to niche markets, both locally and internationally. Therefore, unless sufficient demand is created at least locally, farmers will not be effectively persuaded to adopt traditional paddy farming. Also, efforts such as documenting the traditional knowledge are quite important and motivating and providing an incentive for youth to engage in traditional agriculture is a major challenge.

At present, a limited number of farmers and organizations are engaged in traditional rice cultivation aiming special small markets such as restaurants, supermarkets, and special segments of people in the society and export market.

In recent years a significant increase in the number of Chronic Kidney Disease (CKD) patients has been observed in some parts of the country, especially in North Central, North Western, Uva and Eastern Provinces. Hence, the government has identified the importance of expanding the traditional rice production in the country with the increasing demand at the moment. Referring to “Mahinda Chinthanaya, The Emerging wonder of Asia”, promotion of traditional rice varieties among farmers and increasing the cultivated extent up to 35,000 ha by 2015 and 50,000 ha by 2020 by developing research institutes, improving agricultural bio diversity, accelerating breeding programmes and strengthening extension activities have been identified as interventions to develop agricultural sector.

Rebuilding the popularity of traditional rice varieties is an uphill task and people would have to develop a taste for the traditional varieties. Normally, traditional varieties are as twice expensive as certain new rice varieties in most of the local markets and some argue that it is an artificial price. However, persuading farmers towards growing traditional rice varieties will need a long-term plan and incentives for the farmers to shift. A very limited number of studies have been done in Sri Lanka with regard to production of traditional rice and research regarding the consumer preference and marketing of the traditional rice varieties in Sri Lanka could not be found.

Therefore, it is a timely requirement to conduct a study on the present situation, constraints and future prospects of traditional rice sector in Sri Lanka.

1.3 Objectives

The main objective of this research is to study the present situation, constraints and future prospects of promoting traditional rice sector in Sri Lanka.

Specific objectives are,

1. To understand the present status of traditional paddy cultivation and constraints faced by the growers.
2. To identify the available marketing channels of traditional rice varieties and the potentials and constraints associated with promoting their marketing.
3. To identify the consumer preference and buying behavior of traditional rice varieties.

1.4 Organization of the Research Report

This report consists of seven chapters. Chapter one constitutes the introduction, justification and significance of the study, and objectives of the study. Review of literature pertinent to traditional rice varieties, nutritional value of traditional rice varieties and other positive characteristics of traditional rice varieties, traditional methods, and related studies are given in Chapter Two. The third chapter explains the methodology and nature of the study locations. The fourth chapter is devoted to the analysis of farmers' survey and next chapter explains the results and discussion of consumers' survey. The sixth chapter provides marketing information of traditional rice varieties and the last chapter presents the major findings, conclusion and recommendations.

CHAPTER TWO

Review of Literature

2.1 Traditional Rice Varieties

There are hundreds of known traditional rice varieties cultivated in Sri Lanka. These varieties possess nutritional and medicinal qualities unique to them. Due to this, farmers were engaged in cultivating these varieties from generation to generation, thus conserving the gene pool. Some of these traditional rice varieties are cultivated widely than others. History has recorded more varieties, but throughout generations Sri Lanka has lost many of these since they were not cultivated. Therefore, while the available traditional varieties are minimal, there is a danger of losing these as well (<http://www.ulpotha.com>, <http://www.ranketha.com>). A brief introduction of some of the popular traditional rice varieties is given below.

➤ **Suwandel**

Suwandel is an heirloom variety cultivated organically with traditional rain-fed methods in the Southern lowlands of Sri Lanka. Due to this reason, cultivation takes longer than with other varieties of rice, usually 5–6 months until harvest. The name implies fragrance. In addition, this aroma enhances the appetite. It is exquisitely delicious white rice with a unique aroma. The rice is well known for promoting fair and glowing skin; improving the functioning of the digestive system; improving vocal clarity; it is said to help control diabetes. It is also said to support a balanced growth of the body. Its creamy taste makes it ideal for festive occasions and ceremonies. Suwandel's nutrient composition consists of 90% carbohydrate, 7% crude protein, 0.7% crude fat, and 0.1% crude fiber. It is believed that Suwandel contains higher amounts of glutamic acid and higher concentrations of vitamins than other common rice varieties.

➤ **Kalu Heenati**

Kaluheenati is dark, fine grain, and a highly nutritious red rice variety that contains medicinal properties, is perfect for daily consumption and particularly recommended for lactating mothers. Kaluheenati is highly nutritious red rice that enhances sexual potency and physical strength and its high fiber content helps regulate bowel movement. It is effective in keeping diabetes under control as well as controlling the toxic effects of snakebites. Porridge made with kaluheenati rice is recommended for hepatitis patients.

➤ **Maa-Wee**

Maa-Wee is a reddish-brown rice variety with a unique texture that is low in carbohydrates, and rich in protein and fiber. Ma-Wee is also proven to have 25% to 30% lower Glycemic Index (GI) in comparison to other common rice varieties. It has a nutrient makeup of 84.5% carbohydrates, 9.4% protein, 3.6% fat and 1.1% fiber. It is said to provide relief for burning sensation and cooling the body. Ma-Wee rice

consumed together with meat can reduce alcohol intoxication. It was recommended for tuberculosis patients and is an effective remedy for purging and also recommended for diabetes tuberculosis, constipation, hemorrhoids and cardiovascular disease and is known to control corpulence. Ma-Wee rice is best when soaked prior to boiling.

➤ **Pachchaperumal**

Pachchaperumal is a wholesome short grain red rice rich in nutrients and protein that when cooked takes on a deep rich burgundy colour. The word 'Pachchaperumal' means the Lord 'Buddha's complexion' and has been considered a divine rice variety in the traditional Sinhalese culture. It was often used in alms givings. Pachchaperumal is known to be a perfect diet for those with diabetes and cardiovascular disease. Pachchaperumal is believed to be particularly good for children as it is rich in nutrients and proteins.

➤ **Kuruluthuda**

It is a delectable and nutritious red rice variety which is rich in proteins and fiber. It has a pleasant taste. It is said to improve bladder functioning, enhance sexual potency and helps evade Impotency.

➤ **Rathdel**

Rathdel is a delicious red rice variety that provides relief to those suffering from cirrhosis. Porridge and soup made with Rathdel can help fight viral fever. It is recommended for skin rashes caused by mental stress and provides relief for ailments in the urinary system. It also helps flush toxic excretory matter and cools the body. Roasted and ground Rathdel raw rice tempered with ghee can be an effective remedy for purging. It is a tested remedy for preventing the formation of stones in the bladder and gall bladder. Porridge made out of Rathdel rice, sarana, sugar, raisins and fresh cow's milk is suitable for those suffering from tuberculosis and lung ailments. Consumption of boiled Rathdel rice mixed with ghee enhances sexual potency.

➤ **Madathawalu**

Madathawalu is another traditional red rice variety that is highly recommended in Ayurvedic treatment to strengthen the immune system.

➤ **Hetadha Vee**

This is a red rice variety said to help control diabetes and provide relief for burning sensations and cools the body. It is thought to relieve ailments caused by biological imbalances; improves physical strength and an effective remedy for purging, blood vomiting and bleeding disorders.

➤ **Murungakayan**

Murungakayan is a whole grain red rice variety that is high in nutritional value.

➤ **KuruVee**

Kuruwee literally means 'small rice', and is sweet and soft red rice.

➤ **Gonabaru**

Gonabaru is a very rare old variety of red rice that formed the staple diet of both the peasant and king.

➤ **DhikVee**

Dhikwee is soft and wholesome red rice that is high in nutritional value.

➤ **Rath-el**

Rath El is said to improve the complexion and cure skin disease. It is also considered a cure for bladder disease and gallstones, and is prescribed for patients with tuberculosis.

In addition to the varieties mentioned above, there are more varieties which include numerous health benefits (ANNEX 01).

2.2 Nutrition and Medicinal Value of Traditional Rice Varieties

Different historical records revealed that most of the traditional rice varieties have some nutritional and medicinal properties. Hard scientific evidence exists to prove the rich nutritional values and beneficial qualities of traditional rice varieties. In addition, several traditional varieties are tested to have high nutritional values and other therapeutic values. The trend toward hybrid from traditional varieties may be reversing as traditional varieties are experiencing a surge in consumer popularity, partly due to their unique health benefits. For example, the traditional varieties have lower sugar content, making them an appealing choice for consumers who are diabetic, overweight, or monitoring their sugar intake. Those contain higher amounts of glutamic acid, fiber, and vitamins. Some people also uphold traditional varieties for other health benefits, such as cooling the body in Ayurveda treatments, improving vocal clarity, and curing skin rashes. Hence the following nutrients have been found in most of the traditional rice varieties in Sri Lanka ([www.http://ranketha.org/rice.com](http://ranketha.org/rice.com), [www.http://ulpotha.com](http://ulpotha.com)).

1. **Selenium**– It is an important mineral known for its ability to drastically reduce certain forms of cancer, as well as heart disease, inflammatory conditions and rheumatoid arthritis.
2. **Manganese** - One cup will provide with 88.0% of the daily value for the nervous and reproductive systems. It also acts as a co-factor for more than 300 enzymes, including enzymes involved in the body's use of glucose and insulin secretion.
3. **Naturally Occurring Oils** - These heart-healthy oils reduce LDL forms of cholesterol

4. Phytochemicals - Studies show that six servings a week can lower the creation of arterial plaque build-up and reduce chances of developing heart disease and high cholesterol, simply because it contains disease-fighting phytochemicals.
5. Antioxidant - The study conducted by the Industrial Technology Institute (ITI) (No.10715TG6) of Sri Lanka proves that traditional rice has a higher amount of antioxidant properties
6. Fiber - One cup provides 14.0% of the daily value for fiber. Because of its fiber-richness and ability to keep healthy bowel function, the rice “keeps things moving” in a way that promotes weight-loss and metabolic function. People feel fuller despite eating a smaller amount of food.
7. Low glycemic index - Unlike white rice/white bread, these traditional varieties can help keep blood sugar stabilized as it releases sugars slowly and in a sustained fashion. New research shows that individuals who eat at least two servings of this brown rice weekly can reduce the chances of developing diabetes 2 by up to 11 percent.
8. Phosphorus - An essential nutrient required for proper cell functioning, regulation of calcium, strong bones and teeth, and for making ATP (adenosine triphosphate) a molecule which provides energy to human cells. A deficiency in phosphorus can lead to lowered appetite, anemia, muscle pain, improper bone formation (rickets), numbness, and a weakened immune system.
9. Iron - It is part of proteins and enzymes found throughout our body, including hemoglobin and myoglobin, both which help carry oxygen in the blood. Iron is an important component of the muscles. Traditional rice contains iron.
10. Vitamin B6 - Promotes a healthy central nervous and immune system, aids in normal cellular growth and healthy skin, helps turn food into energy.
11. Tryptophan - An essential Amino Acid that builds blocks of protein.
12. Calories - Basic unit of energy found in all foods, which is necessary to maintain the body's vital functions.
13. Vitamin B1 – Vital for a healthy heart and nervous system, optimizes metabolism and brain function, aids in circulation, blood formation, growth, muscle tone, energy and learning.
14. Vitamin B3 – Needed for a healthy nervous system, skin, tongue, and digestive system aids in better blood circulation and energy. Lowers the bad LDL cholesterol levels and increases the good HDL
15. Unsaponifiables - A natural remedy popular with arthritis patients.
16. Phytonutrients - An anti-inflammatory that promotes healthy liver function.
17. Lignans - lowers cancer risk by preventing pre-cancerous cellular changes, as well as slow down the progression and movement of cancer cells, reduce the risk of cardiovascular disease, lower LDL cholesterol levels
18. Amylose- and Amylopectin content - provides a high fiber source with a low glycemic index. The more amylose present, the lower the glycemic index. Diabetics may benefit from a diet high in amylose due to the slower insulin response, which prevents quick spikes in glucose levels. Research is being conducted on the benefits of a high amylose diet in the prevention of colon cancer and heart disease.

19. Potassium – An essential nutrient used to maintain fluid and electrolyte balance in the body. A deficiency in potassium causes fatigue, irritability and hypertension.
20. Gamma Oryzanol - Convinces cells to burn sugar in the bloodstream so it does not get deposited as fat in the hips or stomach areas. Lowers LDL cholesterol in individuals, reduces hyperlipidemia, triglycerides, increases testosterone levels, stimulates the release of endorphins (pain-relieving substances made in the body), and promotes the growth of lean muscle tissue, increasing insulin sensitivity in diabetics.
21. Starch (amylum) - 54g in a cup of traditional rice. Rice is most common form of carbohydrate, a good source of energy and the main source of a range of nutrients in our diet.
22. Protein - Needed for bones, muscles, cartilage, skin and blood. They are also building blocks for enzymes, hormones, and vitamins. Although some think rice is less in Protein, considering one cup of milk contains only 8 g of protein, traditional rice is certainly a better option.

Majority of the traditional paddy varieties of Sri Lanka contain a red pericarp and the main features of these varieties were their medicinal and nutritional values.

2.3 Other Positive Characteristics

According to Sharma, et.al, (2010), traditional agriculture practices coupled with endogenous paddy varieties have proven to be more successful in facing climate change events. These traditional paddy varieties have strong characteristics that help them survive climate change impacts such as droughts, heavy rains, and floods, compared to newer varieties used in chemical intensive paddy cultivation and traditional varieties that could be kept in seedling nurseries for as long as three months while the hybrids do not last longer than four weeks. This vigor is based on certain characteristics unique to traditional paddy varieties.

Rathnabharathi, et.al, (2009) also stated that traditional varieties grow tall and they have a strong stem compared to the new improved varieties. This factor helps traditional varieties to withstand heavy rains, winds, and droughts with heavy evaporations. Furthermore, even if the stem bends during heavy winds, rains, and floods, the plant still has a higher probability of survival. The seeds of traditional varieties are also more vigorous. The shell of the seed can withstand water logging and drought conditions. Therefore overall, traditional varieties have been found to be better suited for climate change impacts such as heavy rains, floods, winds, and droughts.

2.4 Environmental Friendly Traditional Methods

It is revealed that, there are many traditional paddy cultivation practices in Sri Lanka ([www.http://ulpotha.com](http://ulpotha.com)). These traditional practices are concentrated around land preparation, water management and fertilizer applications and combined with the

traditional paddy varieties and would be ideal for withstanding climate change impacts. Crops are protected from bugs and pests using traditional and biological methods. These start with observing of auspicious times for planting and the making and keeping of ritual vows to the spirits of the land. Biological means, such as the use of powdered *Neem* seeds, dried *Makra* leaves, crushed coconut shavings, sap from the Jak fruit, Cactus milk, and branches of the *Kaduru* tree, Bamboo leaves and riverbed sand, are all employed when required and appropriate to deal with any infestations. Ploughing and threshing of the paddy are carried out using buffalo, as the use of tractors is avoided. The latter tends to break through the crust that retains water in paddy fields, resulting in the need for far greater amounts of irrigation. They also tend to dig up the soil too deeply, bringing less fertile soil to the surface to the detriment of the crops. Buffalo, on the other hand, do not cause these difficulties and do not produce air and noise pollution, while they do produce useful fertilizer and nourishing milk.

According to Killebrew and Wolff (2010), traditional paddy cultivation is environmental friendly and is the result of natural selection, evolved over many years resisting many climatic and environmental changes. Application of organic fertilizer and environmentally friendly land preparation methods increases the population of macro and micro organisms, in and around the paddy fields. All these activities in turn are capable of keeping the natural food chains surrounding the paddy field intact. Furthermore, the natural food chains manage the pest problems in the fields without harming any of the important fauna and flora in the surrounding environment. Therefore in the end, traditional paddy farming will preserve and improve the natural environment and the aesthetic appeal of the fields, in addition to making it more resilient to impacts of climate change.

As mentioned by Altieri (2008), traditional farming systems are practiced over many generations and are mastered to perfection. With chemical intensive paddy farming, these practices can confine only to the records of history. Adaptation of these methods will preserve the knowledge for the next generation. At the same time, traditional agriculture will promote a healthy and financially sound community. It is commonly observed that most farmers who engage in traditional paddy cultivation are healthier than their peers engaged in chemical intensive paddy cultivation. These farmers and their families have been consuming traditional rice for many generations. Interestingly all these farmers live well in to their 80s, while the life expectancy in Sri Lanka today is 74.9. Therefore, traditional paddy farming is capable of preserving very important traditional knowledge, while ensuring a healthy and wealthy community.

2.5 Related Studies

ITI and DA (2011) did a study to find out the properties of some traditional rice varieties of Sri Lanka. According to the study, a significant difference in the protein content was observed when the same rice variety was grown in different locations. Rice varieties namely Kalubala Wee, Pachchaperumal, Dahanala, Rathu Heenti,

Kattamanjal and Rathel with relatively high iron and protein levels are of high nutritional value and good for anemic conditions. These varieties could be recommended for pregnant women and lactating mothers and children. Rice varieties such as Kalubala Wee, Pachchaperumal, Rath Suwandal and Kaluheenati with high antioxidant levels are known to be having health promoting effects in reducing the prevalence of non-communicable diseases. Rice varieties such as Suwandel, Masuran, Dikwee and Gonabaru with low starch hydrolysis rate (indication of glycemic index) are suitable for diabetic patients due to the low invitro digestion rate. High susceptibility for lodging and low yield potential is reported to be the main drawbacks when traditional varieties are grown in farmers' fields. If traditional varieties are promoted for cultivation, it is advisable to grow them in marginal rice lands taking some precautions to avoid touching of the panicles to the muddy soils. In future the Department of Agriculture must pay attention to develop bio fortified improved varieties for the above traits to feed the nation with nutritionally superior health promoting rice.

Kottearachchi, et.al, (2010) conducted a study to identify traditional rice varieties of Sri Lanka that possess the fragrant gene (*fgr*) using designed allele specific markers based on the gene sequence of mutated version of Betaine Aldehyde Dehydrogenase 2 (BAD2), which is called fragrant gene. Fifty six rice accessions including several Basmati, Suwandal, Samba and Heenati varieties were chosen for the polymerase chain reaction (PCR) amplification with *fgr* would markers. Three fragments that would discriminate homozygous fragrant, homozygous non-fragrant and heterozygous individuals were amplified by multiplex PCR and the fragrance was evaluated phenotypically by potassium hydroxide (KOH) treatment. All positive accessions that amplified the *fgr* allele expressed the fragrance with KOH treatment. Of the traditional varieties, one accession each from Suwandal and Samba and, two accessions from Heenati were identified as the *fgr* genotypes that possessed mutated BAD2. Information from the investigation could be applied in breeding studies on aromatic rice suitable for the Sri Lankan environment, using marker assisted selection with local germplasms.

According to Rathnabharathie et.al (2009), traditional varieties are more profitable than conventional varieties. A simple cost-benefit analysis shows that despite the need for greater labour input (to make compost and *Neem* oil), it is cost effective, because labour comes from family and neighbours. Women can also participate more fully in farming where organic products are used. Rarely cultivated varieties of indigenous rice were shown to offer a solution to the increasing soil salinity. There are around 2,000 traditional Sri Lankan rice varieties, many with high nutritional value and medicinal properties, or resistant to particular diseases and pests. Cultivating them has helped a group of marginalized farmers to increase their harvests; whilst the project's collaborative approach has had a positive impact on the attitude of local agricultural institutions. The participatory approach to variety selection overcame the limitations of the conventional research system in meeting the needs of marginalized farmers and integrating local knowledge into the selection process.

According to Jayawardana (2000), the demand for food has changed and the demand for better quality rice and rice based products has increased, with the changes in lifestyle of the population. The new rice varieties should be developed not only to obtain higher yields but also having contained suitable quality characteristics. At the early stage of rice cultivation, around 600 traditional rice varieties were cultivated. Most of indigenous rice varieties are no more cultivated and the genetic base of rice has become narrow resulting in limited genetic base for rice research.

According to the Rathnabharathie (2010), traditional rice varieties have tremendous nutritional qualities as well as pharmaceutical values, which are recommended for many diseases in traditional medicine. Further, rice has a growing market potential as a weaning complementary food for infants, in tourist hotels, traditional medical centers, hospitals and supermarkets. The main objective of this study was to enhance the living standards of tsunami affected small scale paddy farmers by cultivating traditional paddy in saline paddy fields. Twenty barren locations that were flooded with seawater following the Tsunami and that were affected by prominent fungal diseases and pest issues were selected. Ten traditional indigenous paddy varieties were selected in a participatory process with farmers and cultivated in 20 locations. According to the results of the study, final comparison was made by conventional rice with inorganic inputs and traditional indigenous rice grown with organic and biodynamic inputs. The conventional paddy yield was 1070kg/ac., and traditional paddy yielded 950kg/ac. Selling prices were 15 SLR and 20 SLR respectively. Traditional paddy growers received more than twice the economic profit compared to conventional farmers. The study showed the potential of traditional organic paddy cultivation in Tsunami affected marginalized paddy lands. Apart from the profits, organic cultivation can utilize the marginal fallow paddy lands and traditional rice is a source that provides enormous health benefits to the country, though some are not scientifically analyzed.

Kahandawala (2011), stated that, traditional rice varieties have been conserved, developed and used by Sri Lankan farmers for over 3000 years. A large number of traditional rice varieties are now extinct for neglecting its importance. Policy support is necessary for recognition of traditional rice varieties under the Seeds Act. Technical support to farmers in order to conserve and improve traditional rice, subsidiary support to traditional rice farmers, and protection of community bio-cultural values of traditional rice farming through legal recognition of bio cultural community protocols should be provided. Up to 2011, an estimated 8-10% of farmers still grow traditional rice varieties in full or part in their lands. An estimated 60-70% of consumers prefer traditional grown rice with nature-friendly techniques to modern rice varieties grown with chemicals and fertilizer.

Daniel Donya (2000) conducted a survey on traditional farmers' role in Upland Hill and Inland valley rice cultivation in Volta Region in Ghana. However, records on rice production are lacking and yields are generally low. Therefore, the study was carried

out to find out the strengths and weaknesses in rice production in the Volta Region. The specific objective of the study was to identify local rice varieties in Volta Region that farmers still grow and to find out the reason(s) for still growing these varieties and to identify constraints/potentials of traditional rice production. The farmers identified about ten constraints. The most important of these is weed infestation 22 (65.5%). This was followed by lack of formal credit to farmers (50%), health constraints (47%), lack of improved seeds (30%) and the high input cost (25%). The Government policy on traditional rice production has not been favorable. The cost of inputs is generally high and marketing of indigenous rice varieties is considered to be relatively poor.

Suriyagoda et.al (2006) used 19 traditional and 16 improved rice varieties and those were tested together in the study to identify important changes that occurred in the yield related traits with yield improvement. Path coefficient approach was used to partition the relative contribution of yield components via standardized partial regression coefficients. Panicle density (number of panicles/m²) and panicle dry weight/ hill, were identified as the significantly important first order predictor variables on the response variable, grain yield (g)/m², for both traditional and improved varieties. However, parameter values were different for the two categories. Second order predictor variables on panicle density and panicle dry weight were diverse for the two groups. Further, pseudo-stem dry weight reduction from heading to harvest, expressed as a percentage of dry weight reduction, considering pseudo-stem dry weight at heading as the denominator, was greater for improved varieties, while leaf dry weight reduction was the same for both categories. A negative relationship ($p \leq 0.05$) of the harvesting index (HI) with the crop duration was also found for improved varieties. Grain yield of rice is influenced primarily by panicle density and panicle dry weight for both improved and traditional varieties. With breeding and crop improvement the influence of each parameter has changed. Relationship of second order predictor variables with the first order predictor variables for the two categories is different and is correlated with the morphological changes achieved through the crop improvement programme. Also, the study further revealed the differences of contribution from vegetative structures to the grain yield for the two categories and the negative relationship of crop duration with the HI for improved rice varieties. Further, yield improvement may be achieved through enhanced leaf and canopy photosynthesis as well as with strong grain sinks.

Abeysekara, et.al, (2011) conducted a study to find the Antioxidant Properties of certain Sri Lankan traditional red rice varieties. The study concluded that the brans of selected Sri Lankan traditional red rice possessed marked antioxidant properties and consumption may play an important role in the prevention of oxidative stress associated chronic diseases. Rice bran is one of the most abundant co-products produced in the rice milling industry and the research conducted in the last two decades has shown that it contains a unique complex of naturally occurring antioxidant compounds. Rice is the staple food in Sri Lanka and there are over 300 different traditional Sri Lankan rice varieties. However, no antioxidant activity

evaluation study has been conducted on these indigenous varieties. The present study evaluates the antioxidant properties of some Sri Lankan traditional red RV. Freeze-dried 70% ethanolic extracts of brans of four traditional red RV (*Oryza sativa*) namely Masuran (M), Dik Wee (DW), Goda Heeneti (GH) and Sudu Heeneti (SH). Antioxidant properties of bran extracts of selected RV were evaluated using total polyphenolic content (TPC) (n=6), 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging (n=4), 2-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid [ABTS] radical scavenging (n=4) and ferric reducing antioxidant power (FRAP) (n=6) *in vitro* antioxidant assays. Significant differences were observed among bran extracts of selected RV for investigated antioxidant properties ($P < 0.05$). Mean TPC, DPPH, ABTS and FRAP antioxidant properties were in the range of 11.74 – 29.75 mg gallic acid equivalents/g, 5.14 ± 0.17 – 6.77 ± 0.06 mmol Trolox equivalents (TE)/100g, 8.67 ± 0.14 – 14.25 ± 0.46 mmol TE/100g, 8.30 ± 0.15 – 11.02 ± 0.25 mmol FeSO₄/100g rice bran respectively. The order of mean TPC was SH > M > GH > DW. Bran extracts of all the RV exhibited dose dependent radical scavenging activity against both DPPH and ABTS radicals. Bran extracts of GH demonstrated maximum radical scavenging activity for both radicals. However, the order of scavenging was observed to be different among bran extracts of different RV for DPPH and ABTS radicals. The order of scavenging for DPPH was GH > SH > DW > M and for ABTS it was observed as GH > SH > M > DW. The highest mean FRAP was observed for bran extract of GH variety while the lowest for bran extract for SH variety. The antioxidant power of the bran extracts for FRAP is in the order of GH > M > DW > SH. The study concluded that, brans of selected Sri Lankan red rice possess marked antioxidant properties and consumption may play an important role in prevention of oxidative stress associated chronic diseases.

A study conducted by Dharmasena (2010), with the support of 'Future in Our Hands', during 2007 - 2010 in the Moneragala district, investigated how traditional rice farming and the related ecology faced the challenge of drought and emerging issues of modern farming by tracing coping strategies from the past. Traditional system practiced by farmers includes: i) cultivation of traditional rice varieties ii) use of organic fertilizers (straw, green manure, cow dung, poultry manure, liquid fertilizer etc.) iii) management of weeds through hand weeding, mechanical weeding, and water management iv) management of pest and diseases by practicing *Kem krama* (folk rituals), maintaining bio-diversity, and using bio-pesticides; and v) management of available water without leading to moisture stress.

A study was carried out in 16 villages where some farmers practiced traditional farming and some others adopted modern farming. The main differences observed in modern farming compared to traditional farming were: i) new 'improved' rice varieties; ii) Inorganic fertilizer (Urea, Muriate of Potash and Triple Super Phosphate) iii) Weedicides; iv) Pesticides v) pre-scheduled irrigation. These two farming systems were assessed by using various indicators such as productivity of land, labour, capital, and seed, input cost and net return per unit weight of grains. Results showed that the traditional rice farming when adopted for a few seasons could tolerate drought conditions, reduce soil salinity, and improve soil P, K and

organic matter and some physical properties. Moreover, cost of production decreased while labour and capital productivity increased. The system improved its capacity to control pests without any additional measure. Findings are summarized in the table below:

Table 2.1: Modern Farming Vs. Traditional Farming

Parameter	Modern Farming	Traditional Farming
Crop Economics		
Machinery cost (Rs./ha)	23,251	27,303
Material cost (Rs./ ha)	14,249	7,402
Labour cost (Rs./ ha)	63,327	67,015
Total input cost (Rs./ha)	100,827	102,420
Yield (kg/ha)	4,148	3,177
Cost of production (Rs./kg)IFL	24.31	32.24
Cost of production (Rs./kg)EFL	16.47	16.98
Selling price (Rs./kg)	30.00	40.00
Seed productivity	29.60	32.50
Land productivity (Rs./ha)	23,613	24,660
Labour productivity (Rs./day)	664	869
Investment productivity (Rs./day)	1.50	1.52
Net return (Rs./kg) IFL	5.69	7.76
Net return (Rs./kg) EFL	13.53	23.02
Soil Fertility		
EC (mmhos/cm)	0.99	0.06
PH	6.4	6.4
Soil P	10% increase	19% increase
Soil K	33% increase	52% increase
Organic matter	10% decrease	8% increase
Compaction(Penetrometer reading)	1.3	0.7
Plant Bio-diversity		
Grasses	7.4	4.4
Sedges	9.3	23.1
Broad-leaves	10.3	23.4
Total	27.0	50.9

Source:

The overall conclusion from the study is that the management of system ecology, adoption of traditional farming practices and integrated water resources management are the best practices to mitigate the drought effect in rice farming. However, there is a need to mobilize and strengthen communities and investigate

the possibility of incorporating modern farming objectives such as high yield, increased production, profitability, etc., into traditional farming systems.

In order to identify the value of traditional rice varieties, a research on five traditional rice cultivars was conducted by Bandara, et.al, (2008). The study concluded that the five Sri Lankan traditional rice cultivars tested are nutritionally better than common samba (new varieties) rice. Among the five cultivars, raw suwandel had the lowest Glycemic Index indicating a favorable staple that prevents diabetes. In terms of consumer preference, raw suwandel is the most preferred rice over other tested cultivars.

According to Gunaratne, et.al, (2013), Proanthocyanidin-containing rice varieties have been rarely reported. Antioxidant capacity, major antioxidant components, and nutritional parameters of eight traditional red-grained rice varieties containing proanthocyanidins grown in Sri Lanka were investigated. The tested traditional red varieties, on average, had over sevenfold higher both total antioxidant capacity and phenolic content than three light brown-grained new-improved rice varieties. Major antioxidant phenolic compounds identified in this study included proanthocyanidins, phenolic acids and γ -oryzanols (ferulic acid derivatives). Proanthocyanidins were detected only in the traditional red varieties, but not found in new-improved ones. Most traditional red varieties also contained significantly higher levels of protein with well-balanced amino acids and higher contents of fat, fiber and vitamin E (tocopherols and tocotrienols) than the new-improved ones. Great variations in antioxidant capacity, major phenolics, and nutritional parameters were observed among different rice varieties. These Sri Lankan traditional red-grained rice varieties containing proanthocyanidins may be used as important genetic sources for rice breeding.

CHAPTER THREE

Methodology

3.1 Description of the Study Areas

We have selected five districts namely, Colombo, Galle, Kurunegala, Kegalle and Anuradhapura for the farmer survey, areas which have a high growth of traditional rice varieties in Sri Lanka. The Colombo district was selected purposively for the questionnaire survey of consumers as Colombo is the major consuming district.

3.1.1 Colombo District

Colombo is the largest city of Sri Lanka, with a population of 2,326,000 in 2013 (Central Bank, 2015). It is located on the West coast of the island adjacent to Sri Jayawardenepura Kotte (which is the official capital of Sri Lanka). Colombo is also the administrative capital of Western province. Colombo is often referred to as the capital since Sri Jayawardenepura Kotte is a satellite city of Colombo. It was the political capital of Sri Lanka, before Sri Jayawardenepura Kotte. Colombo's climate is fairly temperate all throughout the year. From March to April the temperature averages around 31 degrees Celsius (88 degrees Fahrenheit) maximum. The only major change in the Colombo weather occurs during the monsoon seasons from May to August and October to January. This is the time of year when heavy rains can be expected. Colombo sees little relative diurnal range of temperature, although this is more marked in the drier winter months where minimum temperatures average 22 degrees Celsius (72 degrees Fahrenheit). Rainfall in the city averages around 2,400 mm (94 in) a year. Colombo is a multi-ethnic, multi-cultural city. The population of Colombo is a mix of numerous ethnic groups, mainly Sinhalese, Sri Lankan Moors, and Tamils (Wikipedia.org/wiki/Colombo).

3.1.2 Kurunegala District

Kurunegala is a district in the North Western province and it is located at the center of several main roads linking other important parts of the country. It is situated about 94 km from Colombo, and 42 km from Kandy. Located at an altitude of 116 meters above sea level, Kurunegala is surrounded by coconut plantations and rubber estates. The region comprising the Kurunegala town is located well above the sea level compared to the coastal areas of Sri Lanka. However, the region is not as high as the central hill country of the island. The nearest beaches to Kurunegala are to the Western coastal areas and include Negombo and Chilaw. According to the census data, the estimated population of Kurunegala in the year 2013 was 1,624,000. Most of Kurunegala's residents belong to the Sinhalese majority. Other ethnic minorities include the Sri Lankan Moors, Sri Lankan Tamils, Burghers and Malays. Residents from ethnic minorities live in all parts of the city, however, a sizeable population of Moors and Tamils also live in the areas of Teliyagonna and Wilgoda (Wikipedia.org/wiki/Kurunegala).

3.1.3 Kegalle District

Kegalle is a district in Sabaragamuwa Province, Sri Lanka. It covers an area of 1,693 km², has a population of 844,000 according to the census of 2013. The Kegalle District, situated in between the Central highlands and Western Southern planes boasts of a spectacular environment. The height of the Western region is less than 500 feet from the sea level while the Eastern region exceeds 1000 feet. Rubber cultivation has stretched over most of the area of the district and minor export crops such as coffee, cocoa, pepper, clove and nutmeg occupy an important place in the economy of the district. Sri Lanka's best graphite mine is situated at Bogala in Kegalle District. The extent of the District is 1,692.8 km² (653.6 sq miles) (Wikipedia.org/wiki/Kegalle).

3.1.4 Galle District

Galle is a district in the Southern Province, Sri Lanka. It is one of the 25 districts of Sri Lanka, the second level administrative division of the country. The district is administered by a District Secretariat headed by a District Secretary appointed by the central government of Sri Lanka. Its area is 1,652 km² (638 sq miles): 35 km² (14 sq miles) is water and 1,617 km² (624 sq miles) is land. Galle district bounded on the North by Bentara River, South and West by the Indian Ocean and East by Matara and Ratnapura districts. The topography of Galle District is very much dissent. The climatic condition of Hiniduma Patthuwa is very similar to the central hill country of Sri Lanka. This area consists of rainforests, which is the water catchment area for most of the rivers and lakes, flows across Galle District. Sinharaja Forest Reserve is one of them. Galle district lies in a temperate climatic zone. Annual rain fall is between 2000-2500mm. The river Gin_ ("Gin Ganga") starts from Gongala Hill of Hiniduma Patthuwa and takes a long journey of 113 km (70 miles). The river nourishes the land in extent of 922 km² (356 sq miles). Madu Ganga starts from Polathu Kanda and flows to the sea from Balapitiya and helps maintain ecological balance in the Galle district. According to the census data, the estimated population of Galle in the year 2013 was 1,068,000 (Wikipedia.org/wiki/Galle).

3.1.5 Anuradhapura District

Anuradhapura is the capital city of the North Central Province, and it is one of the ancient capitals of Sri Lanka, famous for its well-preserved ruins of ancient Sri Lankan civilization. It was 3rd capital of the Kingdom of Rajarata after Tambapanni and Upatissa Nuwara. The city, now a UNESCO World Heritage Site, was the center of Theravada Buddhism for many centuries. The city lies 205 km North of the current capital Colombo in Sri Lanka's North Central Province, on the banks of the historic Malvathu Oya. It is one of the oldest continuously inhabited cities in the world and one of the eight World Heritage sites of Sri Lanka. It is believed that from the 4th century BC, it was the capital of the Sinhalese until the beginning of the 11th century AD. During this period it remained one of the most stable and durable centers of political power and urban life in South Asia. The ancient city, considered sacred to

the Buddhist World, is today surrounded by monasteries covering an area of over sixteen square miles (40 km²). According to the census data, the estimated population of Anuradhapura in the year 2013 was 868,000. (Wikipedia.org/wiki/Anuradhapura).

3.2 Study Population and Sampling Design

The study population consisted of farmers, consumers, management of government/non-government organizations (NGOs) and private sector organizations engaging in traditional rice cultivation. Traders, exporters and Ministry of Agriculture were also incorporated. Simple random sampling was used in this study and 60 farmers engaging in traditional rice cultivation were selected randomly from each district, altogether 300 farmers were selected from all the five districts. We selected 100 consumers from Colombo district and consumers were interviewed when they visited the special pola or retail shops to buy traditional rice.. We interviewed 35 consumers at the *Pola* (special *pola* in Sambodhi Viharaya, Colombo 07), while 31 consumers at popular outlets island wide, 28 from farmers or farmer organizations in the respective area, 5 consumers from retail shops and 1 from supermarket.

This study population was as follows.

Group	No. of Respondents
Farmers	300
Consumers	100
Management of organizations engaged in traditional rice cultivations & exports	10
Traders	10
Total	420

3.3 Collection of Data

The research was based on two sources; both primary and secondary data was used for the study. Questionnaire survey, key informant interviews and focus group discussion were used to collect primary data. Secondary data was gathered from online sources, published reports from relevant organizations and government institutes.

3.3.1 Data Collection Method

Objective 01

Key informant interviews and focus group discussions were held with the leaders of the farmer organizations, management of government/non-government

organizations (NGOs) and private sector organizations engaging in traditional rice cultivation etc.

Structured questionnaires were also administered for farmers who were engaged in traditional rice cultivation.

Objective 02

The key informant interviews and focus group discussions were held with the leaders of the farmer organizations, management of government/non-government organizations (NGOs) and private sector organizations that are engaged in traditional rice marketing, exporting and trading etc.

Objective 03

Structured questionnaires were used for 100 consumers in the Colombo district to find out the consumer preference and buying behavior for traditional rice varieties. We interviewed consumers who purchased traditional rice varieties from *pola*, retail outlets and special selling centers in Colombo district.

3.4 Analytical Tools and Techniques Employed

Both qualitative and quantitative data analysis methods were used.

Likert Scaling

A type of psychometric response scale called Likert Scale was employed for studying the consumers' idea about some special characteristics of traditional rice varieties. For this survey, a five-point scale with levels: very good, good, average, poor and very poor, indicating the level of agreement to a particular statement was used. During this study the scores 5,4,3,2 and 1 were assigned respectively for the characteristics of taste, aroma, keeping quality, swelling capacity, texture and easy - to cook while in the case of price, scores of 1,2,3,4 and 5 were assigned respectively. The mean score was considered for interpretation.

Chi - Square Test

The relationship of the demographic factors with the purchasing behavior of the sample consumers, especially frequency of purchasing rice and purchasing quantity were analyzed using chi-square test.

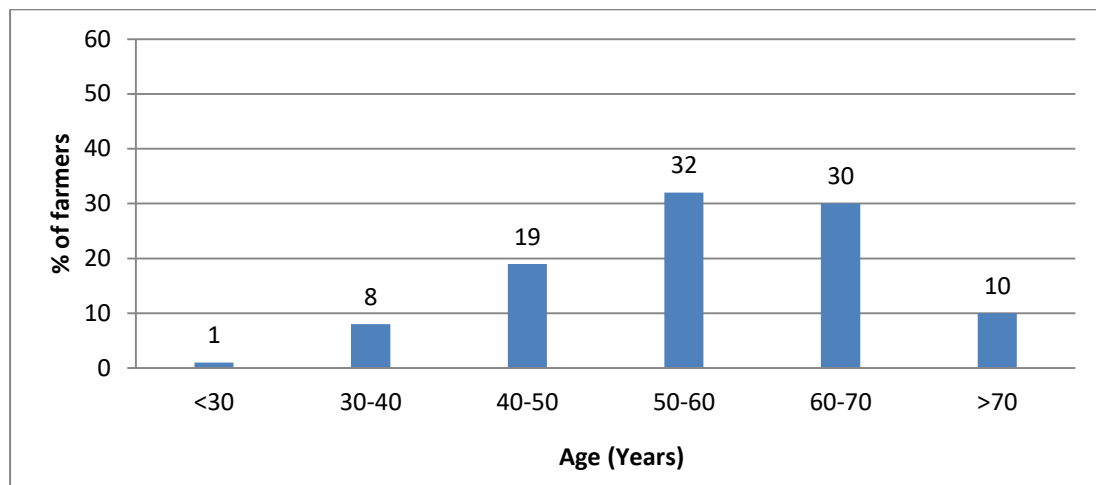
CHAPTER FOUR

Results and Discussion of the Farmer Survey

This chapter is devoted to analyze the farmers' practices in traditional rice farming. It is focused on socio- economic features of traditional rice farmers, how they turned to traditional paddy cultivation, organizational relationship, major paddy varieties cultivated, land and labour utilization, application of chemical and organic fertilizer, agrochemicals and weedicides and finally the cost of production.

4.1 Demographic Characteristics of the Traditional Paddy Farmers

Findings of this study reveal that middle aged and elderly farmers are more involved in traditional paddy farming than young farmers. The majority of farmers (81%) belonged to 40-70 years. Involvement of young farmers in traditional paddy farming was less and only 9% of the total numbers of farmers were below 40 years (Figure 4.1). Less interest of young farmers was observed across most of the selected districts but the results of Anuradhapura District slightly varied from the overall situation. Youth involvement in traditional paddy cultivation in Anuradhapura district was nearly 18% which is little higher than the average level.



Source: HARTI Field Survey Data, 2014

Figure 4.1: Age Distribution of Traditional Paddy Farmers

Table 4.1 shows the percentage distribution of education, occupation, gender classification, monthly income and family members. The level of education of the respondents indicates that the education of majority of farmers had concentrated between primary to secondary education. About 24% and 44% of the sample farmers had limited their education to primary and secondary education respectively. About 26% of the sample farmers had been able to complete G.C. E (O/L) and advanced level while 6% had achieved the graduate level. There was no

farmer who had not been to school, an indication that all the farmers had received formal education.

Considering gender distribution of the sample, about 80% of traditional paddy farmers were male. District wise statistics indicate that male farmer' percentages in Colombo (97%), Galle (82%) and Kurunegala (92%) were higher than Kegalle (60%) and Anuradhapura (70%).

Across all the districts except in Kegalle, the primary occupation of the majority of farmers (50% or above) was paddy cultivation. Those farmers in Kegalle district whose primary occupation was paddy cultivation was as less as 42% compared to other considered districts. A notable characteristic of the primary occupation across the districts was that government as well as private sectors employer cultivating traditional paddy. About 30% in Colombo, 20% in Galle, 28% in Kurunegala and 27% in Kegalle district farmers were government employers. Similarly, 22% in Galle and 15% in Kegalle farmers were private sector employers. Those employers are cultivating traditional paddy mainly for domestic consumption. Those farmers were interested in producing more nutritious and healthy rice. Occupation of nearly 9% of the sample was the category represented by retired government employees, self-employed and skilled labourers.

As a whole, the income level of traditional paddy farmers, the majority of the sample had earned a significant income per month. Nearly 68% in Colombo, 70% in Galle, 61% in Kurunegala, 75% in Kegalle and 60% in Anuradhapura farmers had received a monthly income between Rs.15, 000.00 – Rs.35, 000.00. The mean income of all the districts too was found out to be Rs.31, 875.00 in Colombo, Rs.30,814.81 in Galle, Rs.31,946.43 in Kurunegala, Rs.24,067.80 in Kegalla and Rs.24,288.14 in Anuradhapura.

The sample families were categorized into three categories such as 1-3 members, 4-6 members and more than 6 members in a family. The results indicated that fairly large families (4-6 members) in the sample accounted for 69% in Colombo, 62% in Galle, 68% in Kurunegala, 73% in Kegalla and 71% in Anuradhapura. The average family size is largely similar across the selected districts. However, the average family size is 4.19 in Colombo, 4.40 in Galle, 4.02 in Kurunegala, 4.22 in Kegalle and 4.10 in Anuradhapura, which is marginally higher than the national average family size of 3.9.

Table 4.1: Some Demographic Features of Traditional Paddy Farmers (%)

Variable	Category	Colombo (N=60)	Galle (N=60)	Kurunegala (N=60)	Kegalle (N=60)	Anuradha pura (N=60)	Total (N=300)
Education	Primary	27	32	18	20	23	24
	Secondary	50	35	44	35	57	44
	O/L and AL	13	25	33	43	17	26
	Graduate	10	8	5	2	3	6
	Total	100	100	100	100	100	100
Gender	Male	97	82	92	60	70	80
	Female	3	18	8	40	30	20
	Total	100	100	100	100	100	100
Primary Occupation	Paddy farming	50	50	52	42	68	53
	Government	30	20	28	27	12	23
	Labour	5	0	3	3	0	2
	Private	7	22	8	15	8	12
	Poultry farming	0	0	2	3	0	1
	Other	8	8	7	10	12	9
	Total	100	100	100	100	100	100
Income (Rs.)	<15,000	2	8	5	12	20	9
	15,000- 25,000	45	42	20	38	43	39
	25,000- 35,000	23	28	41	37	17	29
	35,000- 45,000	13	8	13	7	5	9
	45,000- 55,000	12	2	10	3	12	8
	>55,000	5	12	7	4	4	5
	Total	100	100	100	100	100	100
Mean Income		31,875	30,815	31,946	24,068	24,288	28,391
Family Members	1-3 members	27	29	32	27	27	28
	4-6 members	69	62	68	73	71	68
	>6 members	4	9	0	0	2	4
	Total	100	100	100	100	100	100
Family Size		4.19	4.40	4.02	4.22	4.10	4.18

Source: HARTI Field Survey Data, 2014

4.2 Cultivation of Traditional Paddy

4.2.1 Experience in Traditional Paddy Farming

As a whole nearly 89% of the total sample had started their paddy cultivation before more than 20 years back. However those farmers had turned for traditional paddy cultivation less than five years indicating the traditional rice farming is a newly emerged practice among the paddy farmers. About 95% in Colombo 68% in Galle, 80% in Kurunegala, 95% in Kegalle and 67% in Anuradhapura had less than five years' experience in traditional paddy farming (Table 4.2). Farmers turned for traditional rice farming mainly due to the influence of Farmer Organizations or Non-governmental organizations or social organizations in the particular area (30%), through island wide popular organizations (29%), neighbour farmers and friends (20%), and through government intervention (15%). Other sources of influence are not significant (Table 4.3). Across the districts, this situation differs from district to district. In Colombo district 21% of the farmers turned to traditional paddy cultivation due to the government influence, especially Madiwela project conducted by the Urban Development Authority.

Table 4.2: Experiences in Traditional Paddy Farming (%)

Time Period	Colombo	Galle	Kurunegala	Kegalle	Anuradhapura	Total
Paddy Farming						
<5 years	7	3	0	0	0	2
5-10 years	3	3	3	5	3	4
10-20 years	10	7	8	2	0	5
>20 years	80	87	89	93	97	89
Traditional Paddy Farming						
< 5 years	95	68	80	95	67	81
5-10 years	5	29	18	3	15	14
>10years	0	3	2	2	18	5

Source: HARTI Field Survey Data, 2014

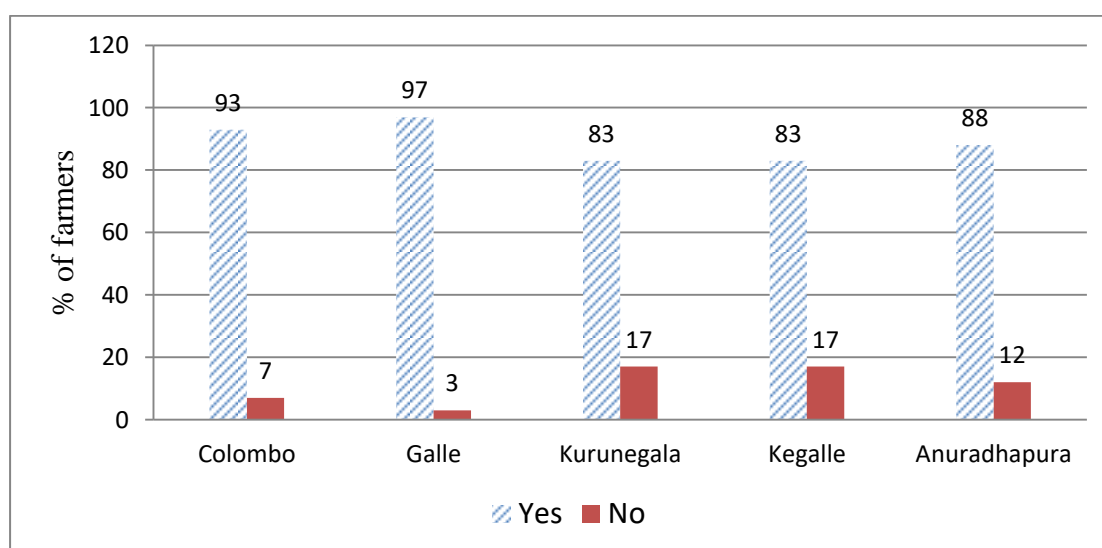
Table 4.3: Influence to Turn to Traditional Paddy Cultivation (%)

Influence	Colombo N=60	Galle N=60	Kurunegala N=60	Kegalle N=60	Anuradhapura N=60	Total N=300
FOs or NGO or social organizations in the area	30	36	26	27	30	30
Island wide popular organizations	29	35	25	30	26	29
Neighbour farmers/friends	15	20	18	8	37	20
Government	21	1	21	26	4	15
Generation	2	4	4	3	0	3
Social organization or NGO or private companies in outside areas	0	0	3	5	2	1
Books/Papers	2	2	1	1	1	1
TV/Radio	1	2	2	0	0	1
Total	100	100	100	100	100	100

Source: HARTI Field Survey Data, 2014

4.2.2 Organizational Behavior

The farmers had started to cultivate traditional paddy varieties due to influences of different sources and the majority of those farmers were engaged in an organization. According to the graph 4.2, 93% in Colombo, 97% in Galle, 83% in both Kurunegala and Kegalle and 88% in Anuradhapura farmers were members in an organization which promotes the traditional paddy cultivation.



Source: HARTI Field Survey Data, 2014

Figure 4.2: Membership in an Organization

In this study, we could identify several organizations which were engaged in the traditional rice sector as follows,

1. Island wide popular organizations - Two popular organizations were identified. These organizations actively participated in improving the production and marketing of traditional rice varieties in Sri Lanka (See Box 1 and 2).
2. Farmer organization or NGO or social organization in the area - There are well organized and popular farmer organization or social organization actively engaging in certain districts. For example, Community Camp Programme (C-CAMP-P) in Kegalle is a well-organized and an actively operating organization (see Box 3).

Box 1

Farmer Federation for the Conservation of Traditional Seeds and Agri-Resources

This organization was started in 1998 as a national level organization with the support of one of the NGOs. From the year 2000, it works as an independent organization and at present around 12,000 farmers were engaged in this organization across 21 districts in Sri Lanka. The organization provides different services and programmes to uplift the traditional paddy production and marketing mentioned below.

1. Conservation of traditional seeds and other seeds and crops
2. Production and distribution of traditional paddy seeds
3. Collection and exchange of the traditional knowledge
4. Consultancy, training services and supervision
5. Production and marketing of traditional rice varieties

Box 2

Movement for Traditional Seeds and Farmer's Heritage (MTSF)

This organization was started in 2000 by the leading members who left the above organization. At present, around 14,300 farmers were engaged in this organization and it is actively operating in the whole country except Ampara and Nuwara Eliya.

The organization also provides different services and programmes to uplift the traditional paddy production and marketing as mentioned in the above organization (box 1).

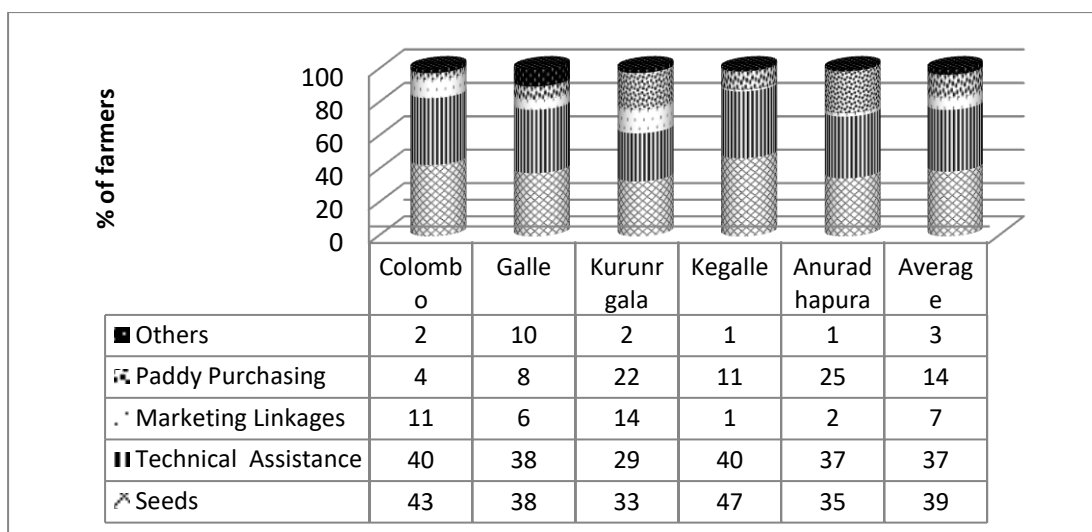
Box 3

C-CAMP-P (Kegalle District)

This organization was started in 2010 with the support of Oxfam in Australia as a volunteer organization. At the moment there are 1500 women farmers engaged in this organization. Providing seed paddy, technical and extension services with the help of officers in Agrarian Service Centers, marketing facilities are the main services provided by this organization.

Farmers were provided different facilities by the organizations. According to the information

Farmers were provided different facilities by the organizations. According to the information received from all selected districts, those facilities had helped farmers to start and continue the traditional paddy cultivation. It is mainly due to the need of indigenous knowledge and practices which are currently away from most present generation farmers. Considering the average of all the five districts, providing of seeds (39%), technical assistance (37%) and purchasing of paddy (14%) were the major facilities provided by different organizations (Figure 4.3).



Source: HARTI Field Survey Data, 2014

Figure 4.3: Facilities Provided by Different Organizations

Availability of traditional paddy seeds was one of the determinant factors to start the cultivation. Social organizations or farmer organizations or NGOs in the area and island wide popular organizations were leading in supplying seed paddy to farmers than government organizations. Although government had made attempts to distribute seed paddy among farmers through the Department of Agriculture and Divisional Secretariat Office, they also purchased seed paddy from those social organizations. About 55% in Colombo, 72% in Galle, 67% in Kurunegala, 49% in Kegalle and 62% in Anuradhapura farmers had provided seed paddy by social organizations or farmer organizations in the area and island wide popular organizations directly (Table 4.4).

Table 4.4: Source of Seed Paddy Supply (%)

Source of getting seed paddy	Colombo	Galle	Kurunegala	Kegalle	Anuradhapura	Average
DS Office	17	7	13	40	20	19
Social organizations or NGO or farmer organizations in the area or island wide popular organizations	55	72	67	49	62	61
Exchange with farmers	15	15	13	7	15	13
Self-made	13	7	7	5	3	7

Source: HARTI Field Survey Data, 2014

4.2.3 Cultivated Traditional Paddy Varieties

Although nearly 1400 traditional paddy varieties are available as a whole concerned on the cultural varieties, at the time of the survey, Suwandel (49%), Kuruluthuda

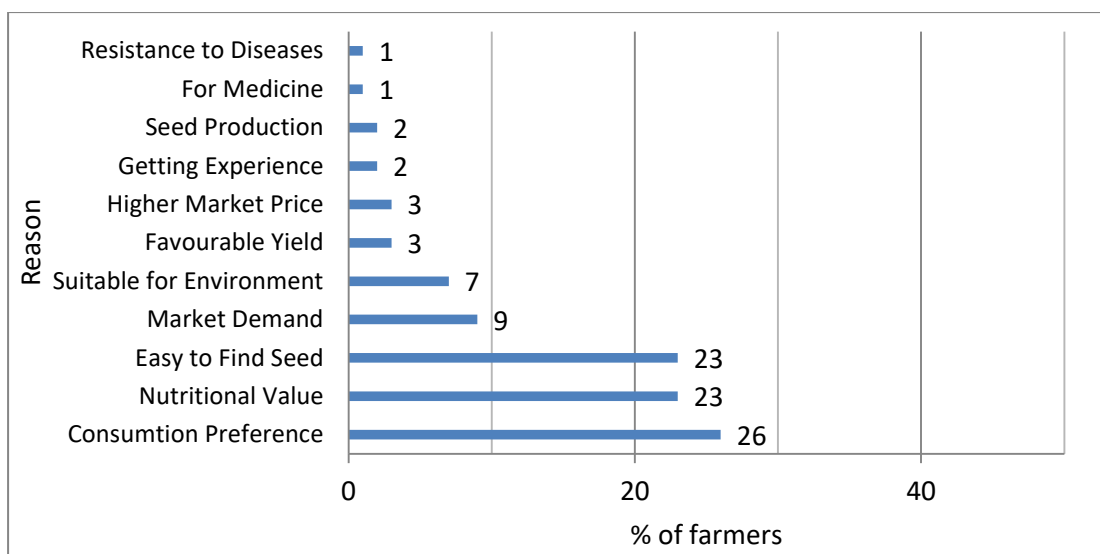
(29%), Pachchaperumal (27%) Kahawanu(18%) and Heenati (13%) took the first, second, third, fourth and fifth places respectively among the sample farmers. District level information somewhat differed from the overall. The highest percentage of farmers in the sample in Colombo (55%) and Anuradhapura (72%) had cultivated Suwandel. However, in Galle, the majority (65%) of farmers cultivated Kuruluthuda while it was Kahawanu (71%) in Kegalle and Pachchaperumal (68%) in Kurunegala.

Table 4.5: Most Cultivated Traditional Paddy Varieties

Paddy Variety	Colombo N=60	Galle N=60	Kurunegala N=60	Kegalle N=60	Anuradha- pura N=60	Average
Suwandel	55	27	47	42	72	49
Kuruluthuda	40	65	13	8	18	29
Heenati	5	9	18	14	17	13
Pachchaperumal	38	4	68	10	13	27
Kahawanu	7	2	3	71	5	18
Dikwee	4	46	0	0	1	11
Madathawalu	5	6	0	9	1	5
Velihandiran	8	0	0	7	3	4
Pokkali	1	11	3	1	3	4
Others	8	10	5	10	11	9

Source: HARTI Field Survey Data, 2014 **Multiple Response is Possible

The farmers were asked the reasons for selecting the particular paddy variety. The farmers revealed that their interest was domestic consumption than marketing objectives. About 26% of the total sample (that is the highest), selected the paddy variety according to the preference of the family and nearly 23% responded that nutritional value and easy availability was the key (23%) (Figure 4.4). The answers of famers in all the selected five districts were largely similar.

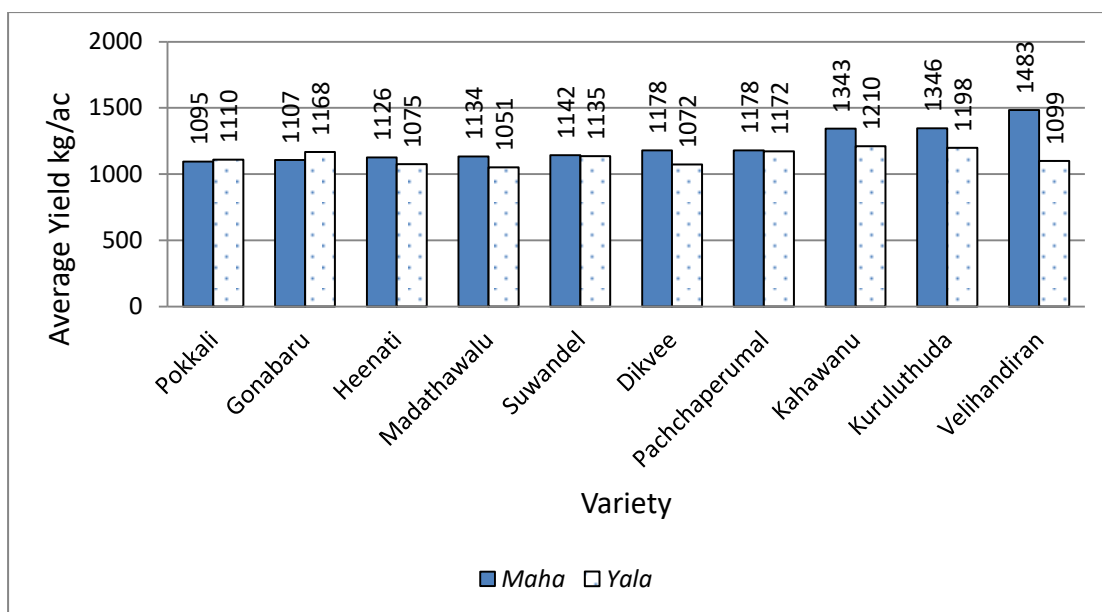


Source: HARTI Field Survey Data, 2014

Figure 4.4: Reasons for Selecting Paddy Varieties

4.2.4 Average Yield

The study attempted to find out the average yield, its variation by variety, season and geographical situation. Out of the total sample (300), only the farmers who were cultivating both *Yala* and *Maha* seasons (181) were selected and analyzed to obtain these results. The average yield of most of the paddy varieties concentrated around 1,100 - 1,200kg/acre irrespective of the season as a whole. The average yield of Velihandiran in *Maha* season was higher by 385kg than in *Yala* season. However, farmers who cultivated Velihandiran was very limited in the field and only three farmers were included in the sample. (Include the average yield of Velihandiran farmers who cultivate at least only one season) The average yield of Kuruluthuda (39 farmers) in *Maha* season was higher by 149Kg/acre than that of in the *Yala* season. Kahawanu was the third place in maintaining a significant gap between *Maha* and *Yala* seasons and it was higher by 133kg/acre in the *Maha* season (Figure 4.5).



Source: HARTI Field Survey Data, 2014

Figure 4.5: Difference of Average Yield by Season (kg/acre)

The average yields of some selected varieties were different when season with district together are concerned. According to the table 4.6, Suwandel cultivation could be observed in all five districts. There was no significant difference of average yield in Colombo, Galle and Kurunegala districts. But the average of Suwandel was higher (11%) in *Maha* season in Kegalle while it was higher in *Yala* season in Anuradhapura. Average yield of Pachchaperumal was higher (14%) in *Maha* but it was higher (14%) in *Yala* in Anuradhapura. The yield of Kuruluthuda is higher in *Maha* season in Colombo (12%) and Kurunegala (10%) and in *Yala* season in Kegalle (20%). The yield of Pokkali is higher in *Maha* season in Galle (11%) but less in *Yala* season in Kegalle (22%) and Anuradhapura (14%).

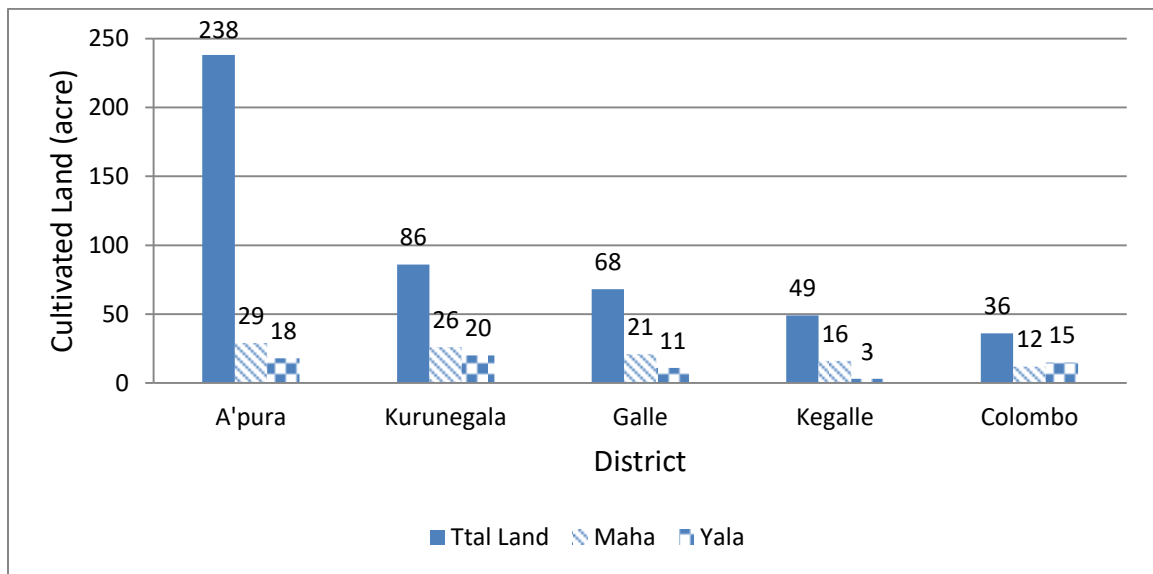
Table 4.6: Difference of Average Yield by Seasons and Districts (kg/Ac)

Variety	Colombo			Galle			Kurunegala			Kegalle			A'Pura		
	Maha	Yala	%	Maha	Yala	%	Maha	Yala	%	Maha	Yala	%	Maha	Yala	%
Suwandel	1209	1220	-0.89	1029	1051	-2.13	1162	1105	4.89	1136	1013	10.84	1095	1192	-8.84
Pachchaperumal	1278	1105	13.53	1050	-	-	1104	1117	-1.12	1002	950	5.16	1380	1570	-13.78
Madathawalu	1256	1022	18.59	1040	1113	-7.05	-	-	-	1153	1000	13.27	-	-	-
Kuruluthuda	1340	1175	12.34	1175	1085	7.69	1219	1097	10.07	1000	1200	-20.00	1574	1433	8.99
Heenati	1000	-	-	1058	1050	0.74	1209	1063	12.09	1167	1021	12.52	1050	1131	-7.76
Velihandiran	1283	1099	14.40	-	-	-	-	-	-	1429	-	-	2100	-	-
Kahawanu	1406	1200	14.67	1253	1033	17.55	1000	1000	-	1351	1067	21.04	1375	1551	12.81
Gonabaru	1067	1200	-12.50	-	-	-	-	1350	-	1333	970	27.25	900	-	-
Pokkali	1200	-	-	1122	1000	10.90	1000	-	-	900	1100	-22.22	1008	1150	-14.09
Dikvee	1289	1203	6.63	1139	1023	10.16	-	-	-	-	-	-	-	-	-
Average	1277	1177	7.84	1122	1057	5.79	1158	1110	4.14	1232	1023	17.01	1294	1293	0.07

Source: HARTI Field Survey Data , 2014 *% values were calculated compared to *Maha* season

4.2.4 Total Cultivated Paddy Land Vs Cultivated Traditional Paddy Land

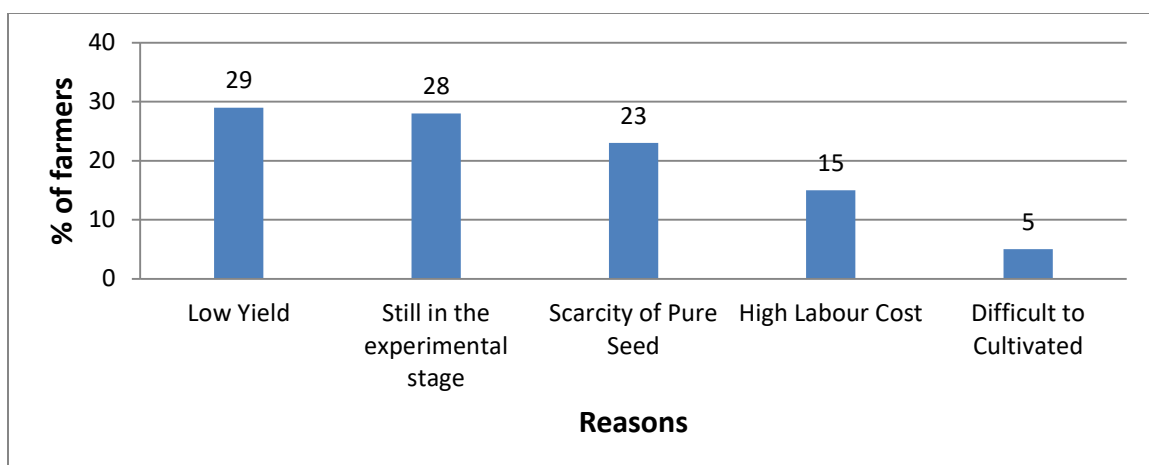
The field survey focused on finding out the extent to which the farmers adopted traditional paddy farming. According to the figure 4.6 farmers in all the districts had allocated a small share for traditional paddy cultivation out of the total cultivated paddy lands. The allocated extent of traditional paddy varieties was more or less similar in all the districts. In Anuradhapura district, farmers allocated only 12% of their total paddy lands in Maha and 8% in Yala for the traditional paddy cultivation. In Kurunegala, 30% of the paddy lands were allocated for the traditional paddy cultivation in Maha and 23% in Yala. In Galle district, farmers cultivated traditional paddy in about 31% lands in Maha and 16% in Yala. Both Kegalle and Colombo district farmers allocated 33% lands for the traditional paddy in Maha but in Yala season it was reported as 6% in Kegalle district and 42% in Colombo district.



Source: HARTI Field Survey Data, 2014

Figure 4.6: Total Cultivated Paddy Lands and Cultivated Traditional Paddy Lands (acre)

When inquired from the farmers why they did not allocate total paddy land for traditional paddy cultivation, about 29% of the farmers reported that low yield is the major reason while the 28% of the total sample said that they have newly entered the traditional paddy cultivation and therefore they are still at experimental stage (Figure 4.7). The rest of the farmers highlighted constraints in traditional paddy cultivation such as scarcity of pure seeds (23%) and the higher labour cost (15%). Considering the district level situation, nearly 40% in Colombo and 48% in Kegalle farmers were at experimental stage. Low yield was the major constraint in Galle (40%) and Kurunegala (48%) while it was the scarcity of pure seed in Anuradhapura (35%).



Source: HARTI Field Survey Data, 2014

Figure 4.7: Reasons for Limited Land Allocation for Traditional Paddy Cultivation

4.2.5 Types of Irrigation

The main irrigation type in all selected district except in Anuradhapura, was rain fed recording 80% in Colombo, 97% in Galle, 67% in Kurunegala and 80% in Kegalle. Nearly 67% and 25% in Anuradhapura district belonged to major and minor irrigation scheme respectively. Also about 23% of Kurunegala farmers belonged to the category of minor irrigation schemes (Table 4.7). These findings reveal that cultivation of traditional paddy represented in the main irrigation system available in the particular district as in non-traditional paddy cultivation. In other words, traditional paddy cultivation does not require a specific irrigation type. The majority of paddy cultivation in Colombo, Galle and Kegalle depend on rain fall and minor irrigation. Both Anuradhapura and Kurunegala are popular for major and minor irrigation.

Table 4.7: Type of Irrigation (% of Farmers)

Irrigation Type	Colombo	Galle	Kurunegala	Kegalle	Anuradhapura	Average
Major	0	0	0	0	67	13
Minor	0	0	23	5	25	11
Rain fed	80	97	67	80	7	66
Other	20	3	10	15	2	10
Total	100	100	100	100	100	100

Source: HARTI Field Survey Data, 2014

4.2.6 Use of Fertilizer and Chemical

“Environmental Friendly Agriculture, “Chemical Free Food” and “Healthy Food” were some of the slogans behind the traditional paddy cultivation. Those slogans were used as marketing tactics to sell paddy or rice in the market. That information was captured by the field survey in this study. About 87% of the total sample had not used chemical fertilizer in the traditional paddy cultivation. Further, about 72% of the total sample had not used agro chemical and weedicide. Farmers use two different methods to control the weed. The first one is controlling weed as much as possible in the land preparation stage. The second one is using inherent characteristics in the traditional paddy plant. That is the height differences between traditional paddy plant and the weed plant. Generally height of the traditional paddy plant is higher than weed and therefore the growth of weed is naturally controlled by the paddy plant. About only 13% of the total sample, or 39 farmers out of 300 sample farmers said that they are using chemical fertilizer in the traditional paddy cultivation and Table 4.8 depicts the use of chemical fertilizer.

Table 4.8: Number of Farmers Using Chemical Fertilizer and Agro Chemicals

Type of Fertilizer	Colombo N=60	Galle N=60	Kurunegala N=60	Kegalle N=60	Anuradhapura N=60	Total
Chemical Fertilizer %						
T.S.P	2	2	8	5	1	18
Urea	3	4	11	4	4	26
M.O.P	3	2	8	4	1	18
Agro Chemicals %						
Fedanol	8	1	5	1	6	21
Nomini	3	6	7	5	3	24
3-4DPA	5	0	3	6	4	18
M-50	0	7	4	0	2	13

Source: HARTI Field Survey Data, 2014 ***Multiple responses are possible

Although, farmers apply chemical fertilizer, their practice was using a combination of both chemical and non-chemical fertilizer. Farmers had used different variety of organic manure. Considering multiple response given by the farmers, compost (55%), straw manure (50%) and cow dung (41%) were in the first, second and third place respectively (Table 4.9).

Table 4.9: Percentage of Farmers Using Organic Fertilizer and Botanicals

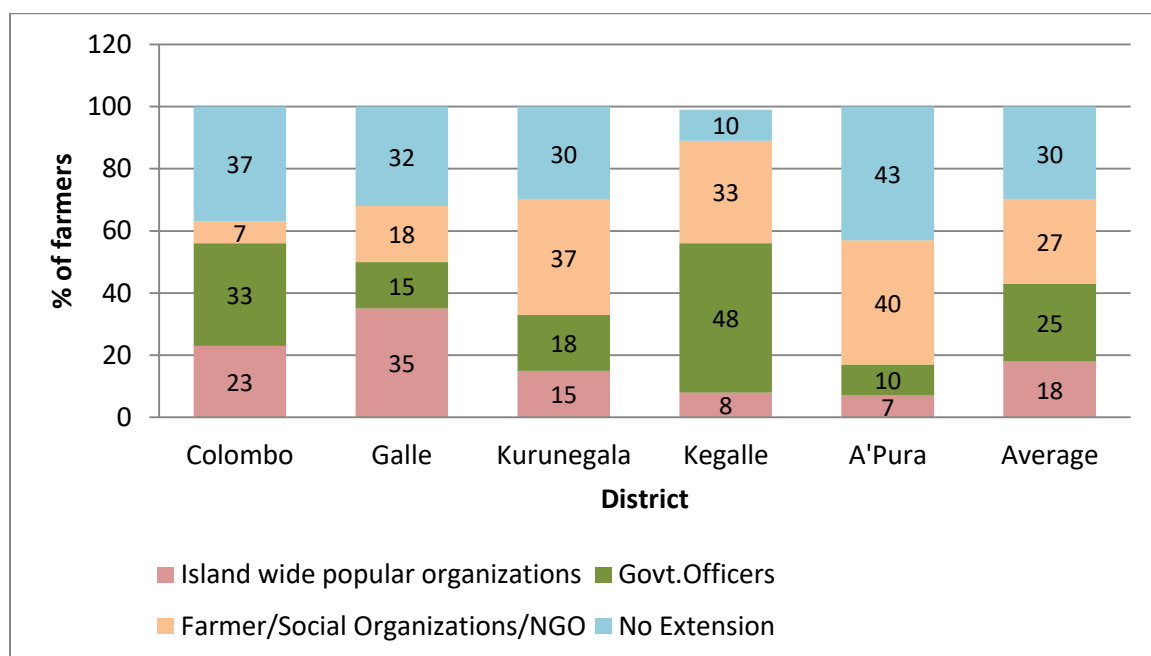
Name of Fertilizer	Colombo N=60	Galle N=60	Kurunegala N=60	Kegalle N=60	Anuradhapura N=60	Average
Organic Fertilizer %						
Compost	61	60	51	45	57	55
Poultry Manure	49	15	44	23	12	29
Goat Manure	10	0	5	6	2	5
Straw Manure	24	46	51	66	64	50
Leaf Fertilizer	20	26	41	74	41	40
Organic Liquid	49	49	10	4	21	27
Cow Dung	31	28	33	62	38	38
Botanicals %						
	N=60	N=60	N=60	N=60	N=60	
Neem Oil	25	65	15	31	0	27
Neem Oil + Tobacco	0	0	0	8	0	2
Home Made Liquid	35	21	85	31	34	41
Neemgro	13	7	0	21	0	8
Cow Urine	5	7	0	0	0	2
Soap + Kerosene	20	0	0	8	34	13
Cinnamon Oil	3	0	0	0	0	0
Cow Urine+ Tobacco	0	0	0	0	32	7

Source: HARTI Field Survey Data, 2014 *** Multiple Responses are Possible

4.2.7 Extension Services

Agricultural extension is one of the major determinants to adopt with any cultivation method. The field survey of this study attempted to capture the extension services that are provided for traditional paddy farming. As a whole, the highest percentage of (30%) farmers still did not receive any extension services and 27% of the total sample had been provided extension services by island wide popular organizations followed by

government officers (25%) and farmer organizations or NGO or social organizations in the particular area (18%). This result indicates that voluntary organizations are major players in providing agricultural extension service. However, government officers were the main agricultural extension service provider in Colombo (33%) and Kegalle (48%). Nationally operating social organizations were leading in Galle (35%) while it was locally operating social organization in Kurunegala (37%) and Anuradhapura (40%) (Figure 4.8). Sri Lanka Army had made an intervention through the Urban Development Authority in Thalawathugoda area in Colombo District. In Kegalle District, two governmental organizations were promoting traditional paddy cultivation. The first was the Department of Agrarian Development. Especially, Development Officer (DO) in Dedigama Agrarian Service Center had done a significant work to spread traditional paddy cultivation. The second was the Department of Irrigation in Kandy. The intervention was done with participatory water and irrigation management programme in Kehel Path Amuna scheme. The Provincial Agriculture Ministry of the North Western province too was promoting traditional paddy farming mainly through distribution of seed. The beneficiaries were able to get seed at a 50% discount rate but this facility was provided only once and the same beneficiary was not served a second time. This situation has limited the expansion of traditional paddy cultivation; sometimes those farmers who did not succeed in the first time had quitting the cultivation.



Source: HARTI Field Survey Data, 2014

Figure 4.8: Percentage of Farmers who Received Extension Service through Different Sources

4.2.8 Cost of Production

The cost of cultivation was calculated for 2013-2014 *Maha* season. The activities that the farmers have to do was same as in non-traditional paddy cultivation such as clearance of canals, land preparation, crop establishment, weed controlling, fertilizer application and harvesting. However, some activities little differed from non-traditional paddy farming methods. Some farmers transplanted instead of broadcasting (Thalawathugoda in Colombo). Meanwhile, farmers in Colombo and Galle used Agrimec for harvesting while the farmers in other districts used combined harvesters. Most of the farmers used natural methods for weed controlling. The majority of farmers applied organic fertilizer and chemicals.

The total cost of production with/without family labour ranged as Rs.37,958.00-Rs.51,914.00/acre and Rs.25,958.00 - Rs.35,763.00/acre respectively. The average yield was between 1113kg - 1275kg/acre. The calculated profit based on above information including and excluding family labour ranged as Rs.16, 517.00 – Rs.38,542.00/acre and Rs.31,017.00- Rs.50,542.00/acre respectively. District wise breakdown of the cost of production is depicted in the Table 4.10.

The highest profit of Rs.39.64/kg excluding family labour was reported in Anuradhapura while the lowest of Rs.27.00/kg was in Galle. The main reason for this gap was maintained by the Total cost and average yield. It was noted that labour was the major component of cost of production accounting for 55% in Kegalle, 49% in Galle, 46% in Colombo, 42% in Anuradhapura and 41% in Kurunegala (Figure 4.10). For further details see Annex 1-5.

Table 4.10: District wise Breakdown of Cost of Production and Profit (Rs) – Maha Season 2013-2014

Description	Colombo	Galle	Kurunegala	Kegalle	A’Pura
Cost for One Acre					
Family Labour	17,000.00	14,500.00	13,000.00	16,600.00	12,000.00
Hired Labour	7,000.00	9,900.00	4,000.00	8,400.00	4,000.00
Inputs	14,134.00	12,373.00	7502.00	5,906.00	5,908.00
Machinery Cost	13,780.00	13,490.00	17,000.00	14,160.00	16,050.00
TC Including Family Labour	51,914.00	50,263.00	41,502.00	450,66.00	37,958.00
TC Excluding Family Labour	34,914.00	35,763.00	28,502.00	28,466.00	25,958.00
Average Yield (Kg/Acre)	1,260.00	1,113.00	1,150.00	1,260.00	1,275.00
Income (Rs.60.00/kg)	75,600.00	66,780.00	69,000.00	75,600.00	76,500.00
Profit Including Family Labour	23,686.00	16,517.00	27,498.00	30,0534.00	38,542.00
Profit Exc. Family Labour	40,686.00	31,017.00	40,498.00	47,134.00	50,542.00
Cost and Profit per/ Kg					
Price of Paddy	60.00	60.00	60.00	60.00	60.0
Cost Including Family Labour	41.20	45.16	36.09	35.77	29.77
Cost Excluding Family Labour	27.71	32.13	24.78	22.59	20.36
Profit Including Family Labour	18.80	14.84	23.91	24.23	30.23
Profit Excluding Family Labour	32.29	27.87	35.22	37.41	39.64

Source: HARTI Field Survey Data, 2014

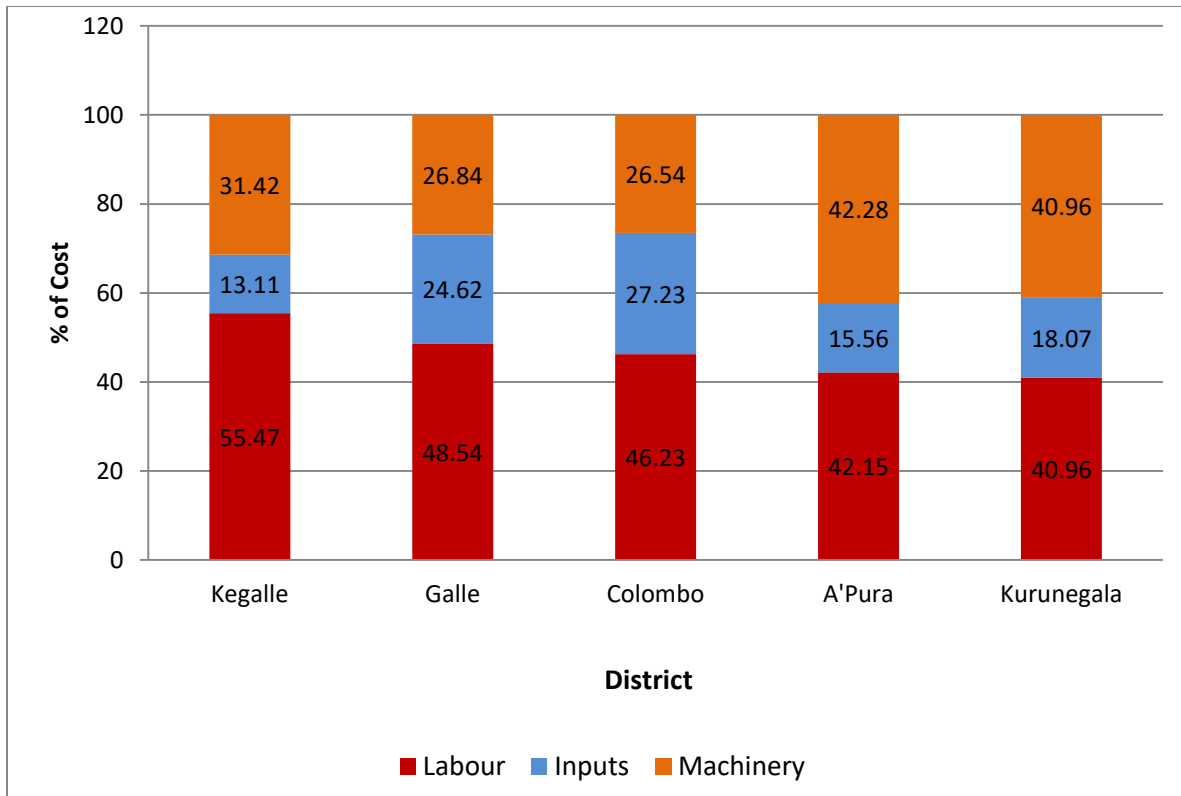
Table 4.11: Cost of Production and Profit (Modern Farming Vs. Traditional Farming)

Description	Traditional Farming (2013/14 Maha)	Modern Farming (2012/13 Maha)
Colombo District		
Total cost of labour	24,000	14,711
Inputs	14,134	7,046
Machinery cost	13,780	15,381
Total cost including family labour	51,914	37,138
Total cost excluding family labour	34,914	22,532
Average yield (kg/Ac)	1,260	1,538
Cost per unit(including family labour) Rs./kg	41.20	24.15
Cost per unit(excluding family labour) Rs./kg	27.71	14.65
Producer price of paddy (Rs./kg)	60.00	30.20
Profit including family labour (Rs./kg)	18.80	06.05
Profit excluding family labour (Rs./kg)	32.29	15.55
Galle District		
Total cost of labour	24,400	24,962
Inputs	12,373	4,905
Machinery cost	13,490	10,098
Total cost including family labour	50,263	39,965
Total cost excluding family labour	35,763	28,708
Average yield (kg/Ac)	1,113	1,384
Cost per unit(including family labour) Rs./kg	45.16	28.88
Cost per unit(excluding family labour) Rs./kg	32.13	20.74
Price of paddy (Rs./kg)	60.00	30.00
Profit including family labour (Rs./kg)	14.84	01.12
Profit excluding family labour (Rs./kg)	27.87	09.26
Kurunegala District		
	Traditional Farming	Modern Farming
Total cost of labour	17,000	18,638
Inputs	7,502	6,371
Machinery cost	17,000	16,730
Total cost including family labour	41,502	41,739
Total cost excluding family labour	28,502	24,789
Average yield (kg/Ac)	1,150	2,273
Cost per unit(including family labour) Rs./kg	36.09	18.36
Cost per unit(excluding family labour) Rs./kg	24.78	10.91

Price of paddy (Rs./kg)	60.00	28.23
Profit including family labour (Rs./kg)	23.91	09.87
Profit excluding family labour (Rs./kg)	35.22	17.32
Kegalle District		
Total cost of labour	25,000	26,633
Inputs	5,906	6,028
Machinery cost	14,160	9,694
Total cost including family labour	45,066	42,355
Total cost excluding family labour	28,466	20,442
Average yield (kg/Ac)	1,260	1,330
Cost per unit(including family labour) Rs./kg	35.77	31.85
Cost per unit(excluding family labour) Rs./kg	22.59	15.37
Price of paddy (Rs./kg)	60.00	30.33
Profit including family labour (Rs./kg)	24.23	-1.52
Profit excluding family labour (Rs./kg)	37.41	14.96
Anuradhapura District		
Total cost of labour	16,000	24,133
Inputs	5,908	7,466
Machinery cost	16,050	11,038
Total cost including family labour	37,958	42,637
Total cost excluding family labour	25,958	31,471
Average yield (kg/Ac)	1,275	1,936
Cost per unit(including family labour) Rs./kg	29.77	22.02
Cost per unit(excluding family labour) Rs./kg	20.36	16.26
Price of paddy (Rs./kg)	60.00	27.69
Profit including family labour (Rs./kg)	30.23	05.67
Profit excluding family labour (Rs./kg)	39.64	11.43

Source: HARTI Field Survey Data, 2014

Table 4.11 shows the gross comparison of the cost and profit of traditional paddy farming and modern farming in selected districts. According to that, though the cost of production of traditional paddy farming was little higher than modern farming, profit for 1kg of traditional paddy was higher than that of new paddy varieties in all the five selected districts.



Source: HARTI Field Survey Data, 2014

Figure 4.9: The Cost Profile of Traditional Paddy Cultivation (in %)

4.2.9 Activity wise Cost Breakdown

The activities in traditional paddy cultivation are divided such as land preparation, broadcasting or transplanting, crop management, harvesting and transportation. The average cost for land preparation was Rs.10,346.00/acre of which Rs.7,346/acre accounted for machinery cost. Nearly three man-days were spent for land preparation and the cost was Rs.3,000. The average cost of broadcasting was about Rs.5,929.00/acre and the labour requirement was as same as in land preparation (3 Man- days). The seed rate was 37-42kg/acre and the price of seed ranged from Rs.60.00-80.00kg/acre. The average cost of crop management (fertilizing + weed, pest disease + water and security) was accounted as Rs. 12,917.00/acre and of which Rs. 4,167.00 was spent for fertilizer and chemicals. Nearly 9 man-days are required for crop management and of which 7 man-days for water management and protection. The average cost of harvesting, drawing and threshing etc was Rs. 13,248.00/acre incurring Rs.6,768.00 as machinery cost. Nearly 7 man-days are required for harvesting, which costs about Rs.7, 000.00 (Table 4.11).

Table 4.12: Activity wise Cost Breakdown (Rs/ac-Average)*

Activity	Man-days			Labour Cost (Rs.)	Machinery Cost (Rs.)	Material Cost (Rs)	Total Cost (Rs)	%
	Family	Hired	Total					
Land Preparation	2.40	1.0	3.0	3,000.00	7,346.00		10,346.00	23
Broadcasting	1.40	1.80	3.20	3,200.00		2,729.40	5,929.40	13
Fertilizing	0.70	0.50	0.80	800.00		4,167.00	4,967.40	11
Weed, Pest, Disease	0.75		0.75	750.00			750.00	1
Water and security	7.20		7.20	7,200.00			7,200.00	16
Harvesting	2.40	4.40	6.80	6,480.00	6,768.00		13,248.00	29
Transport					782.00	2,267.00	782.00	2
Other Cost						2,267.60	2,267.60	5
Total	14.70	6.90	21.60	12,280.00	14896.00	9164.40	45,340.00	100

Source: HARTI Field Survey Data, 2014 *including family labour

4.2.10 Problem Faced by Traditional Paddy Farmers

Although, the traditional paddy cultivation is emerging in the last five years, farmers are facing a number of problems in the field. Especially, the nature of growth of traditional paddy plants in each stage was different from non-traditional. Further, farmers expect more technical assistance in weed and pest control without using agro chemicals. Although, the government was promoting traditional paddy cultivation, it has failed to deliver traditional knowledge and production practices to farmers. However, District Officer in Dedigama Agrarian Development Center has implemented a strong supervision and monitoring system. Meanwhile, Community Camp Programme (C-CAMP-P) in Kegalle district too has appointed extension officers who had a field visiting calendar providing necessary instructions. Island wide popular organizations have trained a limited number of extension persons in each district. Those people were committed and dedicated to expand the traditional paddy cultivation. The present performance which can be observed in the field was the results of those committed people. But there was trouble accessing a wide area. Conducting of training programmes was limited to few people, leaving the farmers' problems unsolved or delaying a solution. As a whole, a poor extension service is the main problem faced by majority of the sample farmers (24%). However, extension service was fairly good in

Colombo District compared to others. Out of 83 responses regarding the problems, only 12% were about poor extension while it was 18-23% in other districts. Low yield was the second problem (15%) faced by the farmers. Low yield is a common and fundamental drawback of traditional rice varieties, even though farmers have some interest in cultivating traditional rice varieties with the understanding of nutritional value with less harm to the environment. The third problem was scarcity of pure seeds (11%). When considering the district wise data, low yield is the highest problem faced by the farmers in Colombo (25%) and Galle (20%) districts. Table 4.12 shows the problems faced by traditional farmers.

Table 4.13: Problems Faced by Traditional Paddy Farmers

Problem	Colombo (%)	Galle (%)	Kurunegala (%)	Kegalle (%)	Anuradhapura (%)	Average (%)
Poor extension	12	18	20	23	22	24
Low yield	25	20	15	18	12	15
Scarcity of pure seeds	12	15	9	16	12	11
Crop damaged by animals	11	9	16	6	7	8
Risk of falling due to height	6	7	11	9	8	8
Scarcity of Organic Fertilizer	5	5	11	8	8	7
Risk	5	9	7	5	6	7
Difficult to harvest	14	7	4	4	11	7
High labour cost	7	9	4	2	8	5
Other	2	1	3	10	6	4

Source: HARTI Field Survey Data, 2014 ***Multiple Responses

CHAPTER FIVE

Results and Discussion of Consumer Survey

5.1 General Characteristics

Consumers are the key to marketing economy. Though their actions differ widely, in total they determine the type and the amount of production. Marketing is aimed at giving consumers what they want at a particular time, in a particular place and in the form they wish. Therefore, it is important to study consumers and their consumption pattern and behavior to further develop traditional rice marketing in Sri Lanka. Hence, we studied 100 consumers in Colombo district, who came to buy traditional rice varieties in retail shops, *pola* and special selling centers etc.

The percentage distribution of general characteristics such as, occupation, religion, gender and monthly income of the sample respondents are shown in Table 5.1. The distribution of the sample based on occupation of the respondents, indicated that the highest percentage (27%) were employed in the private sector. Further the top three slots were occupied by private sector employees, government employees (24%) and retired persons (22%).

Under the gender classification, 56% of the respondents were females and 44% were males reporting women were mostly responsible for the household and food purchasing.

When considering the age category, 30% of the respondents belonged to the category of 50-60 years and 24% of consumers were in the age group of 40-50 years. As a whole, a significant section of consumers (77%) belonged to the age group of 40-70 years. It revealed that the majority of the sample respondents who preferred to buy traditional rice varieties belonged to the older age category.

When analyzing the religion of the sample consumers, Buddhist were a majority (93%), followed by Catholic and Hindu.

When considering the family size, 40% of the respondents belonged to the four (4) member families and 24% belonged to three (3) member families.

Consumers' income determines their purchasing behavior. According to these findings the most of the respondents' (34%) monthly income ranged between Rs.50,000-Rs.75,000 and 22% of respondents' monthly income is more than Rs.100,000. As a whole, 70% of the respondents' monthly income is over Rs.50,000 and on the other hand 22% of consumers' monthly income was more than Rs.100,000. It was revealed that majority of the traditional rice consumers' monthly income was at a satisfactory level.

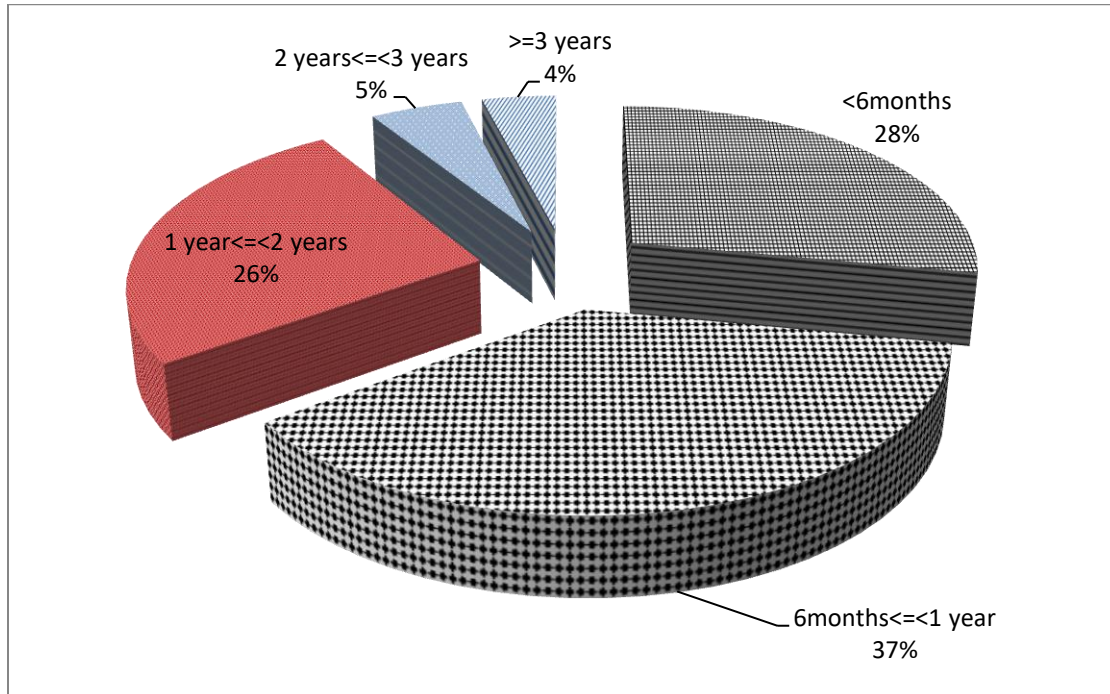
Table 5.1: Percentage Distribution of Socio-economic Features of the Sample Respondents

Category	%` of total sample N=(100)
<i>Occupation</i>	
1.Government sector	24
2.Private sector	27
3.Businessman	19
4.Retired person	22
5. Other (House wife, self-employee etc.)	8
Total	100
<i>Gender</i>	
Male	44
Female	56
Total	100
<i>Age</i>	
age<30	3
30<=age<40	14
40<=age<50	24
50<=age<60	30
60<=age<70	23
age>=70	6
Total	100
<i>Religion</i>	
1.Buddist	93
2.Christian	4
3.Hindu	3
Total	100
<i>No.of family members</i>	
1-2	18
3-4	64
5-6	17
More than 7	1
Total	100
<i>Monthly income (Rs.)</i>	
<15,000	2
15,000<=<25,000	4
25,000<=<50,000	24
50,000<=<75,000	34
75,000<=<100,000	14
>=100,000	22
Total	100

Source: HARTI Field Survey Data, 2014

5.2 Purchasing and Consumption Information

5.2.1 Experience in Traditional Rice Consumption



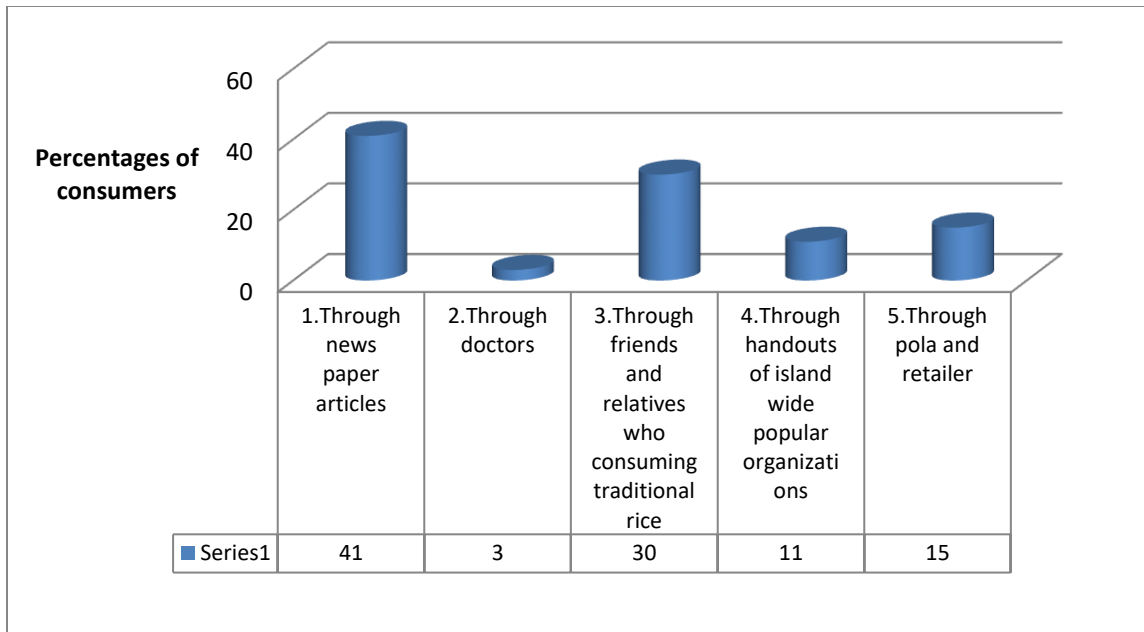
Source: HARTI Field Survey Data, 2014

Figure 5.1: Experience in Traditional Rice Consumption

According to the figure 5.1, majority of the respondents (37%) had experience of more than six months but less than one year (6 months <= 1 year) in consuming traditional rice and 28% of the consumers had less than six months experience in consuming traditional rice. Only 4% of the consumers had more than 3 years' experience in traditional rice consumption. This indicated that about 65% of the consumers had started to consume traditional rice varieties recently (less than one year). It means they had less experience in consuming traditional rice and they were interested and inclined to consume those varieties in the recent past.

5.2.2 Sources of Awareness about Traditional Rice Varieties

Figure 5.2 shows the sources of awareness of consumers about the traditional rice varieties. Accordingly, the highest percentage of consumers (41%) reported that, newspaper articles were the major source of awareness. About 30% of the respondents learned of traditional rice varieties through friends, neighbours and relatives who are consuming traditional rice varieties. Meanwhile, 15% of the consumers reported that *pola* and retailer was the main sources of awareness about traditional rice varieties.



Source: HARTI Field Survey Data, 2014

Figure 5.2: Sources of Awareness about the Traditional Rice Varieties

5.2.3 Preferred Rice Varieties and Reasons for the Consumption

According to the Table 5.2, *Suwandel* is the most popular and most purchased varieties and 77% consumers reported that they preferred *Suwandel*. *Kuruluthuda* rice variety placed second with 34% consumers preferring it. *Heenati*, (24%) *Madathawalu* (21%) and *Pachchaperumal* (19%) came third, fourth and fifth preferred varieties respectively.

Table 5.2: Preferred Rice Varieties by Consumers

Rice variety	% of total sample
1. Suwandel	77
2. Kahawanu	12
3. Kuruluthuda	34
4. Pachchaperumal	19
5. Madathawalu	21
6. Heenati	24
7. Pokkali	5
8. Dahanala	1
9. Dikwee	1
10. Mawee	14
11. Rath Suwandel	8
12. Unakola samba	4
13. Other	1

Source: HARTI Field Survey Data, 2014 ***Multiple Responses

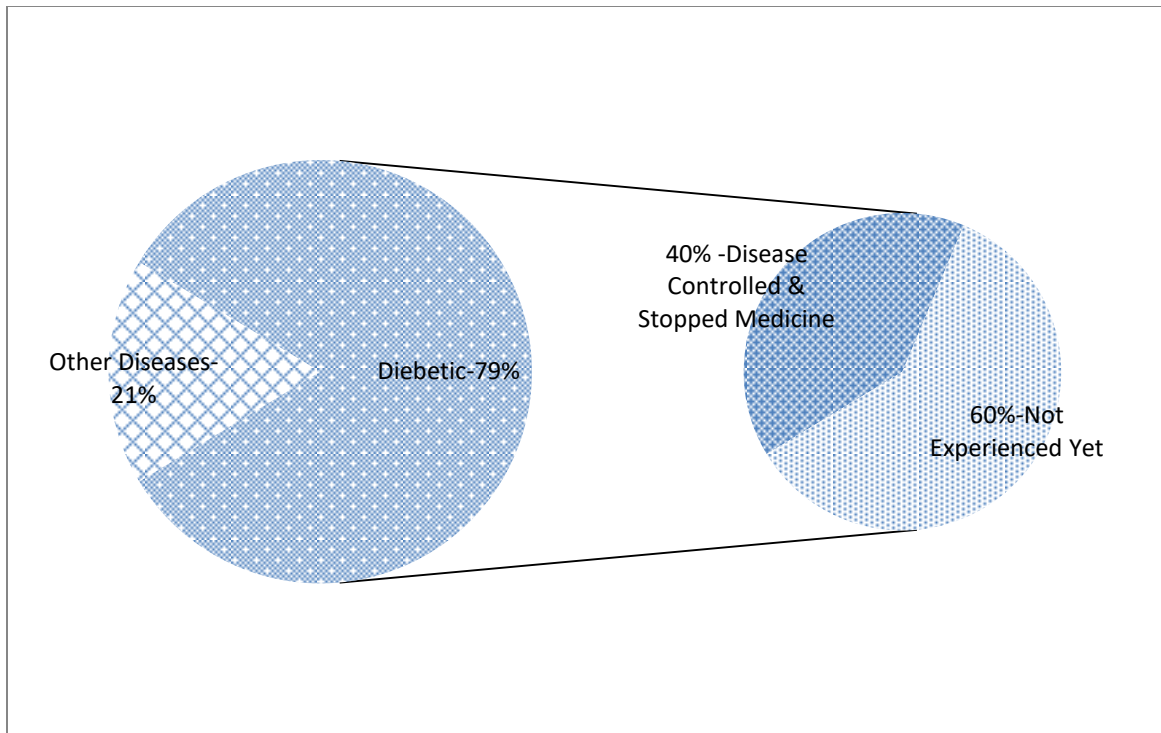
Table 5.3 depicts the reasons for the preference of different rice varieties. Of those consumers, 61% reported that they prefer *Suwandel* due to its high nutritional value and 26% reported that they prefer it due to its good taste and color (White color). Among the consumers who preferred *kuruluthuda*, 41% preferred it due to high nutritional value, 35% used it as a disease prevention solution, 24% reported that taste is the reason. However, of the consumers who preferred *Heenati*, *Madathawalu* and *Pachchaperumal* rice varieties, more than 82% of consumers reported that they used that rice varieties mainly as for solution to prevent certain diseases.

Table 5.3: Reasons for Buying Those Varieties

Rice Varieties	High Nutrition Value (%)	Solution to Prevent some Diseases (%)	Taste and Colour (%)
1.Suwandel(N77)	61	13	26
2.Kahawanu(N12)	67	8	25
3.Kuruluthuda(N34)	41	35	24
4.Pachchaperumal (N19)	16	84	0
5.Madathawalu (N21)	5	95	0
6.Heenati (N24)	13	83	4
7.Pokkali (N5)	20	80	0
8.Dahanala (N1)	100	0	0
9.Dikwee (N1)	0	0	100
10.Mawee (N14)	71	29	0
11.Rath Suwandel (N8)	100	0	0
12.Unakola samba (N4)	50	25	25
13.Other (N1)	100	0	0

Source: HARTI Field Survey Data, 2014

According to the above table, a considerable percentage of consumers in the sample consumed traditional rice varieties as a solution of counter certain diseases. Of these consumers, 79% reported that they used that rice varieties as a solution for diabetes and 21% reported that they used traditional rice to prevent other diseases. This situation is shown in Figure 5.3.



Source: HARTI Field Survey Data, 2014

Figure 5.3: Major Diseases and Experience of Cure Diseases

We inquired about the results or outcome of consuming traditional rice varieties, from those consumed it as a solution for diabetes. Of them, 40% reported that their disease was controlled and they stopped taking medicine after started consuming traditional rice varieties and 60% pointed out that they did not witness any remarkable results yet because they started consuming it recently.

Case Study 1

Prof. Sagara Karunathilaka is a doctor in Homagama who has cured numerous patients around the world and Sri Lanka by with Osteopathy and Healingpathy. He had been using traditional rice for more than 10 years and he thoroughly believes that there is more positive results due to consuming traditional rice varieties and he recommends for some traditional rice varieties even for his patients. According to him the patients also got positive results by consuming those.

Case Study2

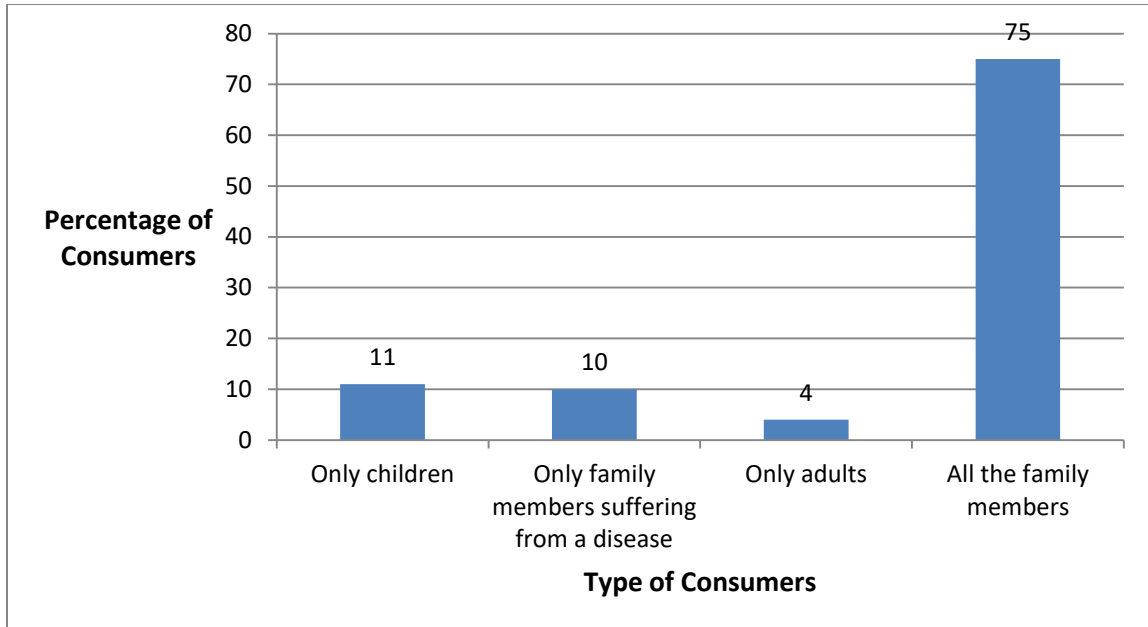
Mrs. Ayoma Rathnayaka is a nurse of Kalubowila hospital. She has been using Soduheenati and kurakkan porridge for several months. After started consuming this porridge her cholesterol level has decreased and now she has stopped medicine taken to control the high cholesterol.

Case Study 3

Mr.A.M.D. Aangama living in Devalawatta, Muruthenge, Kurunegala is a farmer. He is 66 years old and he had been suffering from diabetes for the past 17 years and under medication. He also consumed red raw rice during that period. However, as a farmer, he started to cultivate Pachchaperumal rice (a traditional rice variety) since 2009 and he had been having it daily. After six months from the start, his sugar level dropped to 82. Now he is not having medicine and he firmly believes that consumption of pachchaperumal rice is the main reason for that.

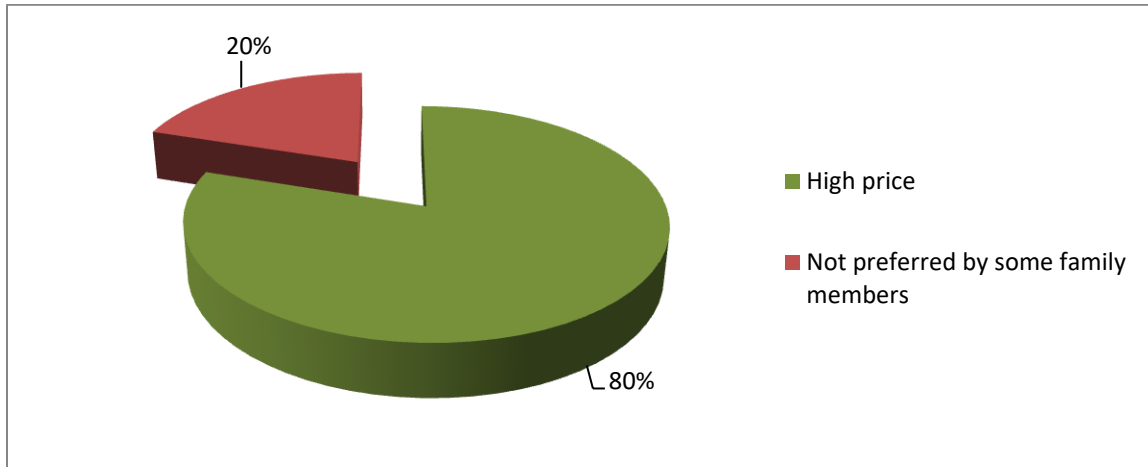
5.2.4 Traditional Rice Consumption

As shown in Figure 5.4, 75% of the consumers purchase traditional rice varieties for the domestic consumption and 11% reported that they purchased it only for their children and 10% only for a family member suffering from a disease. The results revealed that there is a good trend of consuming traditional rice varieties among all the family members in the sample. However, 25% consumers purchased traditional rice only for their children, only for a family member who suffering from a disease or only for adults. The main reason for that was the high price of traditional rice varieties and 80% of the consumers admitted it while the 20% reported that the reason is less preference for traditional rice among some family members. Figure 5.5 shows that situation.



Source: HARTI Field Survey Data, 2014

Figure 5.4: Traditional Rice Consumption



Source: HARTI Field Survey Data, 2014

Figure 5.5: Reasons for not Consuming Traditional Rice Varieties by All Family Members

5.2.5 Purchasing Information of Traditional Rice Varieties

5.2.5.1 Quantity

About 40% of the respondents purchased less than 5kg of traditional rice varieties per month for their consumption while 36% purchased more than 5kg- less than 10kg of rice per month. Around 6% of the respondents purchased more than 20kg per month. However, this result revealed that 76% of the consumers purchased 5-10kg of traditional rice varieties per month. Table 5.4 depicts the above results.

Table 5.4: Purchased Quantity per Month

Quantity	N	%
<5kg	40	40
5<=<10	36	36
10<=<15	14	14
15<=20	4	4
>20	6	6
Total	100	100

Source: HARTI Field Survey Data, 2014

5.2.5.2 Frequency of Purchase and Average Quantity

According to the Table 5.5, 50% of the consumers purchased traditional rice varieties once a week and they have purchased 5kg of rice as an average quantity per week. About 33% of the respondents purchased traditional rice once a month and the average rice quantity they purchased was about 8kg.

Table 5.5: Frequency of Purchase and Average Quantity

Frequency	N	%	Average quantity (kg)
Several times per week	2	2	4.64
Once a week	50	50	4.79
Fortnightly	5	5	5.67
Once in three weeks	10	10	1.00
Once a month	33	33	8.42
Total	100	100	

Source: HARTI Field Survey Data, 2014

5.2.5.3 Chi-square Tests on Demographic Factors and Purchasing Behavior

Table 5.6: Chi-square Tests

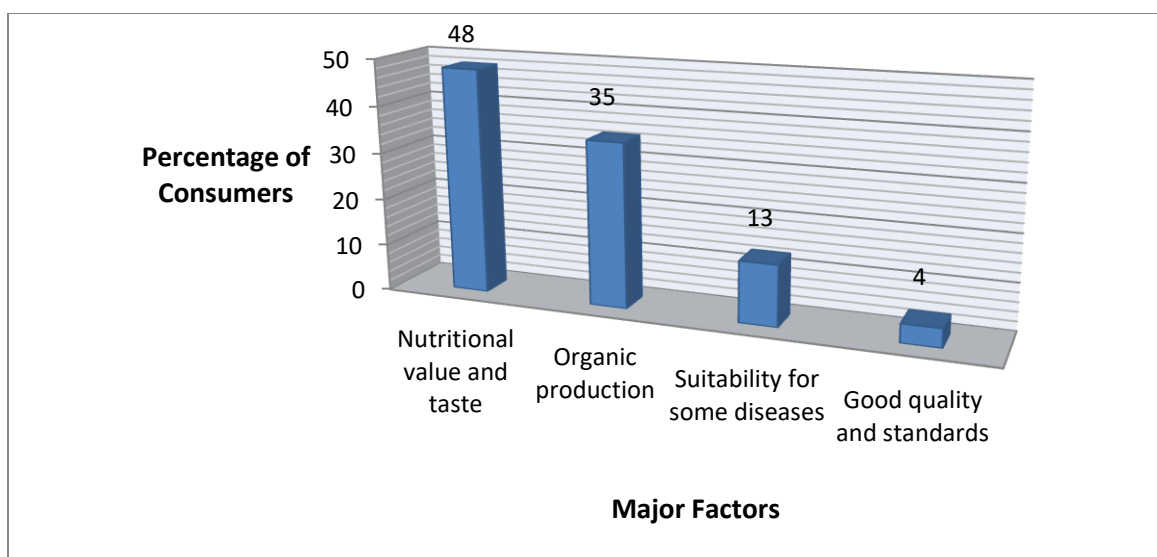
Variables	Groups	N	P	Decision
Quantity of rice purchased per month	Gender	100	0.447	Not significant
	Religion	100	0.326	Not significant
	Occupation	100	0.263	Not significant
	Monthly income	100	0.032	Significant
	Number of family members	100	0.008	Significant
Frequency of purchase	Gender	100	0.479	Not significant
	Religion	100	0.695	Not significant
	Occupation	100	0.648	Not significant
	Monthly income	100	0.423	Not significant
	Number of family members	100	0.014	Significant

Source: HARTI Field Survey Data, 2014

The relationship of demographic factors with the purchasing behavior of the respondents was analyzed using chi-square tests (Table 5.6). The results revealed that only monthly income and number of family members had a significant relationship with the quantity of monthly purchased rice and other factors had no relationship with that. When considering the frequency of purchasing rice, only the number of family members had a significant relationship.

5.2.5.4 Major Factors Considered by the Consumers when Purchasing Traditional Rice Varieties

According to the Figure 5.6, 48% of the consumers mainly consider about the nutritional value and taste of the traditional rice when purchasing those varieties. While 35% of the consumers study its organic value and 13% consider about its disease prevention ability, only 4% think about the quality and standards.

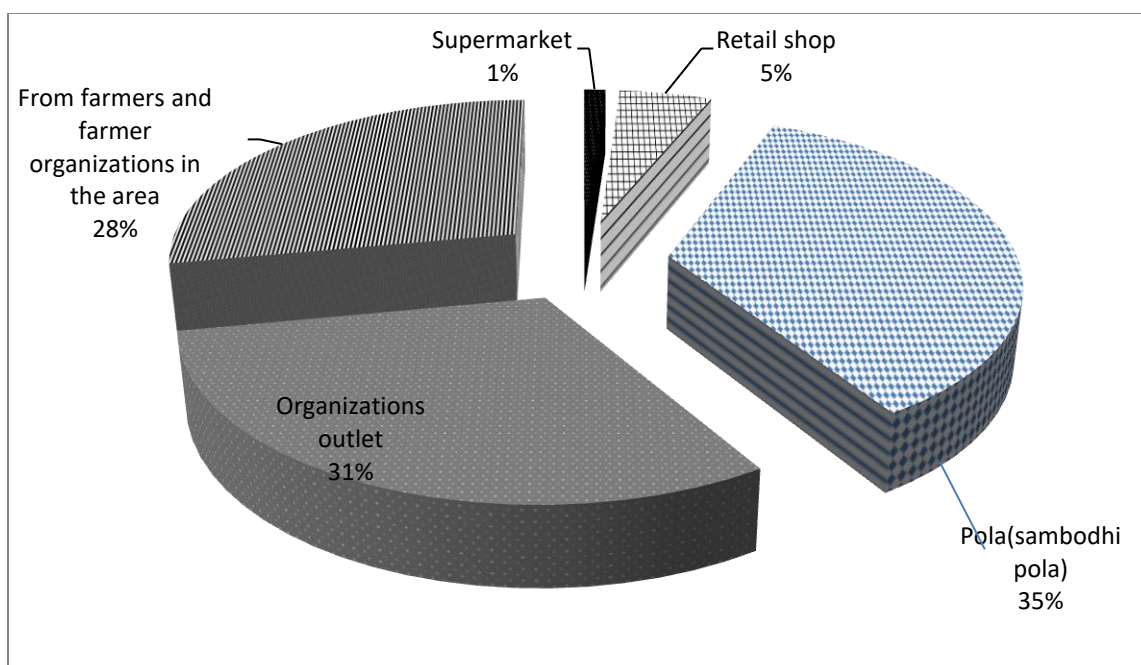


Source: HARTI Field Survey Data, 2014

Figure 5.6: Major Factors Considered by Consumers when Purchasing Rice

5.2.5.5 Sources of Purchasing Traditional Rice Varieties

As mentioned in the methodology chapter, we purposively selected consumers who purchased traditional rice at their purchasing point itself. We selected consumers from the following sources and it is presented in Figure 5.7. However, 58% of the consumers reported that they purchased traditional rice varieties regularly only from that place where they mentioned above and 42% noted that their purchasing point has changed overtime.



Source: HARTI Field Survey Data, 2014

Figure 5.7: Sources of Purchase

As mentioned earlier, 58% of the consumers generally purchase traditional rice varieties from the same place. In other words, they have not changed their purchasing place time to time. The main reason for that is trustworthiness and 51% of those consumers reported the same. They trust, good quality and authentic traditional rice were available in those places where they normally buy. About 27% of the consumers cited availability as the main reason while 18% resorted to proximity. This situation is depicted in the Table 5.7.

Table 5.7: Reasons for Selecting Same Sources for Purchasing

Reasons	Responses	
	N=58	%
Trustworthiness	42	51
Availability	22	27
Proximity	15	18
Lower prices	3	3
Reputation	1	1
Total	83	100

Source: HARTI Field Survey Data, 2014

5.3 Time of Consumption of Rice and Way of Using

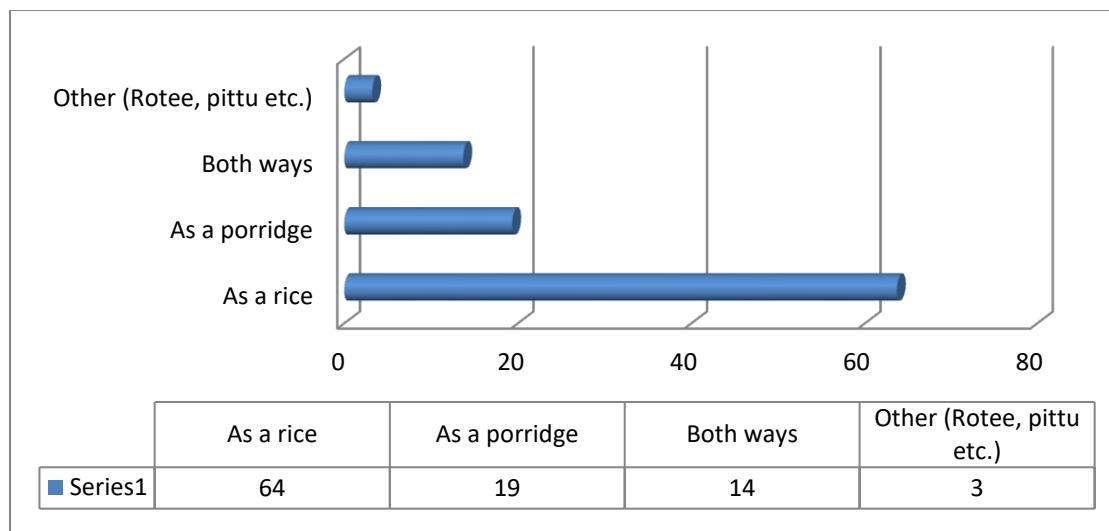
According to the Table 5.8, 50% of the respondents consumed traditional rice varieties in two main meals a day (breakfast and lunch). About 22% of the consumers consumed those varieties only for breakfast while 13% used it in main three meals per day, 10% used it for only lunch and 5% only for dinner.

Table 5.8: Time of Consumption

Time	Responses % (N=100)
Breakfast only	22
Lunch only	10
Dinner only	5
Two main meals (Breakfast & Lunch)	50
For all the three meals	13
Total	100

Source: HARTI Field Survey Data, 2014

When considering the way of consumption, 64% of the consumers consumed traditional rice as rice while the 19% used it in porridge and 14% consumed it in both ways as rice and porridge. Only 3% used it in making other foods such as, *pittu*, *roti*, in the form of rice flour. Figure 5.8, shows that situation.



Source: HARTI Field Survey Data, 2014

Figure 5.8: The Ways of Using Traditional Rice Varieties

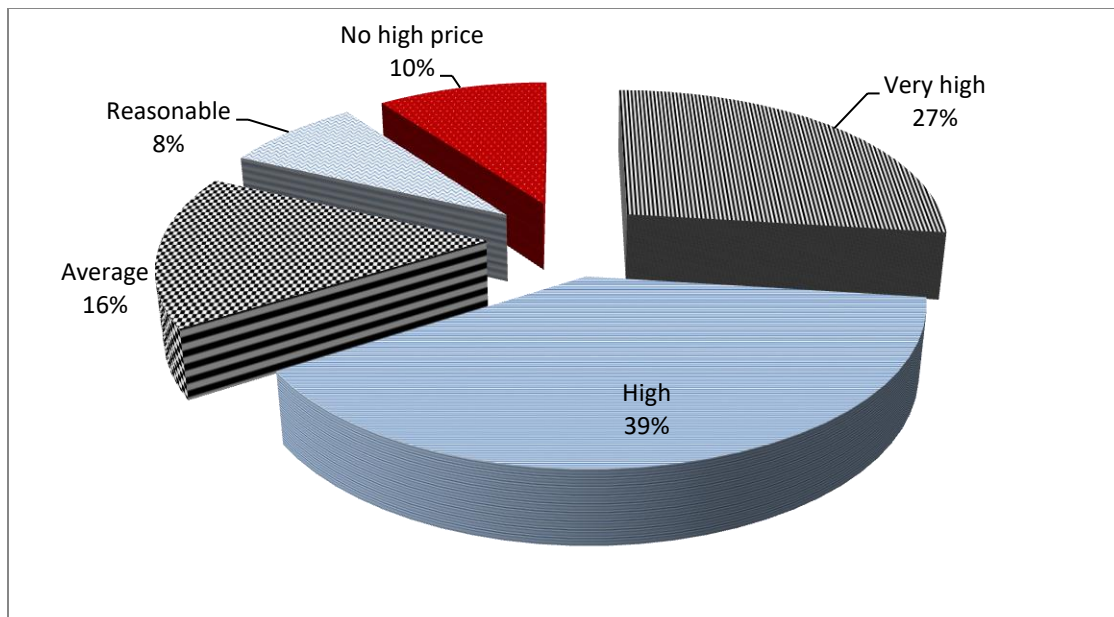
5.4 Consumers' Idea about Some Characteristics of Traditional Rice Varieties

Table 5.9 presents the consumers' opinion about some special characteristics of different traditional rice varieties, using the Likert scale technique and scores given by the respondents. With *Suwandel* rice the respondents attached the highest mean score (4.86) for aroma, followed by taste (4.77) and keeping quality (4.15). Its mean according to the respondents, aroma, taste and keeping quality of *Suwandel* rice variety is very high. However, the situation is much different for *Kahawanu*, *Heenati* and *Ma vee* rice varieties and consumers attribute the highest mean score based on taste and mean scores reported as (4.71), (4.35) and (4.5) respectively. The highest score for swelling capacity was recorded of *Kuruluthuda*, *Madathawalu*, *Pokkali* and *Unakolasamba*. For *Pachchaperumal* and *Rathsuwandel*, the respondents attached highest mean score for the keeping quality. Similarly, for all the rice varieties the lowest mean score was reported for the price. That indicates the price is very high or in the high category. The figure 5.9 shows the respondents' idea towards the price.

Table 5.9: Mean Scores for the Idea of Consumers' on the Special Characteristics of Traditional Rice Varieties

Rice variety	Characteristics						
	Price	Taste	Aroma	Keeping quality	Swelling capacity	Texture	Easy to cook
	Mean Scores						
1.Suwandel	2.27	4.77	4.86	4.15	3.94	3.81	3.71
2.Kahawanu	1.71	4.71	3.29	3.67	3.71	4.00	3.71
3.Kuruluthuda	2.52	4.33	3.46	4.14	4.65	3.00	2.92
4.Pachchaperumal	2.56	3.88	3.35	4.31	3.87	2.71	2.65
5.Madathawalu	2.26	4.06	3.68	4.12	4.33	2.39	2.95
6.Heenati	2.57	4.35	3.95	4.06	4.29	2.70	3.05
7.Pokkali	3.00	4.33	3.00	4.33	5.00	2.25	2.50
8.Dahanala	2.00	5.00	5.00	5.00	1.00	2.00	2.00
9.Mavee	1.50	4.50	4.27	4.22	3.20	2.60	2.80
10.Rath suwandel	2.22	4.10	3.56	4.43	3.90	2.30	2.80
11.Unakola samba	2.67	4.50	4.00	4.33	5.00	3.50	3.25

Source: HARTI Field Survey Data, 2014

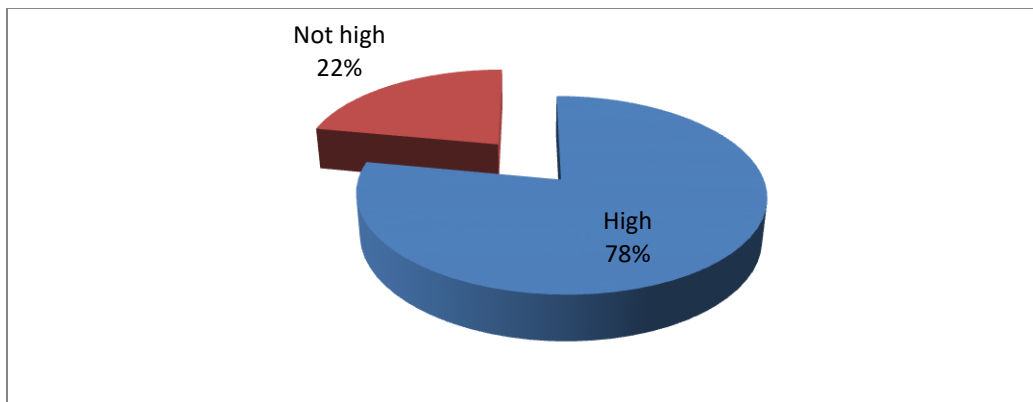


Source: HARTI Field Survey Data, 2014

Figure 5.9: Consumers' Idea towards the Price

According to the Figure 5.9, 39% of the consumers reported that the price of traditional rice is high while 27% of the consumers reported that the price is very high. It is revealed that 66% of the respondents think the price of traditional rice varieties is in a higher level and difficult to afford. However, 18% of the consumers said that it is reasonable and not high when compared to its nutritional value.

Further, we questioned about the swelling capacity of the traditional rice varieties. According to the Figure 5.10, 78% of the consumers reported that compared to the other rice varieties swelling capacity of traditional rice varieties is very high. It means generally 1kg of traditional rice variety can serve more people than that of other rice varieties.

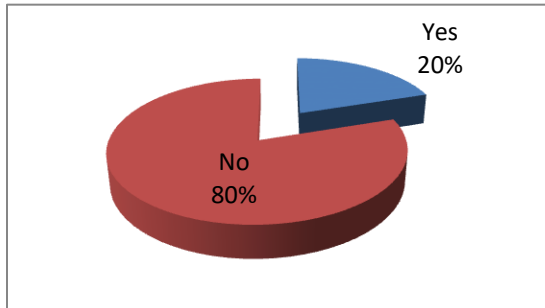


Source: HARTI Field Survey Data, 2014

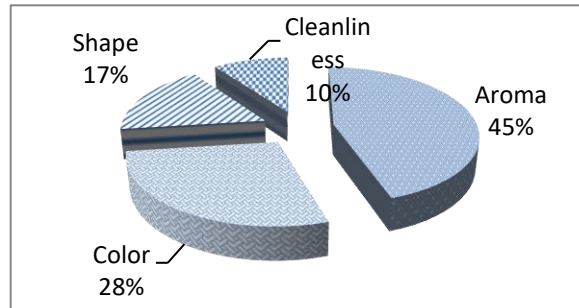
Figure 5.10: Swelling Capacity

5.5 Identification of the Traditional Rice Varieties with Other Rice Varieties and the Way of Identification

According to the Figure 5.11, 80% of the consumers reported that they could not differentiate the traditional rice varieties from other rice varieties. However 20% of the consumers reported that they could identify the traditional rice varieties.



Source: HARTI Field Survey Data, 2014



Source: HARTI Field Survey Data, 2014

Figure 5.11: Identification of Traditional Rice

Figure 5.12: Way of Identification

According to the Figure 5.12, of the consumers who can identify traditional rice varieties from other varieties, 45% reported that they identified it by its aroma. Further 28% of the respondents reported that they identified by its color and 17% by its shape and 10% by its cleanliness.

5.6 Problems Faced by the Consumers

According to the Table 5.10, 41% of the consumers reported that low availability of rice and lack of selling centers is the main problem when they purchased traditional rice

varieties. About 35% of the consumers noted that there is no way to identify pure traditional rice varieties. High price came next and it was reported by 30% of the consumers. No organic or standard certification (20%), low keeping quality as subject to the rice weevil attack (12%), lack of awareness programme (8%) were cited respectively.

Table 5.10: Problems Faced by the Consumers

Problems	Responses %
1.Low availability of rice varieties and lack of selling centers	41
2.No way to identify pure traditional rice varieties	35
3.Comparatively higher price	30
4.No organic certification or standards	20
5. low keeping quality as easily damaged by rice weevil	12
6. Lack of awareness programmes	8
7. Lack of uniformity in for the same rice variety	4
8.Long cooking time	2

Source: HARTI Field Survey Data, 2014 ***Multiple Responses

5.7 Consumers' Suggestions to Improve the Traditional Rice Sector

As shown in Table 5.11, the highest percentage of consumers (64%) pointed out that price should be decreased to a reasonable level. Further, 39% of the consumers reported that rice varieties and quantities should be increased. About 20% of the consumers suggested that the government policy must be strong to develop that sector and bringing in quality assurance. Launching awareness programmes on the nutritional values of traditional rice varieties over media is the fourth important idea suggested by the consumers. The last important suggestion is imposition of rules and regulations to stop adulteration of traditional rice varieties in the market.

Table 5.11: Consumers' Suggestions

Suggestions	Responses %
1.Price should be decreased to a reasonable level	64
2.Increasing the rice varieties and quantities	39
3.Government policy must be strong to develop and introduce quality assurance for this sector	20
4. Awareness programmes about its nutritional values must be launched	18
5.Rules and regulations must be imposed to develop this sector	6

Source: HARTI Field Survey Data, 2014 ***Multiple Responses

5.8 Using Traditional and Other Rice Varieties

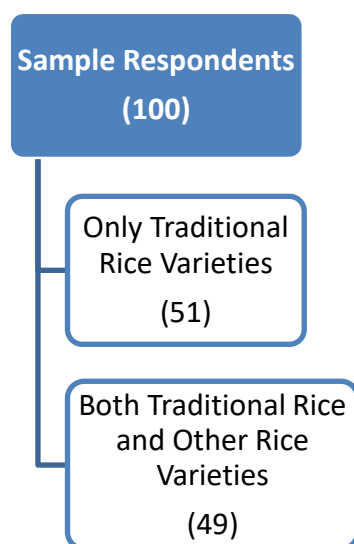


Figure 5.13: Using Traditional Rice Varieties and Other Rice Varieties

Table 5.12: Other Rice Varieties

Rice Variety	Responses %
Red raw	47
Ponni samba	20
White raw	12
Keeri samba	6
Basmathi	6
Samba	8
Nadu	12
Red samba	4
Kora	4

Source: HARTI Field Survey Data, 2014 ***Multiple Responses

According to the Figure 5.13, 51% of the consumers consume only traditional rice varieties and 49% consume both traditional and other rice varieties. Among the consumers who consume both varieties, 47% consume red raw rice and 20% consume *Ponni samba*. The Table 5.12 depicts the other rice varieties consumed by the respondents.

CHAPTER SIX

Marketing of Traditional Rice Varieties

6.1 Marketing Information of Farmers

When considering the farmers who sell traditional paddy varieties in any forms such as seed paddy, paddy or rice forms, they sold limited stocks compared with the production in Colombo, Galle and Kegalle districts while the farmers in Anuradhapura and Kurunegala districts sold a considerable amount out of the total production. In Colombo district out of the total production, 18% of the harvest had been sold in *Yala* season and about 22% of the production had been sold in *Maha* season. In Galle district, 2% of the harvest out of the total production had been released to the market in *Yala* season and 18% had been issued to the market in *Maha* season. About 41% of the production in *Yala* season and 65% of the production in *Maha* season had been sold to the market by farmers in Kurunegala district and in Kegalle district, 22% of the production in *Yala* and 24% of the production in *Maha* had been released to the market by the sample respondents. Of the five districts Anuradhapura is the main district which released traditional paddy stocks to the market in any form in *Yala* season followed by Kurunegala district while a higher amount of production in *Maha* season was reported in Kurunegala district followed by Anuradhapura district. However, in Anuradhapura district, 55% of the production in *Yala* season and 62% of the production in *Maha* season had been sold to the market by the sample respondents. This situation is depicted in the Table 6.1.

Table 6.1: Selling Amount of Traditional Rice out of the Total Production

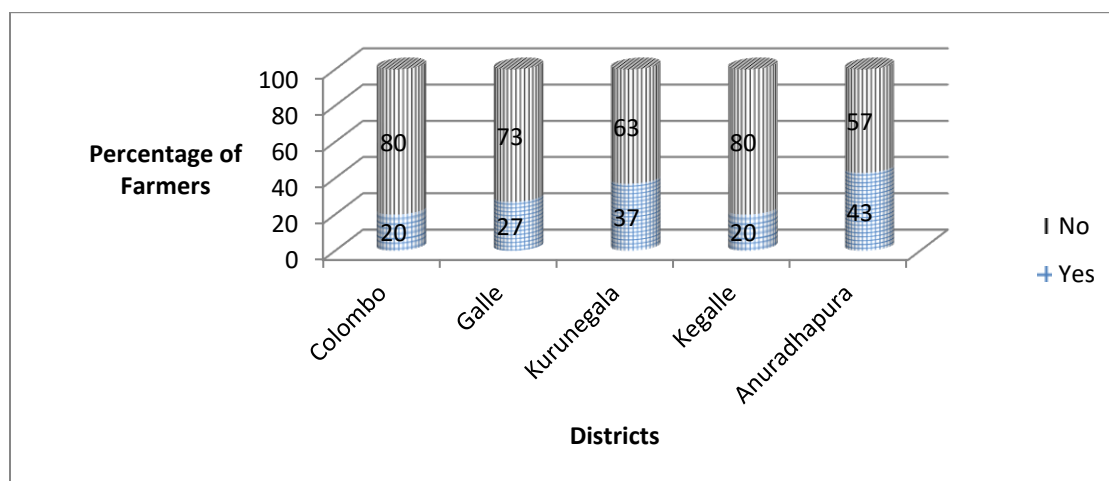
District	<i>Yala</i> Season (% of Selling Amount out of the Total Production)	<i>Maha</i> Season (% of Selling Amount out of the Total Production)
Colombo	18.14	21.71
Galle	2.12	18.46
Kurunegala	41.29	65.26
Kegalle	22.12	24.27
Anuradhapura	55.07	62.12

Source: HARTI Field Survey Data, 2014

6.1.1 Selling of Seed Paddy

According to the Figure 6.1, only 20% of the farmers in Colombo, 27% farmers in Galle, 37% farmers in Kurunegala, 20% in Kegalle and 43% in Anuradhapura districts sell their

paddy as seed. However, majority of the farmers in all the five districts (71%), do not sell their paddy as seed.



Source: HARTI Field Survey Data, 2014

Figure 6.1: Selling of Seed Paddy by Farmers

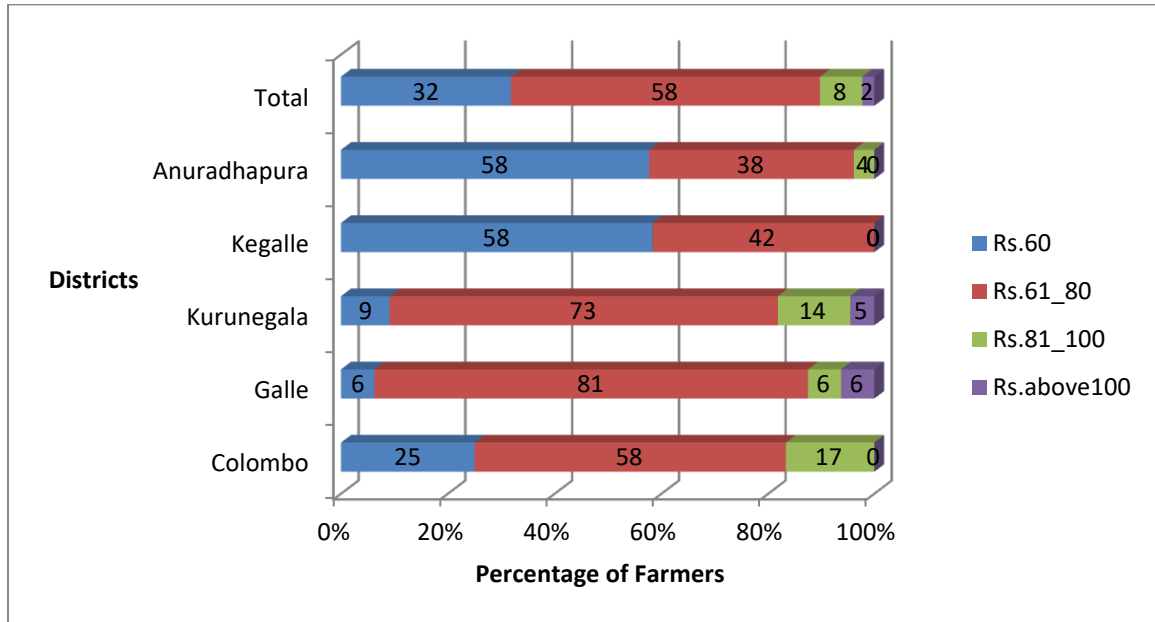
Majority of the farmers who sell their paddy for seeds in Colombo (67%), Galle (75%), Kurunegala (45%) and Anuradhapura (38%) sell their seed paddy to other farmers in the area while the majority of the farmers (50%) in Kegalle district sell their seed paddy to the social organization or farmer organization in the particular area. As a whole, 49% of the farmers sell their seed paddy to the farmers in the area and 31% sell their seed paddy to social or farmer organization and 11% sell their seed paddy to popular organizations island wide. The following table depicts the situation.

Table 6.2: Sources of Selling Seed Paddy

Sources	Colombo		Galle		Kurunegala		Kegalle		Anuradhapura		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
To farmers	8	67	12	75	10	45	3	25	10	38	43	49
To island wide popular organizations	2	17	1	6	2	9	2	17	3	12	10	11
To social or farmer organizations	2	17	3	19	8	36	6	50	8	31	27	31
To DS office or agricultural office	0	0	0	0	2	9	1	8	5	19	8	9
Total	12	100	16	100	22	100	12	100	26	100	88	100

Source: HARTI Field Survey Data, 2014

According to the Figure 6.2, 58% of the farmers in Colombo, 81% in Galle, 73% in Kurunegala sell their seed paddy at the range of Rs.61.00- 80.00/kg and 58% of the farmers in both Kegalle and Anuradhapura sell their seed paddy at about Rs.60.00/kg. As a whole, 90% of the farmers in all the five districts sell their seed paddy at a price of Rs.60.00-80.00/kg.

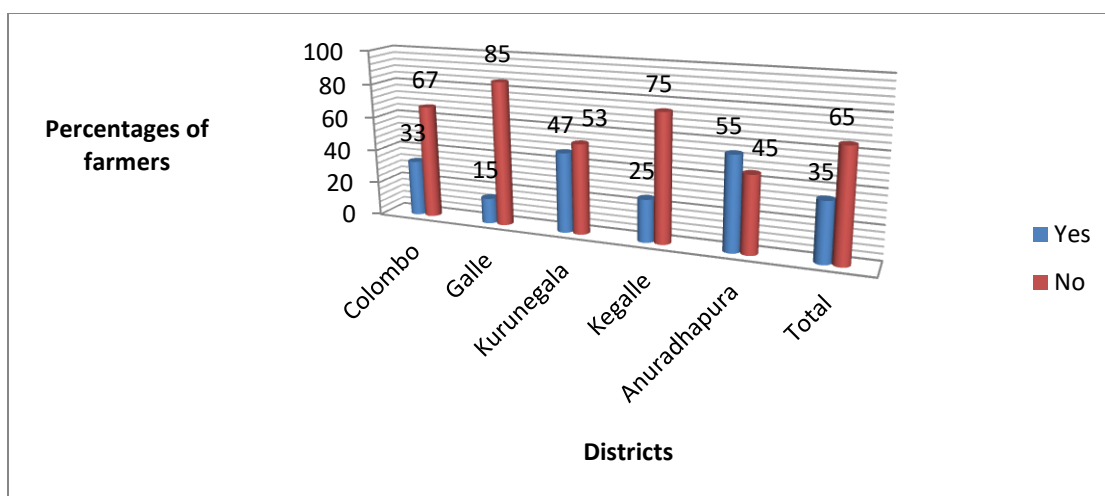


Source: HARTI Field Survey Data, 2014

Figure 6.2: Selling Price of Seed Paddy

6.1.2 Selling of Paddy

According to the Figure 6.3, 33% of the farmers in Colombo, 15% in Galle, 47% in Kurunegala, 25% in Kegalle and 55% of the farmers in Anuradhapura districts have issued their traditional paddy stocks to the market. The highest percentage of farmers who sell their paddy stocks was reported in Anuradhapura district followed by Colombo, Kurunegala and Kegalle while the lowest paddy selling farmers was reported in Galle (15%). As a whole, out of the total respondents (300), 35% of the farmers sell their paddy to the market while majority of the farmers (65%) do not sell their traditional paddy but reserve it for their consumption.



Source: HARTI Field Survey Data, 2014

Figure 6.3: Selling of Traditional Paddy by Farmers

Table 6.3 depicts the paddy varieties sold by the farmers in each district. In Colombo district, the highest percentage of farmers sell *Suwandel and Kuruluthuda* (44%), followed by *Madathawalu* (33%). In contrast, *Madathawalu, Kuruluthuda, and Velihandiran* (33%) were the highest selling varieties by farmers in Galle district. In Kurunegala district, *Suwandel* came first (57%) followed by *Pachchaperumal* (32%). *Kahawanu* (47%) came first in Kegalle district and *Madathawalu* came next. In Anuradhapura district, *Suwandel* (45%), *Kuruluthuda* (27%), *Heenati* (21%) and *Pachchaperumal* were the most important paddy varieties sold by farmers. As a whole, the highest selling paddy variety is *Suwandel* (29%), followed by *Kuruluthuda* (17%), *Madathawalu* (13%), *Pachchaperumal* (11%) and *Kahawanu* (10%).

Table 6.3: Paddy Varieties

Variety	Colombo N=20		Galle N=9		Kurunegala N=28		Kegalle N=15		Anuradhapura N=33		Total N=105	
	N	%	N	%	N	%	N	%	N	%	N	%
Suwandel	8	44	1	17	16	57	2	13	15	45	42	29
Pachchaperumal	1	6	0	0	9	32	1	7	5	15	16	11
Madathawalu	6	33	2	33	5	18	4	27	1	3	18	13
Kuruluthuda	8	44	2	33	5	18	0	0	9	27	24	17
Heenati	1	6	1	17	1	4	0	0	7	21	10	7
Velihandiran	3	17	2	33	1	4	1	7	4	12	11	8
Kahawanu	2	11	1	11	1	4	7	47	3	9	14	10
Gonabaru	1	6	0	0	1	4	0	0	4	12	6	4
Gurusinghe wee	1	6	0	0	0	0	0	0	1	3	2	1
Total	31	100	9	100	39	100	15	100	49	100	143	100

Source: HARTI Field Survey Data, 2014

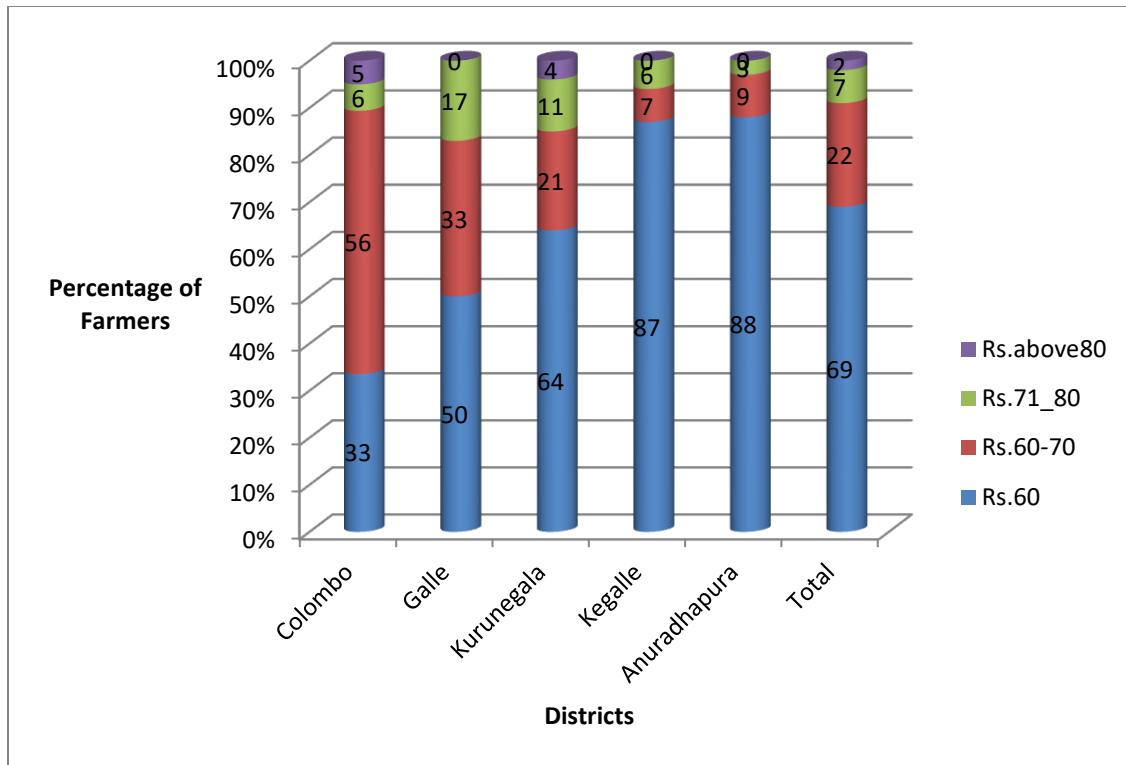
Majority of the farmers (58%) who sell their paddy stocks to the market in all the five districts, sell their paddy to the social or farmer organizations particular in the area and it was recorded as 35% of the farmers in Colombo, 45% in Galle, 67% in Kurunegala, 63% in Kegalle and 69% in Anuradhapura districts. In Colombo district, 31% of the farmers sell their paddy stocks to the neighbours or relatives and 28% sell to popular organizations island wide. In Galle second and third highest percentage of farmers sell their stocks to the DS office or agricultural office and popular organizations island wide. In Kurunegala, the second highest percentage of farmers sells their stocks to the neighbours or relatives and 11% sell to the DS office. In Kegalle the second highest percentage of respondents, sell paddy to DS office and in Anuradhapura district, farmers sell paddy to popular organizations island wide. The following table depicts the above situation.

When considering the selling price, 60% of the farmers in Colombo district sell their paddy stocks at the range of Rs.61.00-70.00/kg and 30% of the respondents sell their paddy at about Rs.60.00/kg. The similar situation reported in Galle district and 56% of the farmers sell their paddy stocks at the price range of Rs.61.00-70.00/kg and 33% sell it at about Rs.60.00/kg. However, the situation is much different in Kurunegala, Kegalle and Anuradhapura districts and highest percentage of farmers in these three districts sell their paddy stocks at about Rs.60.00/kg and second highest percentage of farmers sell paddy at the range of Rs.61.00-70.00/kg. When considering the five districts as a whole, majority of the sample farmers (66%) sell their paddy stocks at the price of Rs.60.00/kg and 25% sell their paddy at the price range of Rs.61.00-70.00/kg. Figure 6.4 shows that situation.

Table 6.4: Selling Sources of Paddy

Name /Institute	Colombo N=20		Galle N=9		Kuruneg ala N=28		Kegalle N=15		Anuradha pura N=33		Total N=105	
	N	%	N	%	N	%	N	%	N	%	N	%
Island wide popular organizations	9	28	2	22	1	3	1	6	10	24	23	17
DS office /Agriculture office	0	0	2	22	4	11	3	19	1	2	10	7
Social/Farmer organizations/NGO particular in area	11	35	4	45	24	67	10	63	29	69	78	58
Private traders	2	6	0	0	1	2	1	6	1	3	5	4
Neighbours/Relatives	10	31	1	11	6	17	1	6	1	2	19	14
Total	32	100	9	100	36	100	16	100	42	100	135	100

Source: HARTI Field Survey Data, 2014

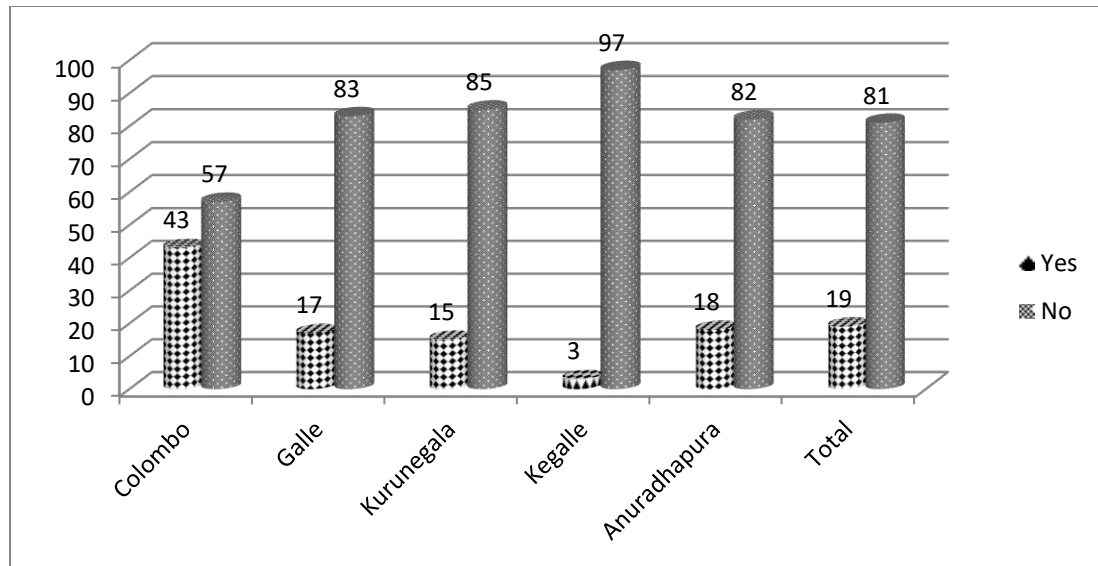


Source: HARTI Field Survey Data, 2014

Figure 6.4: Selling Prices of Paddy

6.1.3 Selling of Rice

According to the Figure 6.5, 43% of the farmers in Colombo district, 17% farmers in Galle, 15% farmers in Kurunegala, and 3% in Kegalle and 18% farmers in Anuradhapura districts issued their traditional rice to the market. When considering all the five districts, majority of the farmers (81%) do not sell their traditional rice to the market and only 19% of the farmers do.



Source: HARTI Field Survey Data, 2014

Figure 6.5: Selling of Traditional Rice

As we mentioned earlier in the paddy selling sector, majority of the farmers in all the five districts sell *Suwandel* rice, followed by *Kuruluthuda*, *Heenati* and *Madathawalu*. The traditional rice varieties sold by the sample respondents are shown in Table 6.4.

In contrast with the sources of selling paddy, rice selling sources are somewhat different. In Colombo district majority of the farmers (47%) sell their rice stocks directly to the consumers by themselves and 20% of the farmers sell their rice to the social or farmer organizations in the particular area. However, in Galle, Kurunegala, Kegalle and Anuradhapura districts, the highest percentage of farmers sell their rice stocks to the social or farmer organizations in the particular area. When we consider all the five districts as a whole, the highest percentage of farmers sell their rice stocks directly to the consumers by themselves (32%), while the 30% of the respondents sell their rice stocks to the social or farmer organizations and 20% sell their rice stocks to private traders or private shops. Table 6.6 shows that situation.

Table 6.5: Selling Rice Varieties

Name of Paddy variety	Colombo N=26		Galle N=10		Kurune gala N=9		Kegalle N=2		Anuradha pura N=11		Total N=58	
	N	%	N	%	N	%	N	%	N	%	N	%
Suwandel	11	25	4	20	3	30	1	50	5	38	24	27
Pachchaperumal	3	7	1	5	3	30	0	0	1	8	8	9
Madathawalu	4	9	2	10	2	20	0	0	1	8	9	10
Kuruluthuda	14	31	4	20	0	0	0	0	1	8	19	21
Heenati	5	11	1	5	2	20	0	0	2	15	10	11
Welihandiram	2	4	2	10	0	0	0	0	0	0	4	4
Kahawanu	3	7	2	10	0	0	1	50	2	15	8	9
Gonabaru	2	4	4	20	0	0	0	0	1	8	7	8
Ma wee	1	2	0	0	0	0	0	0	0	0	1	1
Total	45	100	20	100	10	100	2	100	13	100	90	100

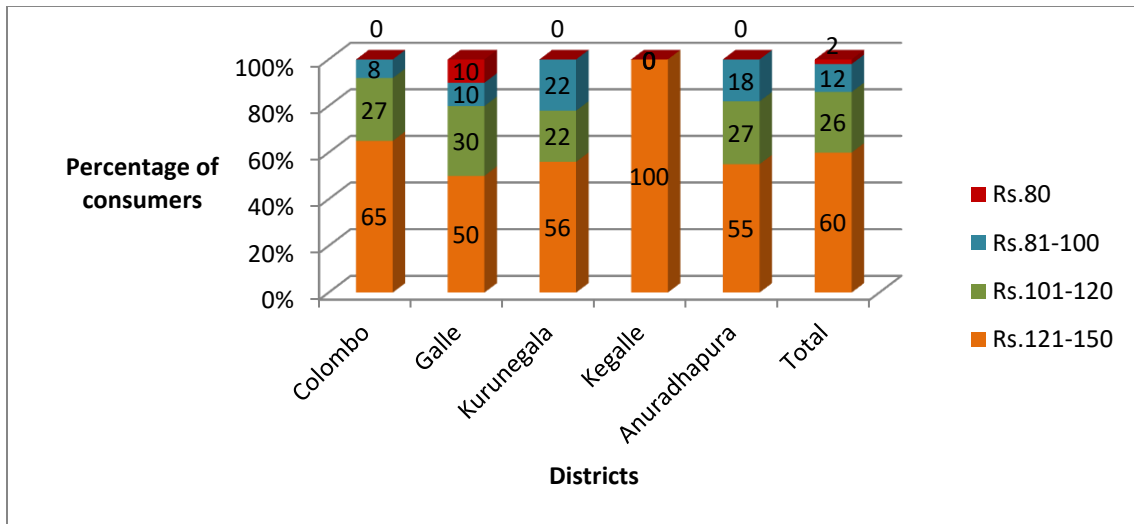
Source: HARTI Field Survey Data, 2014

Table 6.6: Selling Sources of Rice

Name /Institute	Colombo N=26		Galle N=10		Kuruneg ala N=9		Kegalle N=2		Anuradha pura N=11		Total N=58	
	N	%	N	%	N	%	N	%	N	%	N	%
Island wide popular organizations	7	16	5	18	1	6	1	25	2	11	16	14
DS office	3	7	1	4	0	0	1	25	0	0	5	5
Social/Farmer organizations particular in area and organizations in the outside areas	9	20	8	30	6	35	2	50	8	44	33	30
Private traders/Shops/Private companies	5	11	7	26	5	29	0	0	5	28	22	20
Directly to consumers)	21	47	6	22	5	30	0	0	3	17	35	32
Total	45	100	27	100	17	100	4	100	18	100	111	100

Source: HARTI Field Survey Data, 2014

According to the figure 6.6, more than 50% of the farmers in all the five districts sell their rice in the range of Rs.121.00 - 150.00/kg. As a whole, about 60% of the farmers in the five districts sell their rice stocks at Rs.121.00 - 150.00/kg and 26% of the farmers sell their rice at Rs.101.00-120.00/kg and 12% of the farmers sell their rice at Rs.81.00-100.00/kg and only 2% of the respondents reported that they sell their rice stocks at Rs.80.00/kg.

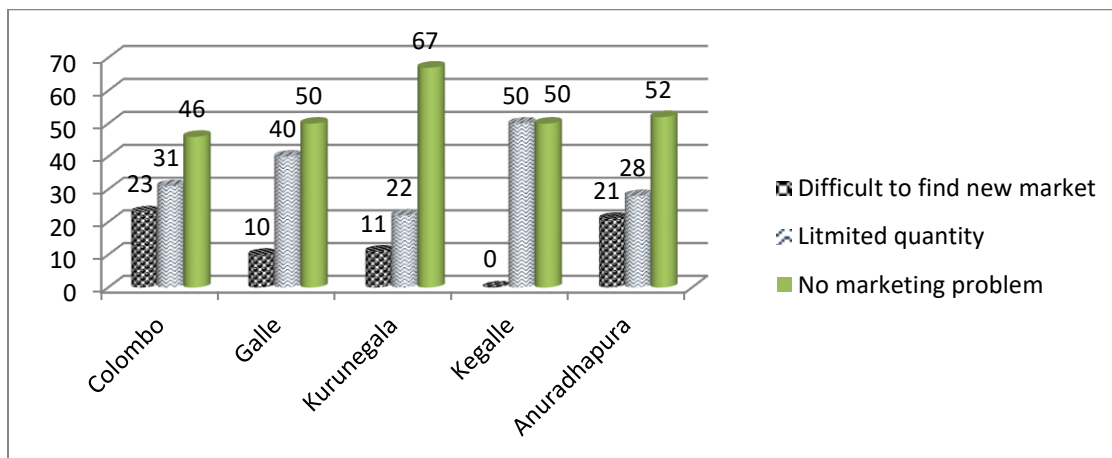


Source: HARTI Field Survey Data, 2014

Figure 6.6: Selling Prices of Rice

6.2 Marketing Problems Faced by Farmers

According to the Figure 6.7, the highest percentage of farmers in Colombo, Galle, Kurunegala, Kegalle and Anuradhapura reported that they do not have marketing problems to sell their traditional paddy or rice varieties to the market. It was reported by 46% farmers in Colombo, 50% farmers in Galle, 67% in Kurunegala, 50% of the farmers in Kegalle and 52% of the farmers in Anuradhapura districts. Meanwhile, the second highest percentage of farmers in all the five districts reported that limited quantity is the problem and difficulties to find new market is another problem faced by the sample respondents.



Source: HARTI Field Survey Data, 2014

Figure 6.7: Marketing Problems Faced by Farmers

6.3 Marketing Channels

There were limited and short channels in the process of marketing traditional rice varieties in all the five districts. The main channel for selling traditional rice was the farmer organizations or social organizations in the particular area or organizations outside the area. Majority of the farmers in all the five districts sold their traditional rice stocks through this channel and that farmer organizations or social organizations sold that rice stocks directly to the consumers or to the wholesalers or retailers in the area or exporters in the outside areas. However, the amount of selling to the exporters was very limited as no sufficient stocks are for exporting. Some of the farmers sold their rice stocks to the government offices in the area targeting the office staff. Island wide popular organizations were also a major channel which farmers sold their traditional rice stocks to and branches of those organizations situated in different areas actively participated in this process. Further, farmers selling their traditional rice stocks directly to the consumers in the area or outside the area in the special *pola* or in their own house or shop. Figure 6.8 shows the marketing channel of traditional rice varieties.

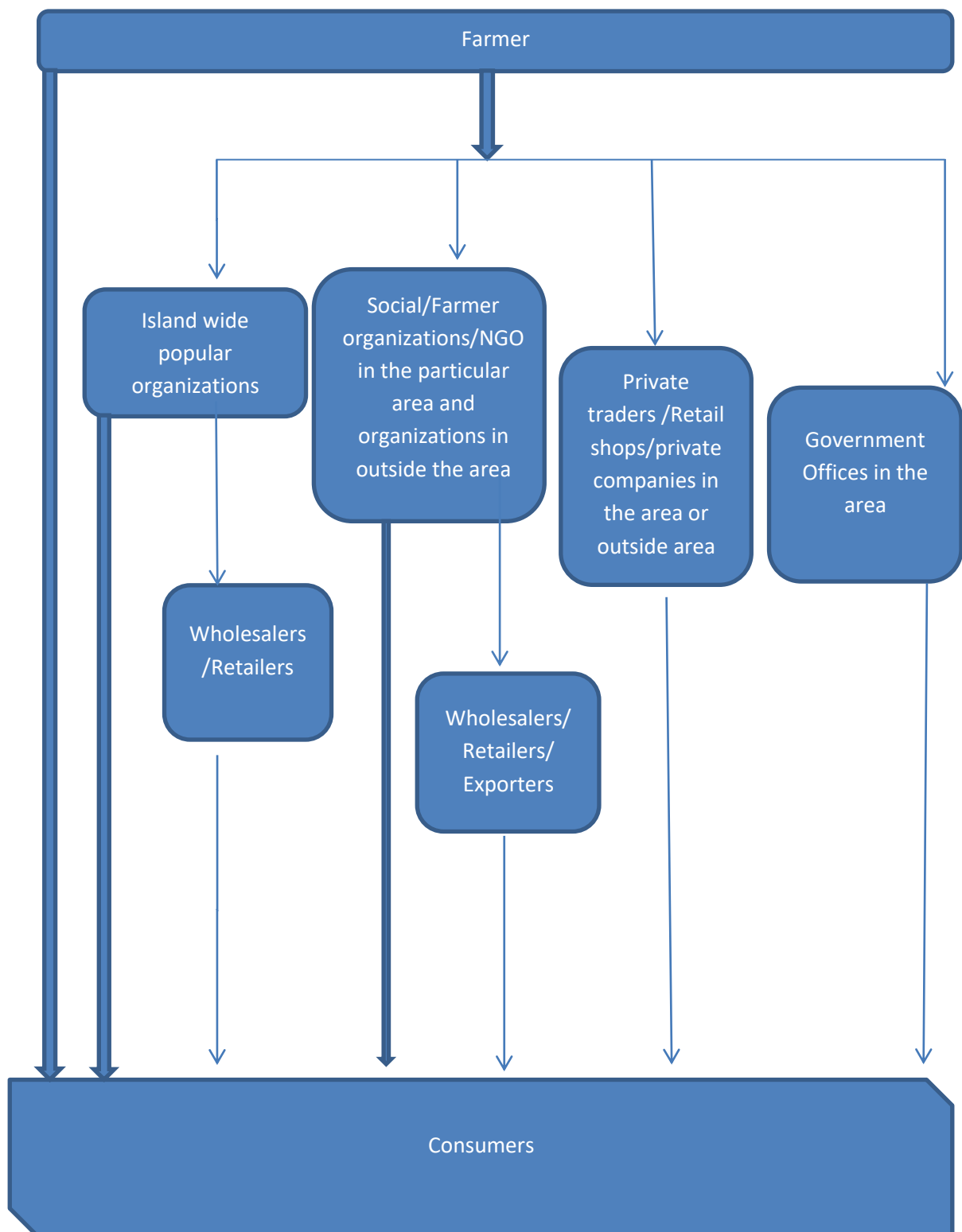


Figure 6.8: Marketing Channels of Traditional Rice Varieties

6.4 Traders and Exporters

We interviewed ten traders and two exporters dealing in the traditional rice marketing field.

According to the traders, there is a good demand for traditional rice varieties from consumers and majority of consumers are regular consumers and some are not. However the demand for those rice varieties has shown an increasing trend. Most of the consumers suffering from some deceases especially in diabetes, cholesterol, and cancer visited to find the suitable rice varieties. According to them the major problem that they faced is low availability of traditional rice. They pointed out that sufficient traditional rice stocks are not available to cater to the consumer demand and no continuous supply.

Table 6.7: Margin Analysis of Local Markets

Category	Traditional Red Rice Varieties (Rs./kg)	Suwandel (Rs./kg)
Paid for farmer or supply organization	125.00	140.00
Packing cost	12.00	12.00
Label cost	7.00	7.00
Transport cost	4.00	4.00
Total cost borne by middleman	148.00	163.00
Profit margin of middleman	32.00	27.00
Wholesale price	180.00	190.00
Traders' margin	30.00	30.00
Retail price	210.00	220.00

Source: HARTI Field Survey Data, 2014

Table 6.8: Margin Analysis of Export Markets

Category	Traditional Red Rice Varieties (Rs./kg)	Suwandel (Rs./kg)
Paid for farmer or supply organization	125.00	140.00
packing cost	200.00	200.00
Total cost borne by exporter	325.00	340.00
Exporters' minimum profit margin	175.00	160.00
<i>Minimum exporting price</i>	500.00	500.00

Source: HARTI Field Survey Data, 2014

According to the exporters, they exported traditional rice mostly to the Maldives, Australia, Canada and the Middle East is the main exporting region. Also Sri Lankan traditional rice varieties such as *El hal*, *Suwandel* and *Rathdel* have a higher demand in the USA, UK and some European countries than that of samba and red raw rice. According to them, the demand is increasing from those countries boutique hotels based on native treatment methods. Out of the total exported traditional rice quantity, about 40% was *Suwandel* and 20% was *Rathdel* and *Kuruluthuda*. Other 40% included *Pachchaperumal*, *Madathawalu*, *Heenati*, *Mawee* and *Ranthebili El*. According to their experience, around 25,000kg - 35,000kg of traditional rice is exported to those countries per month and the demand is higher than that of the supply. Though, there is a good potential to expand the export market of traditional rice varieties, insufficient supply is the major problem that the exporters have to face. According to the exporters they can get a higher profit margin by exporting the rice than selling it at the local market. Margin analysis of those two marketing channels of exporters is depicted in the Table 6.7 and 6.8. According to that exporters get a higher profit margin by exporting traditional rice and they pointed out that, they can export their traditional rice at a minimum price of Rs.500.00/kg .

CHAPTER SEVEN

Major Findings, Conclusion and Recommendations

7.1 Major Findings

7.1.1 Farmer Survey

01. Elderly farmers were dominant in traditional paddy farming and involvement of youth in traditional paddy farming is less and only 9% of the total sample was below 40 years of age. The education level of the farmers was satisfactory. About 24% and 44% of the sample farmers had attended primary and secondary education respectively. About 30% in Colombo, 20% in Galle, 28% in Kurunegala and 27% in Kegalle district farmers were government employees. Further, 22% in Galle and 15% in Kegalle farmers were private sector employees. Those employees are cultivating traditional paddy mainly for home consumption. Those farmers were keen on producing more nutritious and healthy rice.
02. As a whole, the majority of the sample had earned a significant income per month. Nearly 68% in Colombo, 70% in Galle, 61% in Kurunegala, 75% in Kegalle and 60% in Anuradhapura farmers had received monthly income between Rs.15,000 – 35,000.
03. Traditional paddy farming has re-emerged for the last five years. Although 89% of the total sample had been cultivating paddy for more than 20 years, about 81% have turned to the traditional paddy cultivation during the last five years. Farmer organizations or NGOs or social organizations in the area and popular organizations Island wide have played a major role for this change. More than 80% of the sample had membership in an organization which promotes traditional paddy cultivation.
04. Farmers were provided different facilities by the organizations. According to the information received from all selected districts, those facilities had helped farmers to start and continue the traditional paddy cultivation. Considering the average of all five districts, providing of seeds (39%), technical assistance (37%) and purchasing of paddy (14%) were the major facilities provided by different organizations.
05. Availability of traditional paddy seeds was one of the determinant factors to start the cultivation. Social organizations or farmer organizations in the area and popular organizations island wide were leading in supplying seed paddy to farmers.

06. *Suwandel* (49%), *Kuruluthuda* (29%), *Pachchaperumal* (27%) and *Kahawanu*(18%) were the most popular varieties among the sample farmers although a number of varieties are available. District level information somewhat differs from the overall situation. The highest percentage of farmers in the sample in Colombo (55%) and Anuradhapura (72%) had cultivated *Suwandel*. But in Galle, the majority (65%) of farmers cultivated *Kuruluthuda* while it was *Kahawanu* (71%) in Kegalle and *Pachchaperumal* (68%) in Kurunegala.
07. Farmers reveal that their interest was domestic consumption than marketing objectives. Consumption preference of farmer families (26%), nutritional values (23%) and seed availability were main factors of seed choice.
08. The average yield of most of the paddy varieties concentrated around 1,100 - 1,200Kg/acre irrespective of the season as a whole.
09. Majority of the farmers allocated a small share for traditional paddy cultivation out of the total cultivated paddy lands. When considering the total cultivatable paddy lands of the sample farmers in all the selected districts, they allocated less than 36% of the land for traditional paddy cultivation irrespective of the season. The main reasons for that is low yield (29%), still being at the experimental stage (28%) and scarcity of pure seeds (23%).
10. About 87% of the total sample had not used chemical fertilizer in the traditional paddy cultivation. Compost (55%), straw manure (50%) and leafy manure (40%) were major organic fertilizer applied. Also about 72% of the total sample had not used agro chemical and weedicide. Only about 13% of the total sample or 39 farmers out of 300 sample farmers stated that they are using chemical fertilizer in the traditional paddy cultivation.
11. Extension service was unorganized and nearly 30% of the samples had not received any significant knowledge about cultivation practices. About 27% of the sample had received extension service through different types of social organizations and farmer organizations in the area. Sometimes there was confusion over the cultivation methods suggested by those organizations.
12. The total cost of production with/without family labour ranged as Rs.37,958.00 - 51,914.00/acre and Rs.25,958.00 - 35,763.00/acre respectively. The yield was between 1113kg - 1275kg/acre. The calculated profit based on above information with/without family labour ranged as Rs.16,517.00 – 38,542.00/acre and Rs.31,017.00 - 50,542.00/acre respectively.

13. Unit cost including family labour ranged from Rs.29.77/Kg (Anuradhapura) – Rs.41.20/Kg (Colombo) and the profit ranged as Rs.14.84/Kg (Galle)- Rs.30.23/Kg (Anuradhapura). Unit cost excluding family labour ranged from Rs.20.36/Kg (Anuradhapura) – Rs.32.13/Kg (Galle) while the profit ranged as Rs.27.87/Kg (Galle) – Rs.39.64/Kg (Anuradhapura).
14. When we compared the cost and profit of the traditional paddy farming and the modern farming it clearly shows that, the cost of production of the traditional paddy cultivation was higher than that of the modern paddy cultivation. However, profit for one kilo of traditional paddy was also higher than that of the new paddy varieties.
15. Labour cost (41%-55%) and the machinery cost (27%-42%) were the major components in total cost of production.
16. Considering the activity-wise cost breakdown for an acre of land, harvesting had shared a large share of the total cost amounting to Rs.13,248.00 (29%). About Rs.10,346.00 (23%) was spent on land preparation. The cost of water management and security was Rs.7,200.00 (16%) while broadcasting/transplanting incurred about Rs.5,929.40 (13%).
17. Poor extension (24%), low yield (15%) and scarcity of pure seeds (11%) were the three major problems faced by the traditional paddy farmers.

7.1.2 Consumer Survey

1. Consumers' income determines their purchasing behavior and it is the governs the buying decision. As a whole, 70% of the respondents' monthly income is over Rs.50, 000 and on the other hand 22% of consumers' monthly income was more than Rs.100,000.00. It revealed that majority of the traditional rice consumers' monthly income was at a satisfactory level.
2. The relationship of the demographic factors with the purchasing behavior of the respondents was analyzed using Chi-square tests and it revealed that only monthly income and the number of family members had significant relationship with the quantity of monthly purchased rice whereas other factors had no relationship with that. When considering the frequency of purchasing rice, only the number of family members indicated a significant relationship.

3. About 71% of the consumers had started to consume traditional rice varieties recently (less than a year). It indicates that they had less experience in consumption of traditional rice and they develop an interest to consume those varieties lately.
4. *Suwandel* is the most popular and most purchasing varieties and 77% of consumers reported that they preferred to purchase *Suwandel*. Among those consumers 61% reported that they prefer *Suwandel* for its high nutritional value and 26% reported that they prefer it due to its good taste and color (white color). *Kuruluthuda* rice variety was the next important variety and 34 consumers preferred it. Among those consumers, 41% liked it due to high nutritional value, 35% used it as a solution to prevent some deceases and 24% reported that the taste is the reason. *Heenati*, *Madathawalu* and *Pachchaperumal* ranked next preferences respectively.
5. About 88% of consumers in the sample consumed traditional rice varieties as a step to prevent some diseases. Among these consumers, 79% reported that they used that rice varieties as a solution for diabetes and 21% reported that they used traditional rice for other diseases.
6. Consumers who consumed traditional rice as a solution for some disease have revealed their experience and 40% of them reported that their disease was controlled and they stopped medicine after starting to consume traditional rice varieties and 60% pointed out that they could not achieve important results yet as they started consuming traditional rice varieties lately.
7. Around 75% of the consumers purchase traditional rice varieties for consumption of all the family members and 11% reported that they purchased it only for their children and 10% only for a family member suffering from a some disease.
8. The study revealed that, 76% of the consumers normally purchased 5-10kg of traditional rice varieties per month. However, this result revealed that 76% of the consumers normally purchased 5-10kg of traditional rice varieties per month and 50% of the consumers purchased traditional rice varieties once a week and they have purchased 5kg as an average quantity per week.
9. According to the survey, 48% of the consumers mainly consider the nutritional value and taste of the traditional rice when purchasing those varieties, while 35% of the consumers study its organic value and 13% consider about its suitability to prevent certain diseases.

10. Fifty percent of the respondents consumed traditional rice varieties for two main meals per day (breakfast and lunch). About 22% of the consumers consumed those varieties only for breakfast while 13% consumed it for three main meals per day, 10% used it only for lunch and 5% only for dinner.
11. According to the Likert scale, the respondents attached the highest mean score (4.86) for Aroma, followed by taste (4.77) and keeping quality (4.15) for *Suwandel*. It means, aroma, taste and keeping quality of *Suwandel* rice variety is very high. The highest score for swelling capacity was recorded of *Kuruluthuda*, *Madathawalu*, *Pokkali* and *Unakolasamba*. For *Pachchaperumal* and *Rathsuwandel*, the respondents attached the highest mean score for keeping quality. For *Pachchaperumal* and *Rathsuwandel*, the respondents attached the highest mean score for the keeping quality. Similarly, for all the rice varieties the lowest mean score was reported for price. That means the price is very high or high category.
12. Seventy eight percent of the consumers reported that compared to the other rice varieties the swelling capacity of traditional rice varieties is very high. It means generally one kilo of traditional rice varieties can serve more people than that of the other rice varieties.
13. Forty one percent of the consumers reported that low availability of rice and scarcity of selling centers is the main problem when they purchased traditional rice varieties. About 35% of the consumers noted that there is no way of identifying pure traditional rice varieties. High price came to the next place and it was reported by 30% of the consumers. No organic certification or standard (20%), low keeping quality as it was quickly damaged by the rice weevil (12%), lack of awareness programmes (8%) came next respectively.
14. The highest percentage of consumers (64%) pointed out that the price should be reduced to a reasonable level. Further, 39% of the consumers suggested to increasing the rice varieties and the quantities. About 20% of the consumers suggested that government policy must be strong to develop that sector and its quality assurance. Awareness programmes on the nutrition values of traditional rice varieties launched over media is the fourth important idea suggested by the consumers (18%). The last important suggestion is imposition of stringent rules and regulations to curb the practice of adulteration of traditional rice varieties in the market.

7.1.3 Marketing

1. When considering the farmers who sell traditional paddy varieties as any form such as seed paddy, paddy or rice, they sold limited stocks compared with the

production in Colombo, Galle and Kegalle districts while the farmers in Anuradhapura and Kurunegala districts sold a considerable amount out of the total production. Among the considered five districts Anuradhapura is the main district which released traditional paddy stocks to the market in any form in the *Yala* season followed by Kurunegala district while a higher amount of production in the *Maha* season sold by the farmers was reported in Kurunegala district followed by Anuradhapura district. However, in Anuradhapura district, 55% of the production in the *Yala* season and 62% of the production in the *Maha* season had been sold to the market by the sample respondents.

2. However, majority of the farmers in all the five districts (71%), do not sell their paddy in the form of seed.
3. As a whole, 49% of the farmers sell their seed paddy to the farmers in the area and 31% sell their seed paddy to a social or farmer organization and 11% sell their seed paddy to popular organizations island wide.
4. Ninety percent of the farmers in all the five districts sell their seed paddy at a price of Rs.60.00-80.00/kg.
5. Out of the total respondents (300), 35% of the farmers sell their paddy to the market while majority of the farmers (65%) do not sell their traditional paddy and they keep it for home consumption.
6. As a whole, the highest selling paddy variety is *Suwandel* (29%), followed by *Kuruluthuda* (17%), *Madathawalu* (13%), *Pachchaperumal*(11%) and *Kahawanu*(10%).
7. When considering the all five districts, majority of the farmers (81%) do not sell their traditional rice to the market and only 19% of the farmers sell their rice to the market.
8. As in the paddy selling sector, majority of the farmers in all the five districts sold *Suwandel* rice, followed by *Kuruluthuda*, *Heenati* and *Madathawalu* varieties.
9. The highest percentage of consumers in all the five districts sell their rice stocks directly to the consumers (32%), while 30% of the respondents sell their rice stocks to social or farmer organizations and 20% sell their rice stocks to private traders or private shops or private companies in the area or outside areas.
10. About 60% of the farmers in the five districts sell their rice stocks for over Rs.120.00/kg and 26% of the farmers sell their rice at the price of Rs.101.00-120.00/kg.

11. The highest percentage of farmers in Colombo, Galle, Kurunegala, Kegalle and Anuradhapura reported that they do not have any problem in selling their traditional paddy or rice varieties to the market. It was recorded by 46% farmers in Colombo, 50% in Galle, 67% in Kurunegala, 50% of the farmers in Kegalle and 55% in Anuradhapura districts. Meanwhile, the second highest percentage of farmers in all the five districts reported that limited quantity is the problem and difficulties to find new market is another problem faced by the sample respondents.
12. The main channel of selling traditional rice was the farmer organizations or social organizations in the particular areas or organizations outside the area. Majority of the farmers in all the five districts sold their traditional rice stocks through this channel and that farmer organizations or social organizations sold that rice stocks directly to the consumers or to the wholesalers or retailers in the area or exporters outside those areas.
13. The farmers who sell traditional paddy varieties in forms such as seed paddy, paddy or rice sold limited stocks compared with the production in Colombo, Galle and Kegalle districts while the farmers in Anuradhapura and Kurunegala districts sold a considerable amount out of the total production.
14. Majority of the farmers in all the five districts (71%) do not sell their paddy as in seed form.
15. As a whole, out of the total respondents (300), 35% of the farmers sell their paddy to the market while majority of the farmers (65%) do not sell their traditional paddy and they reserve for consumption.
16. According to the traders, the major problem they faced is low availability of traditional rice. They pointed out that they do not have sufficient traditional rice stocks to cater to the consumer demand and no consistent supply.
17. According to the exporters, traditional rice is mostly exported to the Maldives, Australia, Canada and the Middle East is the main exporting region. Out of the total exported traditional rice quantity, about 40% was *Suwandel* and 20% was *Rathdel* and *Kuruluthuda*. Other 40% include Pachchaperumal, Madathawalu, Heenati, Mavee and Ranthembili El. According to their experience, around 25000kg-35000Kg of traditional rice is exported to those countries per month and the demand is higher than the supply. Though, there is a good potential to expand the export market of traditional rice varieties, insufficient supply is the major problem that the exporters have to encounter.

7.2 Conclusion

With the growing awareness of health and nutrition among the people of Sri Lanka, they are now more inclined to consuming chemical free and nature-friendly products. Certain literature and reports of ITI revealed that most of the traditional rice varieties consist of medicinal value and are rich in nutritional properties. Further, some report have revealed that - rice varieties containing Proanthocyanidin have been rarely reported and Proanthocyanidin Antioxident activity include only in the traditional varieties, hence it is effective in fighting kidney and liver diseases, heart diseases, diabetes, cancer etc. According this survey, there is a good demand and growing trend to consume traditional rice varieties and consumers suffering from non-communicable diseases, tend to consume traditional rice mostly. The literature and our study also revealed that the traditional rice farming is still economically viable and farmers get higher net returns for 1kg of traditional rice than the other rice varieties. Despite the interest of some of the ministries, non-governmental organizations, farmer organizations, certain private companies and individuals towards popularizing traditional rice cultivation in Sri Lanka, still the traditional rice extent remains very low, which is about 0.4% out of the total cultivated paddy extent. Lack of a proper policy that recognizes and appreciates farmers for their traditional knowledge, poor extension services, lack of research emphasis and incentives for conservation and sustainable use of traditional rice varieties have triggered this situation. Majority of the farmers cultivate traditional rice for self-consumption and limited number of farmers cultivate for commercial purposes. Hence low availability of traditional rice was recorded in the market and comparatively higher prices are also recorded. Traditional paddy cultivation yields less than the yield of other paddy varieties and it takes a longer time to harvest. However, to cater to the increasing demand there is a need to expand the traditional paddy cultivation in terms of variety and geographical area while paying due attention to climatic and soil conditions. If the production of traditional rice is increased, it will be available at a reasonable price for the consumer. However, practically it is difficult to meet the total rice requirement only with tradition rice varieties, so the local rice requirement can be met by a contribution of high yielding rice varieties and traditional rice varieties.

7.3 Recommendations

7.3.1 Recommendations for the Development of Production

1. There is a significant gap of average yield between traditional and new paddy varieties. Therefore, combination of both traditional and new paddy varieties is recommended. Achieving this target, promotion of traditional paddy cultivation in abandoned paddy lands especially in the Western province is suggested. The model implemented by the Urban Development Authority in Thalawathugoda is suggested to cultivating abandoned paddy lands. Meanwhile, paddy lands in minor irrigation and rain-fed areas where the average yield is more or less

similar to the yield of traditional paddy also can be utilized to promote the traditional paddy cultivation.

2. At the beginning, promotion of selected paddy varieties is recommended. *Suwandel, Kuruluthuda, Pachchaperumal, Heenati* and *Kahawanu* were major varieties among the farmers' choice of cultivation. Consumer preference too was those varieties and *Madathawalu*.
3. Traditional paddy farming tends to expand as an organic cultivation. The farmers' attitude towards chemical free agriculture was also observed. This production method will be an alternative to the present issues tied to overuse, misuse and abuse of agro chemical and fertilizer. However, farmers faced difficulties due to unavailability of sufficient quantities of organic chemical and fertilizer. Certain organic fertilizer and chemical are home-made. Hence, quality should be assured scientifically. The availability can be increased by extending the government fertilizer subsidy scheme to traditional paddy cultivation, by way of providing organic chemicals and fertilizer.
4. Extension service should be strengthened through public and social organizational partnership. Existing social organizations are very keen to promote the traditional paddy cultivation and seeking external support. This strength can be used for further promotion. Certain government organizations were trying to promote traditional paddy cultivation by providing seeds. Even though, information received from the farmers revealed that traditional paddy cultivation is not discussed at the *Kanna* meeting (seasonal cultivation meeting). This situation has led to difficulties for farmers in acquiring support services. Hence, traditional paddy cultivation should be included in the master cultivation plan at possible level.
5. The average yield should be measured through crop cutting survey implemented by the Department of Census and Statistics.
6. A mechanism to identify pure traditional seeds is very important and integration of various organizations and institutes related with traditional rice is very important.
7. More scientific research is needed to extract more nutritional and medicinal properties from improved varieties and from the parent-tree.

7.3.2 Recommendations for the Development of Marketing and Consumption

1. More research on nutritional and medicinal value of the traditional rice varieties should be encouraged (The Sri Lankan government expended Rs.772.3 million in 2014 on the import of medicine for diabetes and expended Rs.250 million in distributing iron tablets for school children and maternal care as a solution for the iron deficiency). If more research can prove those values contained in traditional rice varieties, it is vital to popularize it; the expenditure incurred on those medicine can be cut down.
2. A public information dissemination system on proven benefits of traditional rice varieties should be established and an advertising campaign should be carried out by using popular personalities and internationally popular ways such as advertising with airline magazines etc.
3. Easy-to-cook, value added productions such as small rice tin suitable for infants or small children, special rice pack suitable for porridge should be introduced to promote the sale.
4. Stringent rules and regulations should be imposed to track malpractices and corruption in the traditional rice marketing process (mixing traditional rice with other rice varieties is a common malpractice to earn more profit).
5. Marketing activity should be well structured and regularly monitored by an authorized institute which supplies labels and certification.

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Annex 1: Traditional Paddy Varieties

Paddy variety	Maturity period (months)	Cultivation Season	Cultivated Districts	Yield (Bushel/acre)	Medicinal values
Muthu Samba	7	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	Aphrodisiac
Maha Maa Vee	7	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	Nutritional
Sudu Maa Vee	7	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	Nutritional
Kuru Maa Vee	6	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	Energizing
Muthu manikkan	6	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	Treatment in orthopedics
Girisa Vee	6	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	-do-
Rasna vaalu	6	<i>maha</i>	Kalutara,Colombo,Gampaha, Galle,Matara	60-70	-do-
Dandu maara	4 ^{1/2} ,5	<i>Yala&maha</i>	Galle,Matara, Kalutara,Rathnapura	60	Nutritional, improves immune system
Kaharamana	4 ^{1/2} ,5	<i>Yala&maha</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Nandu Horanavalu	4 ^{1/2} ,5	<i>Yala&maha</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Kahata Vee	4 ^{1/2}	<i>Yala&maha</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Sudu Vee	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Mudali Vee	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Galwaka	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Sulai	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Gonabaru	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Ma Doluwa	4 ^{1/2}	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Dewareddiri	04	<i>Yala</i>	Galle,Matara, Kalutara,Rathnapura	60	-do-
Pihatu Vee	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy,Trincomalee	60	-do-

Heen Handirin	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	Nutritional, treatment for gangrene, jaundice, good for expectant mothers
Rath Handirin	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	-do-
Panniti Vee	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	
Bollu	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	-do-
Aththa Vee	04	<i>Yala</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	
Bala Ma Vee	04	<i>Maha</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	-do-
Hondarawala	04	<i>Maha</i>	Rathnapura, Kalutara, Galle, Kandy, Trincomalee	50-60	
Murungakayan	04	<i>Yala&maha</i>	North Central Province	50-60	-do-
Dikvee	4 ^{1/2}	<i>Yala&maha</i>	Galle, Matara	60-70	
Veli handiran	3 ^{1/2}	<i>Yala&maha</i>	Kalutara, Galle,	60-70	Good for expectant mothers
Kuru Hondarawala	3 ^{1/2}	<i>Maha</i>	Rathnapura, Kalutara, Galle, Kandy	60-70	Nutritional, energizing
Mada El	3 ^{1/2}	<i>Maha</i>	Kalutara, Galle, Kandy	50	-do-
Mada Thawalu	3 ^{1/2}	<i>Yala&maha</i>	All Districts	60	-do-
Muppan Gan	3 ^{1/2}	<i>Yala</i>	North Central Province	60	-do-
Kottiyaran	3 ^{1/2}	<i>Yala</i>	Trincomalee, Kalutara	80	-do-
Kiri Naran	4	<i>Yala &maha</i>	Rathnapura,	70	-do-
Ilan Kayan	4	<i>maha</i>	North, Kurunegala	70	
Perun Nalli	4	<i>maha</i>	Jaffna	70	
Madei karuppan	4	<i>maha</i>	Jaffna	70	
Sudu mala wariyan	3 ^{1/2}	<i>Yala&maha</i>	Jaffna	70	
Rathu kurumba	3 ^{1/2}	<i>Yala&maha</i>	Matale	70	
Kiri kurumba	3 ^{1/2}	<i>Yala&maha</i>	Matale	70	
Rath mada El	3 ^{1/2}	<i>Yala&maha</i>	Matale, Kandy	50-60	
Rath kunda	3 ^{1/2}	<i>Yala&maha</i>	Rathnapura, Badulla	50-60	
Kalu kunda	3 ^{1/2}	<i>Yala&maha</i>	Rathnapura, Badulla	50-60	
Kalu kanda	3 ^{1/2}	<i>Maha</i>	Kalutara, Galle,	50-60	
Lumbini	3 ^{1/2}	<i>Yala&maha</i>	Kalutara, Galle,	50-60	
Danduwel	4	<i>yala</i>	Kalutara, Gampaha	60	
Rathu vee	4	<i>yala</i>	Kalutara	60-70	
Sudu Heenati	4	<i>Yala&maha</i>	All Districts	60-70	
Rata Tawalu	3 ^{1/2}	<i>Yala&maha</i>	Galle, Rathnapura	50-60	Controls diabetes
Suramaniyam	3 ^{1/2}	<i>yala</i>	Galle, Matara	60-70	Cure for snake bites

Kalu Heenati	3-3 ^{1/2}	<i>Yala&maha</i>	All Districts	40-50	Good for expectant mothers, prescribed for Hepatitis, diarrhea, first rice meal for babies
Rathu Heenati	3-3 ^{1/2}	<i>Yala&maha</i>	All Districts	40-50	-do-
Podi Heenati	3-3 ^{1/2}	<i>Yala&maha</i>	All Districts	50	-do-
Thawalu Heenati	3	<i>yala</i>	North central province	40	-do-
Dahanala	3	<i>Yala&maha</i>	North central province	40	-do-
Suwanda samba	3	<i>Yala&maha</i>	All Districts	50	
Rathu sooduru	3	<i>Yala&maha</i>	All Districts	40	
Kalu Bala Vee	3	<i>Yala&maha</i>	All Districts	40	Controls diabetes
Bata Polel	3-3 ^{1/2}	<i>Yala&maha</i>	Kalutara, Galle,	40-50	-do-
Pachcha perumal	3	<i>Yala&maha</i>	North central province	50-60	-do-
Mookala vee	3	<i>Yala&maha</i>	Rathnapura, Badulla	50	
Rath Kara	3-3 ^{1/2}	<i>yala</i>	Kalutara, Galle,	50	
Kota Thawalu	3-3 ^{1/2}	<i>yala</i>	Kalutara, Galle,	50	
Ganthumba El	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	
Kiribaru El	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	Nutritional, aphrodisiac softens the vocal cords
Batu El	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	-do-
Pinna El	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	-do-
Nugapath El	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	-do-
Suwandel	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	-do-
Polael	4	<i>yala</i>	Rathnapura, Kalutara, Galle	80	-do-

Source: Economic Review, April/May, 2010

Annex 2: Cost of Production of Traditional Paddy per Acre - Colombo District - 2013/14 Maha

Operation	Labour Days			
	Family Labour		Hired Labour	
	Male	Female	Male	Female
Land Preparation	1			
Plastering Bunds	2			
Leveling and Broadcasting	2		1	
Fertilizer Application (Chemical)				
Fertilizer Application (Organic)	1			
Pest and Disease Control				
Water Management	7			
Harvesting Drawing Threshing	2		5	
Winnowing	2		1	
Total	17		7	

Source: HARTI Field Survey Data,2014

Labour Cost (Salary/day with Meal)

	Days	Salary/Day	Amount/Rs
Male	24	1000	24000
Female	0	0	0

Source: HARTI Field Survey Data,2014

Material Cost

Variety of Cost	Amount Kg	Price Rs.	Cost Rs.
Seeds	37	79.00	2923.00
Chemical Fertilizer			
Organic Fertilizer (Cow Dung, Poultry Manure)	180	4.67	840.60
Organic Fertilizer (Kata- HS)	100	35.00	3500.00
Organic Fertilizer (Katu Pohora)	58	44.00	2552.00
Organic Fertilizer (liquid fertilizer)	4	500.00	2000.00
Agro-Chemical			
Transport for Chemical Fertilizer			
Transport for Organic Fertilizer			690.00
Meal for Labourers	7	132.00	924.00
Packaging Cost	32	22.00	704.00
Total			14133.60

Source: HARTI Field Survey Data,2014

Machinery and Equipment Cost

Operation	Cost/Rs
Plugging(Tractor)	7700
Weed, Pest and Disease Control	
Harvesting and Threshing (Combine Harvester)	3900
Winnowing	1390
Transport Cost For Production	790
Total	13780

Source: HARTI Field Survey Data,2014

Total Cost (Including Family Labour) Rs. 51914

Total Cost (Excluding Family Labour) Rs. 34914

Average Yield - Kg/Ac 1260

Per Unit Cost(Including Family Labour) Rs. 41.20

Per Unit Cost(Excluding Family Labour) Rs. 27.71

Annex 3: Cost of Production of Traditional Paddy per Acre - Galle District - 2013/14
Maha

Operation	Labour Days			
	Family Labour		Hired Labour	
	Male	Female	Male	Female
Land Preparation	1		1	
Plastering Bunds	1		2	
Leveling and Broadcasting	1			
Weed Control	1			
Fertilizer Application (Chemical)			0.5	
Fertilizer Application (Organic)	0.5			
Pest and Disease Control				
Water Management and Monitoring	8		3	
Harvesting /Drawing/ Threshing	1		1	3
Winnowing	1		7.5	
Total	14.5		1	3

Source: HARTI Field Survey Data,2014

Labour Cost (Salary/day with Meal)

	Days	Salary/Day	Amount/Rs
Male	22	1000	22000
Female	3	800	2400

Source: HARTI Field Survey Data,2014

Material Cost

Variety of Cost	Amount (Kg)	Price (Rs)	Cost (Rs)
Seeds	36	74.00	2664.00
Chemical Fertilizer			
Organic Fertilizer (Cow Dung, Poultry Manure)	150	9.50	1425.00
Organic Fertilizer(Kata- HS)	50	45.00	2250.00
Organic Fertilizer (Katu Pohora)	53	43.00	2279.00
Organic Fertilizer (Liquid Fertilizer)	3	485.00	1455.00
Agro-Chemical			
Transport for Chemical Fertilizer			
Transport for Organic Fertilizer			400.00
Meal for Labourers	8	144.00	1152.00
Bag Cost	34	22.00	748.00
Total			12373.00

Source: HARTI Field Survey Data,2014

Machinery and Equipment Cost

Operation	Cost/Rs
Plugging(Tractor)	7790
Weed, Pest and Disease Control	
Threshing (Agrimec)	4200
Winnowing	800
Transport Cost For Production	700
Total	13490

Source: HARTI Field Survey Data,2014

Total Cost (Including Family Labour) Rs. 50263

Total Cost (Excluding Family Labour) Rs. 35763

Average Yield - Kg/Ac 1113

Per Unit Cost(Including Family Labour) Rs. 45.16

Per Unit Cost(Excluding Family Labour) Rs. 32.13

Annex 4: Cost of Production of Traditional Paddy per Acre - Kurunegala District - 2013/14 Maha

Operation	Labour Days			
	Family Labour		Hired Labour	
	Male	Female	Male	Female
Land Preparation	1			
Plastering Bunds	1		1	
Leveling and Broadcasting	1		2	
Weed Control	1			
Fertilizer Application (Chemical)	0.5			
Fertilizer Application (Organic)	0.5			
Pest and Disease Control				
Water Management and Monitoring	7			
Harvesting/ Drawing/ Threshing	1		1	
Winnowing				
Total	13		4	

Source: HARTI Field Survey Data,2014

Labour Cost (Salary/day with Meal)

	Days	Salary/Day	Amount/Rs
Male	17	1000	17000
Female	0	0	0

Source: HARTI Field Survey Data,2014

Material Cost

Variety of Cost	Amount Kg	Price Rs.	Cost Rs.
Seeds	42	60.00	2520.00
Chemical Fertilizer	50	7.00	350.00
Organic Fertilizer	105	22.00	2310.00
Agro-Chemical			
Transport for Chemical Fertilizer			250.00
Transport for Organic Fertilizer			650.00
Meal for Labourers	6	138.00	828.00
Bag Cost	27	22.00	594.00
Total			7502.00

Source: HARTI Field Survey Data,2014

Machinery and Equipment Cost

Operation	Cost/Rs
Plugging(Tractor)	7300
Weed, Pest and Disease Control	
Harvesting and Threshing (Combine Harvester)	9000
Winnowing	
Transport Cost For Production	700
Total	17000

Source: HARTI Field Survey Data,2014

Total Cost (Including Family Labour) Rs.	41502
Total Cost (Excluding Family Labour) Rs.	28502
Average Yield - Kg/Ac	1150
Per Unit Cost(Including Family Labour) Rs.	36.09
Per Unit Cost(Excluding Family Labour) Rs.	24.78

Annex 5: Cost of Production of Traditional Paddy per Acre – Kegalle District – 2013/14
Maha

Operation	Labour Days			
	Family Labour		Hired Labour	
	Male	Female	Male	Female
Land Preparation	1			
Plastering Bunds	2			
Leveling and Broadcasting	2		2	
Weed Control	0.5			
Fertilizer Application (Chemical)				
Fertilizer Application (Organic)	0.5			
Pest and Disease Control				
Water Management and Monitoring	7			
Harvesting/ Drawing/ Threshing	1	2	2	3
Winnowing	1		2	
Total	15	2	6	3

Source: HARTI Field Survey Data,2014

Labour Cost (Salary/day with Meal)

	Days	Salary/Day	Amount/Rs
Male	21	1000	21000
Female	5	800	4000

Source: HARTI Field Survey Data,2014

Material Cost

Variety of Cost	Amount Kg	Price Rs.	Cost Rs.
Seeds	38	70.00	2660.00
Chemical Fertilizer			
Organic Fertilizer	270	5.00	1350.00
Agro-Chemical			
Transport for Chemical Fertilizer			
Transport for Organic Fertilizer			300.00
Meal for Labourers	7	140.00	980.00
Bag Cost	28	22.00	616.00
Total			5906.00

Source: HARTI Field Survey Data,2014

Machinery and Equipment Cost

Operation	Cost/Rs
Plugging(Tractor)	7690
Weed, Pest and Disease Control	
Harvesting and Threshing (Combine Harvester)	4800
Winnowing	750
Transport Cost For Production	920
Total	14160

Source: HARTI Field Survey Data,2014

Total Cost (Including Family Labour) Rs. 45066

Total Cost (Excluding Family Labour) Rs. 28466

Average Yield - Kg/Ac 1260

Per Unit Cost(Including Family Labour) Rs. 35.77

Per Unit Cost(Excluding Family Labour) Rs. 22.59

**Annex 6: Cost of Production of Traditional Paddy per Acre - Anuradhapura District -
2013/14 Maha**

Operation	Labour Days			
	Family Labour		Hired Labour	
	Male	Female	Male	Female
Land Preparation	1			
Plastering Bunds	1		1	
Leveling and Broadcasting	1		2	
Weed Control	0.5			
Fertilizer Application (Chemical)				
Fertilizer Application (Organic)	0.5			
Pest and Disease Control				
Water Management and Monitoring	7			
Harvesting/ Drawing/ Threshing	1		1	
Winnowing				
Total	12		4	

Source: HARTI Field Survey Data,2014

Labour Cost (Salary/day with Meal)

	Days	Salary/Day	Amount/Rs
Male	16	1000	16000
Female	0	0	0

Source: HARTI Field Survey Data,2014

Material Cost

Variety of Cost	Amount Kg	Price Rs.	Cost Rs.
Seeds	40	72.00	2880.00
Chemical Fertilizer			
Organic Fertilizer	350	1.50	525.00
Agro-Chemical			
Transport for Chemical Fertilizer			
Transport for Organic Fertilizer			950.00
Meal for Labourers	5	135.00	675.00
Bag Cost	27	32.50	877.50
Total			5907.50

Source: HARTI Field Survey Data,2014

Machinery and Equipment Cost

Operation	Cost/Rs
Plugging(Tractor)	6250
Weed, Pest and Disease Control	
Harvesting and Threshing (Combine Harvester)	9000
Winnowing	
Transport Cost For Production	800
Total	16050

Source: HARTI Field Survey Data,2014

Total Cost (Including Family Labour) Rs. 37958

Total Cost (Excluding Family Labour) Rs. 25958

Average Yield - Kg/Ac 1275

Per Unit Cost(Including Family Labour) Rs. 29.77

Per Unit Cost(Excluding Family Labour) Rs. 20.36

Annex 7: Diabetes Medicinal Item Received Report

Variety	Unit		2010	2011	2012	2013	2014	Total value
Insulin Isophane (human)1000IU/10ml	Vial	Qt.	36,500	25,000	75,000	64,990	65,000	
		Value (Rs.mn)	13.8	9.0	26.9	23.3	23.3	96.3
Insulin Soluble (Human)1000IU/10	Vial	Qt.	117,300	30,000	40,000	65,000	65,000	
		Value (Rs.mn)	50.8	13.0	17.3	28.2	28.2	137.5
Glibenclamide Tablet 5mg	Tab	Qt.	69,929,000	55,787,700	62,928,000	64,994,000	64,999,000	
		Value (Rs.mn)	8.0	6.4	6.3	6.6	6.6	33.9
Tolbutamide Tablet 500mg	Tab	Qt.	61,143,000	88,862,000	75,000,000	142,500,0	95,000,000	
		Value (Rs.mn)	39.1	56.9	59.3	112.6	75.1	343.0
Gliclazide tablet 40mg	Tab	Qt.	-	-	-	10,999,600	7,500,000	
		Value (Rs.mn)	-	-	-	22.0	15.0	37.0
Metformin Tablet 500mg	Tab	Qt.	207,455,000	183,110,900	244,836,000	297,481,500	341,680,500	
		Value (Rs.mn)	123.2	122.9	164.3	199.6	260.7	870.7
Gliclazide Tablet 80mg	Tab	Qt.	-	-	3,999,500	5,000,000	6,461,000	
		Value (Rs.mn)	-	-	45.8	57.3	74.0	177.1
Biphasic Isophane Insulin injection (Human) 30% Soluble/70% Isophane	Vial	Qt.	375,000	570,727	525,000	874,998	956,450	
		Value (Rs.mn)	149.9	228.1	165.4	268.3	289.4	1101.1
Total value			384.8	436.3	485.3	717.9	772.3	2796.6

Source: Medical Supplies Division, Ministry of Health