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## Introduction

Paddy occupies approximately 37 percent (0.77 million ha) of the cultivated land area of Sri Lanka. It is cultivated during two major seasons; Yala and Maha, where a majority is cultivated during the latter. Close to 1.8 million farm families are dependent on paddy farming throughout the country. The demand for paddy in Sri Lanka will increase at a rate of 1.1 per cent per year, which requires production also to increase at a rate of 2.9 per cent per year. Therefore not only is paddy the staple food of the country, but its cultivation is the livelihood of a significant portion of people (DSC, 2013).

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 termed and high yielding, they were chemical fertilizer and labour intensive and posed a negative externality to the environment (Wiggins and Brooks, 2010). Most importantly, these new improved production incentive paddy varieties and agricultural practices were not resilient towards climate change impacts.

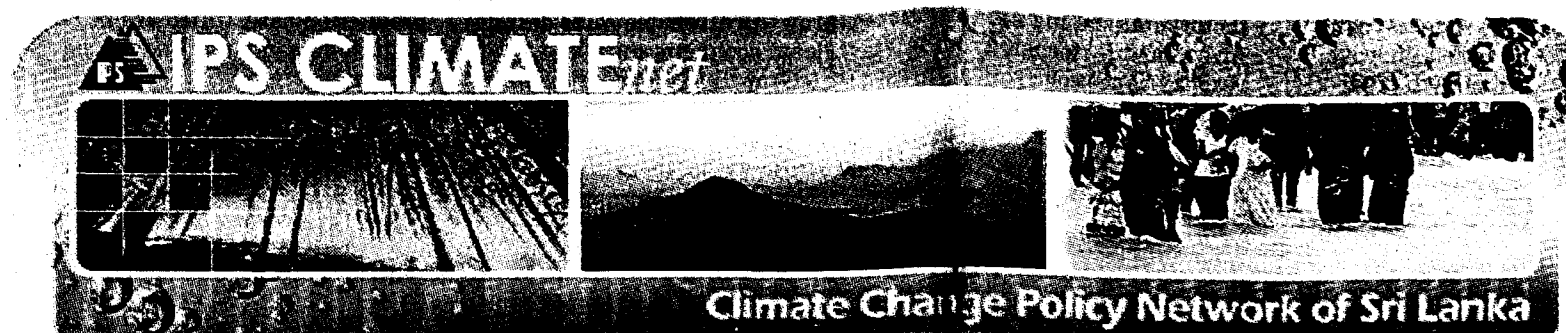
The paddy sector is extremely vulnerable to climate change impacts. Over the years, on many occasions, farm lands were heavily damaged due to floods and droughts. Traditional agriculture practices coupled with endogenous paddy varieties have proven to be more successful in facing climate change events 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).

There are only a handful of traditional paddy varieties in existence today in Sri Lanka. These are: Suwandel, Rathdel, Kaluheenati, Ma-Wee, Kuruluthuda, Pachchaperumal, Madathawalu, Hetadha Wee, Hondarawalu, Ghrisa, and Heenati. 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 vigour is based on certain characteristics unique to traditional paddy varieties.

While new improved varieties only can be raised in a nursery for 3-4 weeks, traditional varieties can be held back for 2-3 months. Therefore in a case of drought, heavy rainfall, or floods, the traditional varieties are capable of surviving in the nursery until the field conditions are favourable for planting. Traditional varieties are tall. 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 (Rathnabarathi, 2009).

There are many traditional paddy cultivation practices in Sri Lanka. These traditional practices are concentrated around land preparation, water management, and fertilizer applications, and combined with the traditional paddy varieties and would be

# Use of traditional paddy cultivation as a means of climate change adaptation in Sri Lanka



ideal for withstanding the climate change impacts. Among many, one such traditional practice is the 'Nava Kekulan' method, or the dry sowing system, practiced in the dry zone of Sri Lanka. The next section will describe in detail the special features of the dry sowing method, highlighting how these features increase the endurance of the paddy land to the impacts of climate change.

## Dry Sowing System:

The dry sowing system has been in existence for many generations. The dry sowing method does not clear bunds, and does not involve re-plastering when the cultivation season starts. This initiative will boost the flora and fauna population around the field, making the bunds resistant to dry conditions, as well as heavy rain conditions. Also it involves little to no tillage. This practice will preserve the soil fertility by facilitating the microbes while preserving soil moisture. Therefore, paddy fields can preserve its fertility during dry spells. Furthermore, since the biological, physical, and chemical properties are preserved, the soil can get back to its normal stage once the rainy season starts.

Furthermore, mulching acts as a protector against evaporation, therefore the soil moisture is protected during dry seasons, and crops can tolerate water stress to a greater degree. Mulching matter degrades into organic particles and will increase the water retention capacity of the paddy field. Therefore when the rains do come, the fields are capable of storing much of the water. Finally, water management practices in the dry sowing method are unique and important for adaptation to climate change impacts. Water management practices are specific in keeping the soil at filled capacity and avoid inundation situations. The dry conditions are maintained until the panicle initiation starts, which occurs approximately two months before the expected time of harvest. These water management activities result in extensive growth of the root system. An extensive root system will help the paddy plant to survive during heavy winds, rains, and even in droughts since deep root systems hold the plants upright in heavy rains and winds, and are better capable of reaching ground water (Upawansa, 2013).

As mentioned earlier, traditional paddy cultivation and traditional varieties go hand-in-hand. Upon reviewing the attributes of traditional varieties and traditional farming systems such as dry sowing, which discussed above; it is clear that climate change impacts can be successfully fought against, once these methods are adopted. In addition to being climate resilient, traditional paddy farming has further environmental, economic, and social sustainability potential. The next section will focus on highlighting several of those significant benefits.

## Environment, Economic and Social Sustainability Potentials

Traditional paddy cultivation is environmentally 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 microorganisms, in and surrounding 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 (Killebrew and Wolff, 2010). 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 climate change impacts.

It is also fair to say that there are possible economic gains from traditional paddy cultivations. Firstly, farmers gain economic savings when crop damages and yield losses are minimized as a result of climate change resilient, traditional paddy cultivation. However, there are other avenues through which traditional agriculture generates economic benefits. In the market place, traditional paddy varieties, cultivated using traditional methods, draws a high-



er price. This price is close to three times higher than the price of other paddy varieties cultivated under chemical intensive paddy farming. Hence, farmers have a price incentive to supply traditional rice to consumers.

Furthermore, in realizing the importance of traditional paddy farming in the preservation and promotion of the natural environment, the government of Sri Lanka recently decided to cut down the fertilizer subsidy by 25 per cent, and requested that farmers adopt organic fertilizers (Sunday Times, 2013 date ?). Whether farmers would actually adopt traditional paddy cultivation to account for the reduction in the fertilizer subsidy, or whether they would cut down the current cultivation extent to suite the fertilizer subsidy, is yet to be seen. In addition, some even argue that traditional paddy could have the potential to become an export commodity. While paddy exports in bulk is not a viable enterprise for Sri Lanka at the moment, identifying niche markets and targeting them is an established practice (Samaratunga, 2011).

Therefore, these niche markets can, and should, be targeted with traditional paddy varieties. One additional factor that could promote traditional paddy exports is the availability of procuring fair trade certifications. Organic products are eligible to obtain fair trade certificates, and hence become eligible to receive tax concessions from the government. Therefore, by focusing on the export market, the government has created a favourable environment for traditional paddy cultivations. At the same time, consumers today (both locally and

globally) are more health conscious and more interested in consuming traditional rice, as opposed to genetically modified varieties. Therefore, at the moment, there is motivation and incentives for farmers to engage in traditional paddy cultivations, while demand from the consumers is also rapidly increasing.

The social benefits of traditional agriculture can come in several avenues. One of the most important avenues is the preservation of traditional knowledge and experience. Traditional farming systems are practiced over many generations and are mastered to perfection. With chemical intensive paddy farming, these practices can disappear in to the annals 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 (Altieri, 2008). 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.

Challenges

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. To start with, farmers are used to fertilizer subsidies, chemical pesticides, and short term production and efficiency oriented paddy cultivation. Therefore, merely reducing the fertilizer subsidy will not guarantee that farmers would adopt traditional paddy cultivation. As mentioned earlier, there is a possibility that these farmers may well cut down the current extent of cultivation, and aim for a guaranteed price, rather than adopt traditional agriculture.

At the same time, it is accepted that traditional paddy cultivation yields less than chemical intensive paddy cultivation and takes a longer time to harvest. Therefore unless proper markets are established, traditional paddy farming will not generate enough 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.

This article highlighted a handful of traditional varieties in Sri Lanka. History has recorded more varieties, but throughout the 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. Tackling this issue is very important especially if Sri Lanka is to promote traditional paddy as an export commodity. Hence the challenge is to preserve the varieties available at the moment and then to rediscover more which are suitable for Sri Lanka's climatic and soil conditions.

In addition to traditional varieties, knowledge of traditional farming methods is on the verge of extinction as well. The knowledge of traditional farming, similar to traditional varieties, was handed down from generation to generation. There is a growing issue in the agriculture sector as a whole, where the younger generation is moving out in search of other livelihood opportunities. This problem is much more prominent in traditional paddy cultivation. Farmers' estimate that traditional farming knowledge will disappear within next 5-10 years, unless the younger generation can be motivated to engage in traditional paddy cultivation. While efforts such as documenting the traditional knowledge are quite important, motivating and providing an incentive for youth to engage in traditional agriculture is a major challenge.

Discussing challenges is not complete unless an attempt is made to identify steps to overcome them. Taking this responsibility, the Departments 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. However, attempts are made to educate farmers on the environmental, and especially, the climate change resilience aspects of this. 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 at 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 adapt 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.

Scope and Possibilities for Regional Cooperation and Information Sharing

Regional cooperation and information sharing is essential

when promoting traditional paddy cultivation in Sri Lanka due to several reasons. The South Asian region is predominantly based on agriculture, while paddy cultivation is an important aspect of livelihood. Hence there is an accumulated knowledge in these countries which could be effectively shared. Agro-climatic condition of the region is more or less similar, therefore there is a great possibility that traditional practices in these countries can be transferred and adapted to suit particular country situations. For example, there could be well established traditional paddy cultivation methods in countries such as

be adapted by Sri Lanka, in order to address the impacts of climate change. Apart from cultivation methods, there are many traditional varieties that could be shared among the region, especially as Sri Lanka has limited numbers of traditional varieties and is fast losing the current stock. Furthermore, the South Asian region is rich with many institutes that focus on promoting traditional agriculture. Regardless of whether these organizations are government, private, NGO/INGO, there is a greater possibility of collaborative research and information sharing. Information sharing is possible in many ways. One main avenue is to hold regional workshops and conferences to share and disseminate knowledge on traditional agriculture. Publishing the regional lessons learnt is also a possibility.

## Conclusions

Traditional paddy farming is resilient to climate change. It is environmentally friendly, has a smaller carbon footprint and preserves bio-diversity. There is an increasing consumer demand for traditional rice and a huge potential for regional collaboration through research and transfer of technologies and paddy varieties. The government has identified the importance traditional farming and is encouraging practices with the aim of achieving environmentally friendly sustainable development. However, knowledge on traditional farming is limited to older generations and it is on the verge of extinction. Furthermore, these farmers only have access to the handful of varieties which are available today. Therefore, Sri Lanka needs to preserve, document, and disseminate, the knowledge on traditional paddy farming while making youth interested and encouraged to adopt these measures. Through this, it is quite possible to fight climate change impacts, preserve the environment, and produce a healthy staple food, while bringing lost traditions back to life.

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