ADOPTED DROUGHT MITIGATION STRATEGIES ON PADDY CULTIVATION IN AMPARA DISTRICT

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1. INTRODUCTION

Climate change and rapid population growth create a major impact on food security in Asian countries (Lesk *et al.*, 2016). Paddy productivity and especially rice production in Ampara region are highly affected by subsequent interactions of adverse climate change, prolonged drought, and very high temperature. Less and altered rainfall patterns have been identified as reasons for the recurrent drought throughout the world (Lobell *et al*., 2011). Barnabas, et al., (2008), states that decline in crop yields are resulted by the undesirable effects on plant reproduction and plant growth and physiology due to the prolonged droughts. Being an effect of climate change, global mean temperature of ocean and land surface has elevated by 0.85°C from the year of 1880 to 2012, while it is predicted to increase in temperature at least 0.2°C per a decade (IPCC, 2014). Meantime, the elevated level of greenhouse gases is a main factor contributing to global warming. Globally, the concentrations of carbon dioxide and methane have increased by 30 and 150 percent, respectively over the last 250 years (Lesk *et al*., 2016). Owing to its close connections with climate change and paddy production, it plays a significant role in the Sri Lankan economy due to its contribution to the national source of income and the livelihood of farmers in the Ampara district (Asmath, 2021). However, previous studies show that a paddy production plan targeted to grow an area of 67,923.56 ha in Ampara district was only sown on 67,415.11 ha due to a lack of water availability, and the total yield received was 338612.32 Mt in 2019. If the temperature rises by 0.4°C after a prolonged dry period, 2 to 5.9 percent of paddy production will be lost (Aheeyar, 2012). Therefore, suitable drought mitigation strategies adopted on paddy cultivation leads to increase the production in order to maintain our nation's economy. So, this study will help the decision makers to consider these trends in policy formulations and in devising mitigation and resilience measures.

2. METHODOLOGY

Ampara district is located in DL_{2b} Agro ecological region in dry zone and the rain for this region is mainly from northeast monsoon and first inter monsoon, used to store in rainwater schemes aiming for irrigation purposes throughout the year. The average temperature in Ampara district is around 30℃, ranges from 24 ℃ to 36℃ while average rain fall is 1400 mm form department of meteorology. The data for this study was collected from randomly chosen 100 farmers in Ampara district after the prolonged dry season, by administrating the pretested questionnaire.

3. RESULTS AND DISCUSSION

3.1. Effect of drought on yield and physiology of rice

The yield potential of a variety under favorable conditions is important for determining the yield potential under water scarcity. In Ampara district, yield from rice production has declined during the periods of drought as the plants stressed with high heat, causes high sterility,

stunting. Accelerated enhancement of temperature beyond 33℃, drastically increase the sterility of rice and chalkiness, resulting reduced rice yield and quality (De Silva and Dayawansa, 2021). Farmers in Ampara District observed both physiological changes during vegetative stage (white leaf tip, chlorotic and white bands and specks) and ripening stages (reduced grain filling). Further, prolonged dry period reduces water availability during the *yala* season also (Rathnayake *et al., 2016*). Due to insufficient water availability in the soil, there is a significant decline in paddy productivity. Also, during the dry season, the dead storage level was reduced resulting in the abandonment of large tracts of paddy farmland by farmers during the *yala* season in Ampara district (Anas *et al.*, 2013). Furthermore, the policy makers in water management and irrigation department make it difficult to supply water to the area, on the other hand the consequences reduce their income and increase poverty in the region (De Silva and Kawasaki, 2018). So the proper adaptation practices lead to mitigate these risks.

3.2. Mitigation strategies against drought in Ampara district

Farmers following mitigation strategies against drought to improve production according to climate resilience in Ampara district. There are numerous cultivation practices are developed to overcome the water scarcity in agriculture. However, many farmers in rural areas are reluctant to adapt new technologies, because they are tightly stick to the conventional farming methods and still most of the farmers are being uneducated (De Silva and Kawasaki, 2018). Anyhow, some aspects, such as social cohesion and mental satisfaction, remain unsolved in socio-economic evaluations. As a result, the author developed an idea to calculate performance index, which incorporates both quantitative and qualitative factors of the evaluation. Farmers surveyed in Ampara district, was with mean age of 45 years old, had secondary education and cultivating paddy more than 2 acres and of land area was 4 acres.

Table 1 portrays the drought mitigation strategies adopted by farmers in Ampara district after a prolonged dry period. Based on the analyzed data collected from farmers, 72% of them cultivating traditional drought tolerance rice varieties and had an awareness while handling of traditional varieties in maha, yala and drought periods without reducing yield. It was observable that they use various rice varieties such as *kuruluthuda, pachchaperumal, suwandel, rathkanda, and kalu heenati*, easily available in Ampara district (Anas *et al*., 2013).

Table 1: Mitigation strategies adopted by farmers in Ampara District

Strategies Adopted	Frequency (Adopted) (%)	Frequency (Not Adopted) (%)
1. Selecting tolerance varieties	72	28
2. Tillage practices	06	94
3. Sowing (broadcast)	66	34
4. Irrigation management	86	14
5. Rainwater harvesting	36	64
6. Short period varieties	72	28
7. Shifting cultivation	64	36

As table 1 depicts, only 6 % of farmers practice tillage during drought season, because of high cost for tillage operation and lack of water availability during land preparation. According to the observations, the farmers primarily use a two-wheel tractor with a rotary plough for initial tillage operations and partially burnt paddy husk and *Gliricidia* leaves are spread over the field two weeks after the first ploughing (Anas *et al*., 2013). Further, farmers showing preferences to prepare the bunds before leveling the field and to practice broadcast method of sowing while nearly 66 % of them practicing to broadcasting methods and rest of them practicing seeding method. 45–50 kg/acre is a recommended seed rate for traditional varieties while improved varieties require 60–70 kg seeds per acre (Anas *et al*., 2013). Nevertheless, novel drought-tolerant crops have been strongly recommended by the government and non-governmental organizations as one of the major agriculture adaptation practices to support farmers' livelihoods (Morton, 2007). According to Morton (2007), farmers use modern farming practices to continue growing high-yielding local varieties. Furthermore, another study found that low-cost innovations, such as the cultivation of locally developed hybrid seeds, aid in increasing the yields of conventional crop varieties (IPCC, 2014). Meanwhile, farmers are employing a new method of paddy transplantation known as the "parachute method," which uses less water and generates higher yields (Thilakasiri *et al*., 2015).

Irrigation management was done by nearly 86 % of respondents, because tillage operations and seed sowing must be carried out with irrigation water, and these practices should be completed in a month of time. Farmers can modify SRI approaches to fit their agro-ecological and socio-economic circumstances. Adaptations are frequently made to adapt changing weather patterns, soil conditions, labor availability, water control, organic input access, and whether or not to farm with organic inputs (Scialaba and Müller-Lindenlauf, 2010). But most of the farmers in Ampara district are not practicing SRI method except some of educated farmers. The majority of farmers in Ampara district suffer from a lack of alternate water sources. Another 34% of users said they utilize rainwater because alternative water sources have dried up during the dry season. It's interesting to note that just 10% of all customers have stated worry about the low quality of other water sources accessible. According to a survey, short-duration cultivars (105 days) can be planted up until the end of April and are also suitable for direct seeding with sprouted seeds if nursery growing is not possible. As these varieties are suitable for water lacking and water shortage period, nearly 72% of farmers practicing short duration varieties such as Bg 300, Bg 304 and Bg 310.

The techniques used for shifting cultivation depend on a variety of variables including climate, soil nature as well as other environmental and topological factors of the area. Nearly 20% practicing due to lack of paddy land in this area, the results suggest that research and extension services must develop agricultural practices and technologies that work well under emerging climate risks, while being cognizant of the market and labour constraints farmers face (Simpson *et al*., 2008). This will necessitate a comprehensive approach in which better practices are combined with complementing market institution support, such as appropriate mechanization services, value chain support for other field crops, and input supply systems. This allows for the development of farmer-friendly technology packages that assist climate risk reduction and lead to more profitable farm-level outcomes.

4. CONCLUSION

Sri Lankan government intervention would be necessary to ensure the food security and technological interventions by smallholders would be required to overcome the deleterious effects of drought; and more research efforts and investments on alternative coping

mechanisms would be required to protect the poor farmers from the effects of drought. Extended dry periods have a greater impact on paddy yields. Proper irrigation management techniques, alteration, and maintenance of urban marketing infrastructures and drainage improvement projects and awareness program to rural societies to mitigate the excess / shortage of water suggest the need for feasible adaptation strategies.

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