Original Research Article

A STUDY ON THE IMPACTS OF FERTILIZER CRISIS ON PADDY CULTIVATION IN FIVE SELECTED DIVISIONAL SECRETARIAT DIVISIONS OF TRINCOMALEE DISTRICT DURING MAHA 2021/22

ABSTRACT

Rice is one of the most important cereal crops in the world. With population growth, farmers have to increase paddy production to meet existing as well as future demand. Fertilizer is the major input in rice production. Growth and yield traits of rice are affected by improper and imbalanced application of plant nutrients. Hence, suitable practices of adequate rate and timing of fertilizer application are needed to increase the rice yield. In May 2021, Imports & Exports (Control) Regulation No 07 of 2021 was issued, banning the importation of chemical fertilizers, pesticides, & herbicides in Sri Lanka. Low fertility of paddy soil created the need for adequate and constant supply of chemical fertilizers in paddy cultivation, which is a major threat to production and endangers the national food security and economy of Sri Lanka, especially in the major cropping season of Maha 2021/22. Therefore, a questionnaire survey was conducted to investigate the impact of the fertilizer crisis in major paddy-cultivating Divisional Secretariat divisions of the Trincomalee district.The random sampling method was used to select respondents for the survey, and the collected data were statistically analyzed by SPSS version 26.0 software. The results revealed that the majority of the farmers experienced a 50% yield reduction compared to the last cropping season of Maha 2020/21 in the entire five DS divisions. The seedling stage was highly affected during the fertilizer crisis in paddy cultivation in all five DS divisions. Further, the cost of production in paddy cultivation increased by more than 50% during the fertilizer crisis compared to the cost involved in Maha 2020/21. The potential for organic manure production is very poor, while the majority of farmers are interested in adopting the sustainable farming system of the Integrated Plant Nutrient System through the judicious application of chemical and organic fertilizers received on a subsidy basis, according to the present government's fertilizer policy, which emphasizes 70% of inorganic fertilizers and 30% of organic manure application to improve sustainability in paddy cultivation in the country.

Key words: Chemical fertilizer, Integrated Plant Nutrient System, Organic matter, Paddy cultivation, Subsidy, Yield

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important food crop in Sri Lanka. It is the single most important crop, occupying 34% of the total cultivated land area in Sri Lanka. There are two main

croppingseasons in Sri Lanka. Yala is the minor agricultural season, which runs from April to September, while Maha is the major cultivation season, which runs from October to March [1].In Trincomalee district, paddy cultivation takes place during both the Maha and Yala seasons. The Maha season provides about 70 percent of the district's annual rice production. The Yala season provides about 30 percent of the district's annual rice production. The average rice production per net hectare (kg) in Trincomalee is 157,272.0 in Maha 2019/20 and 108,222.0 in Yala 2020 [2].

Fertilizer is the major input in crop cultivation. Aisha (2007) mentioned that the usage of chemical fertilizers causes numerous hazardous effects on the environment. Continuous fertilizer application is essential for every season due to the fertilizers being easily lost to the environment through leaching and volatilization, where they will pollute the environment [3]. Further, the overuse of chemical fertilizer has caused greenhouse gas emissions, degradation of the soil environment and water bodies, soil salinization, acidification and hazardous effects on biodiversity[4,5]. However, using chemical fertilizers can precisely provide the elements required by a crop. As these elements are readily available in highly soluble forms, they are easy for the plants to absorb. As the formulation of chemical fertilizers is defined and controlled, crop planning with conventional fertilizers is much easier [6].

Even though excessive use of pesticides and other agrochemicals is very common in Sri Lanka due to a lack of knowledge among the farmers about their detrimental effects, it severely impacts the balanced ecosystem. And it was the main reason behind the sudden increase in fertilizer consumption per unit of arable land in 2018–2020, from 138.3 kg/ha to 300kg/ha in Sri Lanka. This made the Sri Lankan agricultural system environmentally and economically unsustainable and compromised food safety. In this regard, on May 6th, 2021, the Imports and Exports (Control) Act, promulgated the “Imports and Exports (Control) Regulations No. 07 of 2021 (regulation), effective its publication in the Sri Lanka Gazette (No. 2226/48 of May 6, 2021), the Sri Lanka government completely restricting and banning the import of fertilizers and agrochemicals to justify the right of Sri Lankans to a “non-toxic diet” and save foreign exchange that country spent each year importing agrochemicals [7,8]. The ban on chemical fertilizer is a threat to food security, which endangers national security and causes an causes an economic crisis [9,10].

The lack of organic fertilizer productive capacity, coupled with the absence of a formalized plan to import organic fertilizers instead of chemical fertilizers with a determined price, causes a reduction in paddy production [9]. Earlier, the average paddy production in Sri Lanka was about 4 t/ha, and this is likely to be reduced if inorganic fertilizers, such as urea, are not applied at the correct times. As a result of the sudden ban, overall food production in Sri Lanka in the last harvest season was lower than last year [10]. Besides, the fertilizer crisis caused a huge impact on paddy cultivation, especially in the Maha 2021/22 season in Trincomalee district.

The government intends to promote 100% organic farming to maintain eco-friendly agriculture for healthy lives. If it continues to prevail, local crop production, including paddy production, will decrease. Most of the agricultural crops cultivated on the island are hybrid varieties, heavily dependent on chemical fertilizers for expected high yields. It is customary in policy formulation and implementation to look at relevant cases in other countries or in this country [8]. Therefore,

it is essential to analyze the impacts caused by the fertilizer crisis during Maha 2021/22 on paddy cultivation and livelihood activities of farmers in Trincomalee district. This study aimed to investigate the impacts of the fertilizer crisis on paddy cultivation during Maha 2021/22 in selected 5 DS divisions of Trincomalee district.

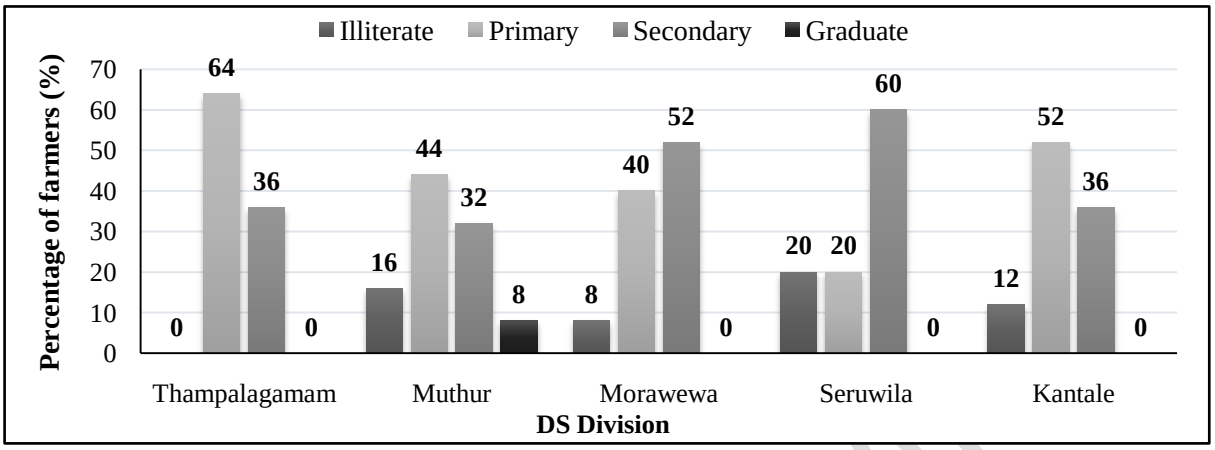
MATERIALS AND METHODS

Five Divisional Secretariat divisions were selected for the survey where paddy is intensively cultivated under major irrigation schemes. These Divisional Secretariat divisions include Kantale, Muthur, Thampalagamam, Seruwila, and Morawewa. The random sampling method was used to select the sample farmers from the particular divisions. From these selected Divisional Secretariat divisions, 25 farmers were selected from each division as samples. Primary data were collected from farmers through pretested ended questionnaires and interviews at their doorsteps in the study areas. The survey was carried out from December 2022 to January 2023. Close ended questionnaires were designed for interviewing paddy farmers in Kantale, Muthur, Thampalagamam, Seruwila, and Morawewa DS divisions. Questions were arranged to get the following information such as personal details of the farmers, such as name, age, gender, and number of family members.Primary data required for this study were collected from the selected respondents through personal interviews using questionnaires at door steps. Further, details of farming, details of paddy cultivation, the effect of the fertilizer crisis on paddy cultivation, the cost of production after the fertilizer crisis, the reason for the crisis, and suggestions for improvement were also interviewed. Before the commencement of data collection, the questionnaires were pretested to assess the suitability of the prepared questionnaires. Changes were made to enable the easy recording of responses from farmers. Secondary data were gathered from the district secretariat, the Department of Agrarian Development, the Department of Agriculture, the publications of the Department of Census and Statistics, and Internet websites. The collected questionnaires were checked for completeness, and the data were analyzed using Microsoft Excel version 15 and SPSS version 26.0. The yield reduction percentage from last season was calculated by the following equation:

Yield reduction (%) = [(Last season yield - Achieved yield) / Last season yield] × 100

RESULTS AND DISCUSSION

1. Demographic Details of the Respondent



1.1.Educational level of farmer

Figure 1. Percentage distribution of farmers based on educational level

In the present survey, the sample farmers were categorized into four groups with respect to literacy status, as mentioned in Figure 1. The small percentage (1.6%) of farmers had a tertiary level of education (graduated); meanwhile, 44.0% of the farmers completed primary education, 43.2% completed secondary education, and 11.2% of farmers were illiterate comparatively in all 5 DS divisions. It may be due to the low income of farm families that they are forced to share family burdens. Cary and Barr (2002) stated that the educational level of the farmers plays an important role in the adoption of any new technology [11].

1.2.Experience in paddy cultivation

According to the results shown in Figure 2, the majority of farmers in all DS divisions are well experienced in paddy cultivation for a minimum 11 to 20 years (32.8%) and 21 to 30 years (29.6%). Also, there is a lower percentage (2.4%) of farmers who have 0 to 5 years of farming experience, and around 14.4% of farmers have more than 30 years of experience in rice cultivation. Rather than traditional experiences and knowledge, a considerable number of farmers have attended special training programs on paddy cultivation, especially in Kantale DS division. 32% of farmers have also attended innovative training programs conducted by the government.

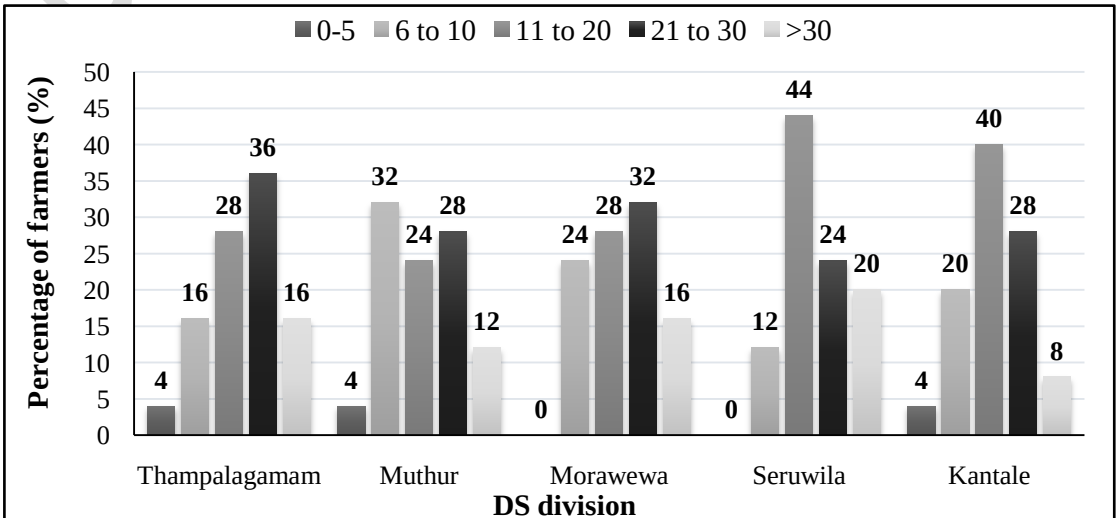
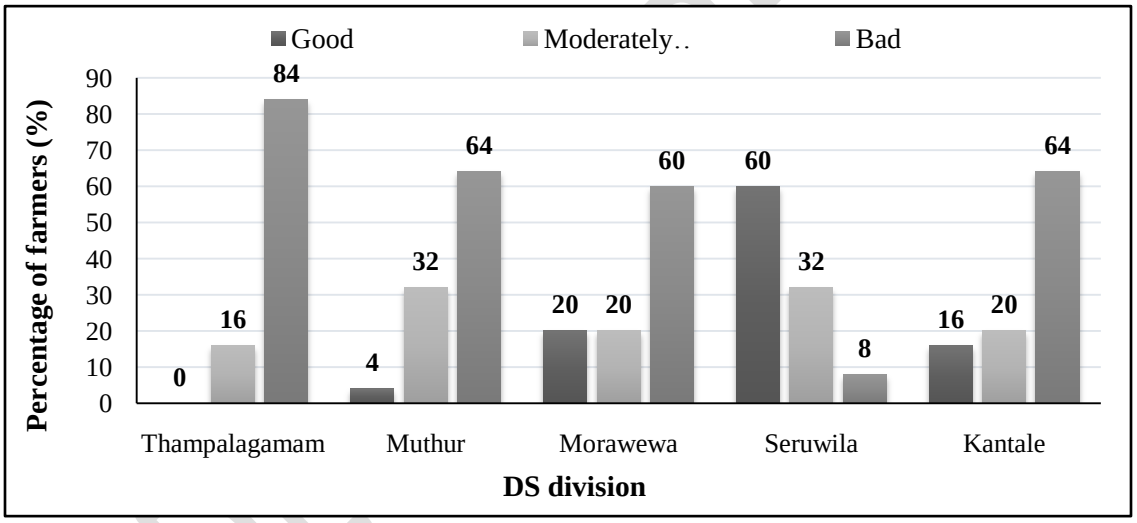


Figure 2. Percentage distribution of farmers based on experience in paddy cultivation

Rice has been cultivated in Sri Lanka for well over 2000 years [2]. Hence, farmers have traditional knowledge and experience in paddy cultivation from their ancestors. Hanis*et al.* (2015) mentioned that farmers' knowledge and experiences on climate change, natural resource management, local farmer innovations, and indigenous knowledge could be captured in order to perform well in agricultural activities [12].



1.3.Extension services

Figure 3. Percentage distribution of farmers based on extension services provided

As per Figure 3, 60% of farmers in the Seruwila DS division said that the extension services were good in terms of conducting government training programs, women's agriculture extension programs, young farmer club activities, agribusiness counseling, etc. However, the majority of farmers (56% in all DS divisions, on average) stated that the extension services were very poor, especially during the fertilizer crisis. It indicates that the majority of the extension services were provided with respect to conventional farming practices. Most of the farmers requested that they need compensation for sudden risks and conventional fertilizers at subsidized prices.

Only a few farmers requested training programs on quality organic manure production, and some of the farmers said that they don't require any extension services from the government due to a lack of skilled personnel. The needs of the increment of the extension services to sustainable farming methods must be promoted. Patcha*et al.* (2017) examined the fact the fact that active and comprehensive supporting extension services play a key role in fostering the sustainable production of rice and helping to ensure local food and cultural security [13]. It is also proved by Bangkim*et al.* (2021) that agricultural extension services are needed to improve farming knowledge that helps in increasing crop production and the technical efficiency of paddy farmers[14].

2. Details of farming

2.1.Adoption of Government fertilizer policy in Maha 2021/2022

Sri Lanka's fertilizer usage intensity is close to the median range among its regional peers. Hence, the government completely banned inorganic fertilizers in May 2021 [10]. Government support and policies are important factors in the transition to organic farming[15].

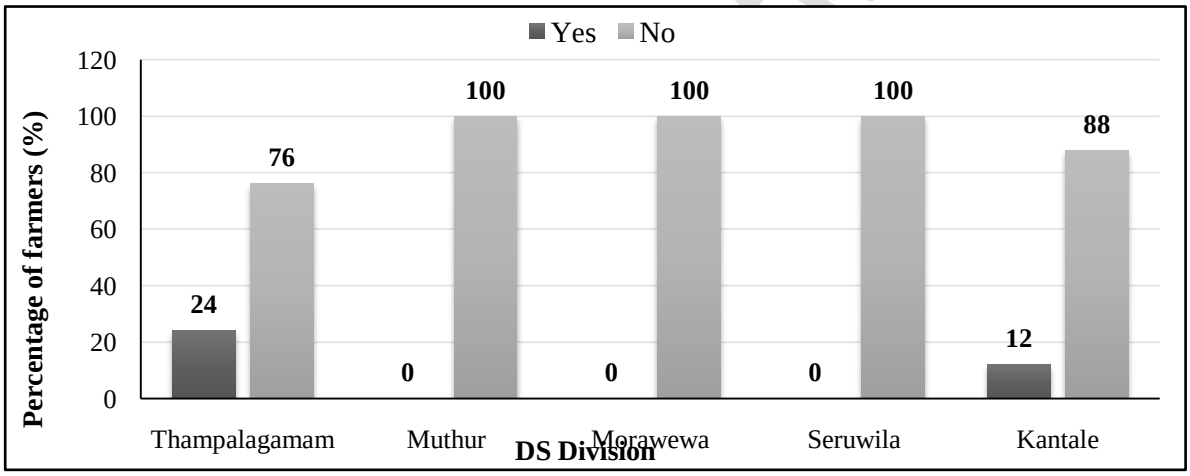


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Figure 4.Percentage distribution of farmers based on adoption of government policy in Maha 2021/22

According to Figure 4. only a certain percentage of farmers, like 24% and 12%, followed government policy in the Thampalagamam and Kantale DS divisions, respectively. The majority of farmers in all DS divisions managed the negative impacts of the fertilizer crisis in paddy cultivation by purchasing inorganic fertilizers from older stocks. Also, a lower percentage of farmers utilized organic manures provided by the government during the crisis in addition to inorganic fertilizers from their older stock and not from their own organic manure production units. Very few farmers in each DS division are involved in quality compost making by using available raw materials and adopting sustainable farming practices from different countries through social apps. These proved that farmers completely rely on chemical fertilizers for higher

paddy yields as they have huge market demand and high productive capacity. These results are supported by Herath and Wijekoon, and Randunu et al. [16, 10].

2.2.Potential for organic manure application in Trincomalee district

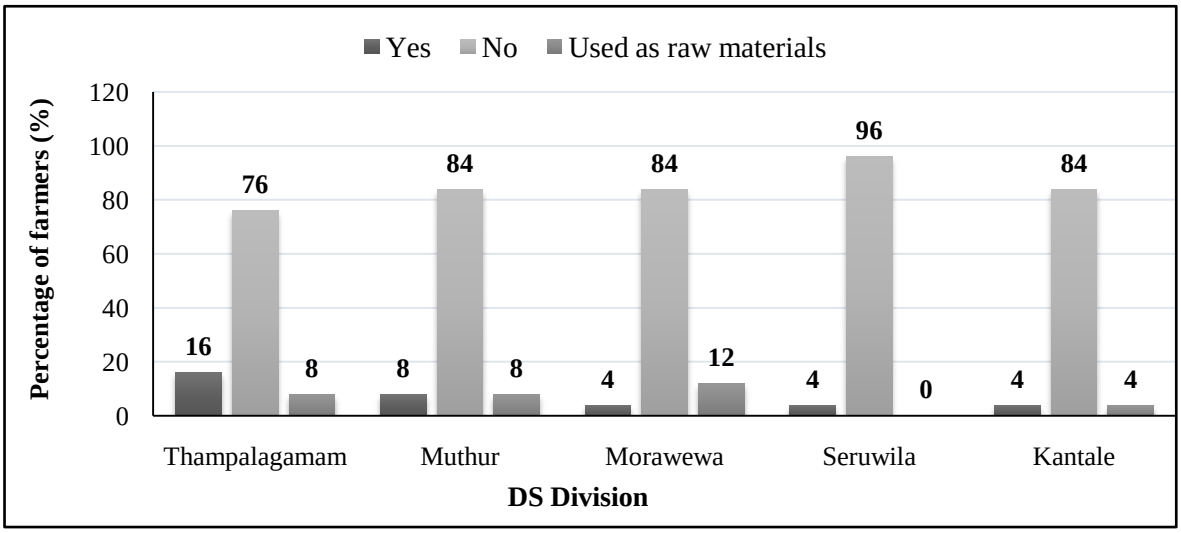


Figure 5.Percentage distribution of farmers based on potential of organic manure application in Trincomalee district

Figure 5. showed that around 86% of farmers in Trincomalee district did not use organic manures due to the unavailability of their own compost production units. About 16% of farmers in the Thampalagamam DS division have compost units at home. Meanwhile, other farmers used only raw materials for paddy cultivation from their livestock farms, especially Morawewa DS division; 12% of farmers used raw materials in their paddy cultivation. Also, more than 80% of farmers in all 5 DS divisions were not interested in compost production. Besides, 20% of farmers in the Thampalagamam DS division are interested in the production and utilization of organic manures. However, the produced compost was very low in the N% range (<1% to 1-2%) due to the low addition of N-enriched composting materials. This contained a bulk quantity of sand and caused the paddy lands to have solid ditches and tight structures due to their low solubility.

However, 100% of farmers in all 5 DS divisions mentioned that lack of productive capacity was the primary reason for the non-adoption of complete organic fertilizers. Around 87% of farmers felt that the production of compost was the most tedious process ever, and around 50% of farmers stated that the application of organic fertilizers caused high labor charges and was involved in high transportation costs and other costs like the collection of raw materials from our

stations and composting tools and machinery. Moreover, farmers also mentioned the limited availability of quality raw materials, the timely unavailability of organic manures for major cropping seasons, the required bulk quantity of compost, and other organic sources for the particular land area[17]. Therefore, the government had decided to purchase an alternative fertilizer called "Nano-N" from India. During the fertilizer crisis in Maha 2021/22, 89.6% of farmers in all DS divisions used Nano N fertilizers. However, almost 100% of farmers were dissatisfied with the performance of Nano- N fertilizers. This is due to reduced crop yield and quality, which caused health hazards like wounds and bad odors during application. The results revealed a minimum potential for organic manure application in paddy cultivation in Trincomalee district.

2.3.Reasons for adoption of conventional urea fertilizers in paddy cultivation

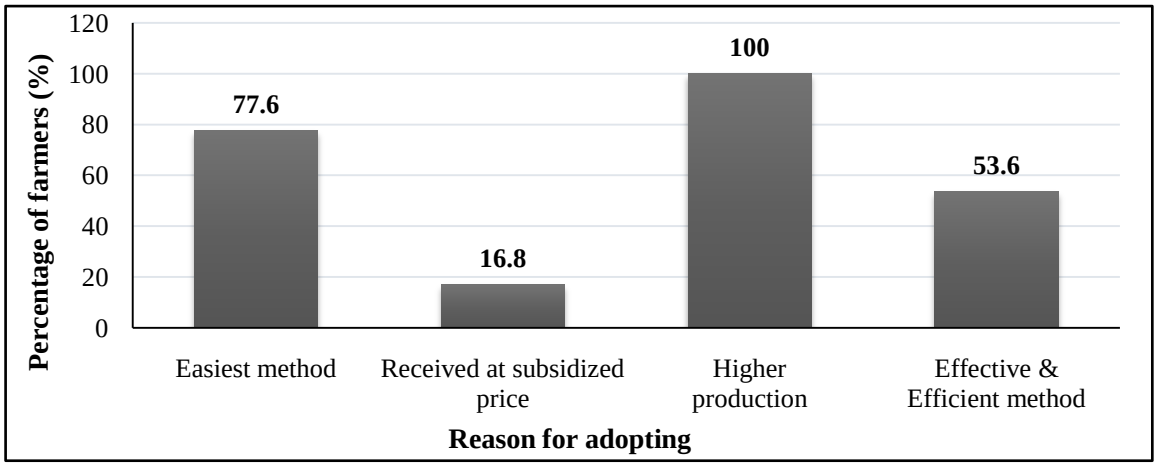


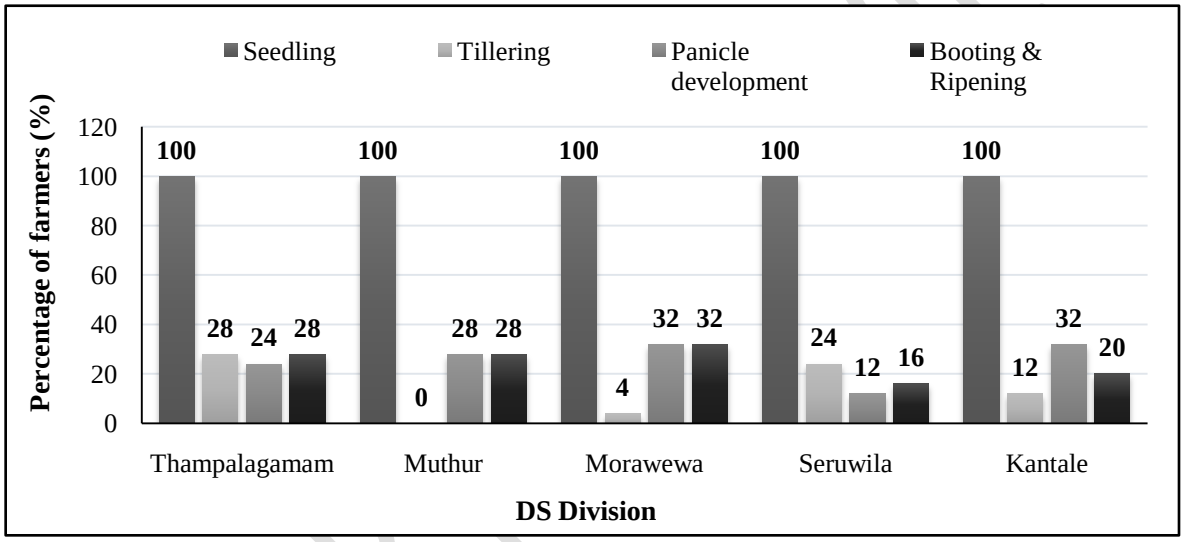
Figure 6.Percentage distribution of farmers based on reasons for adopting conventional fertilizers in Trincomalee district

Analyzing the status of the current level of practices is important to find out the reasons for not adopting organic fertilizers and the interest in inorganic fertilizer usage. As mentioned in Figure 6, the majority of farmers in entire DS divisions adopted urea and other inorganic fertilizers for higher productive potential. More than half of the farmers used it for its effectiveness and efficiency. About 75% of the farmers felt it was easier to use chemical fertilizers in paddy cultivation than organic based cultivation. Further, 16.8% of farmers said that they are doing inorganic fertilizer-based farming due to its lower market price and also received at a subsidized price. It is also evident that 80% of farmers bought subsidy fertilizers from agrarian service centers.

However, 44% of farmers in the Seruwila DS division purchased inorganic fertilizers additionally from retail shops as they had lower market prices and wanted to get higher production per unit area. These results revealed the highest adaptability of paddy farmers to chemical fertilizers and the potential of paddy cultivation in Trincomalee district. Furthermore, only 4% of farmers in the Thampalagamam DS division mentioned that they had a mild illness during the application of inorganic fertilizers, like headaches. In the remaining DS divisions, 100% of farmers had no issues with the application and utilization of conventional fertilizers.

Urea is badly needed by smallholder farmers in some of the hardest-to-reach and most vulnerable areas to help them recover from the recent economic shock and shortage of adequate fertilizers. It is also evident that a secular increase in the contribution of total factor productivity to output growth has been observed by using chemical fertilizers. Jeevika*et al*. (2022) stated that the contribution of fertilizer to the output has always been positive, though it was more pronounced. The results underline the positive and significant roles played by the chemical fertilizers, indicating possible effects [18].

3. Effect of fertilizer crisis on paddy cultivation in Maha 2021/22



3.1.Effect on different rice growth stages during fertilizer crisis

Figure 7. Percentage distribution of farmers based on affected rice growth stages during fertilizer crisis

The growth stage of the rice during the fertilizer crisis also determines the yield reduction of paddy. Each stage of rice development has a specific nutrient requirement. Negligence of these needs may lead to substantial high yield losses [19]. According to Figure 7, 100% of farmers in all DS divisions stated that the seedling stage is the primary affected stage during the fertilizer crisis. N is highly essential for the vegetative growth of plants, especially during the early stages of plant growth and development.

Tillering in rice is an important agronomic trait for the number of panicles per unit land area as well as grain production [20, 21]. 13.6% of farmers in all 5 DS divisions recorded that the number of tillers per plant was also affected in all DS divisions due to inadequate inorganic fertilizers. About 25% of farmers in the entire DS division proposed that the panicle development stage had a significant reduction in panicles. N, P, and K fertilizers affect the number of panicles. Panicle per m^2 differs with regard to nutrient management practices [22, 23]. About 25% of

farmers mentioned that the booting and ripening stages were severely affected by inadequate fertilizers. N, P, and K fertilizers affect the number of grains per panicle.

3.2.Effect of fertilizer crisis on paddy Yield

Fertilizer is the major input in rice production. The growth and yield characteristics of rice are affected by nutrients. The practice of an adequate rate and timing of fertilizer application can increase the rice yield [24]. The nature of crop damages in terms of yield reduction during the fertilizer crisis was classified into 4 categories, viz., <25%, 26–50%, 51–75%, and 76–100%. Figure 8. explains that the majority of farmers in all DS divisions faced a 26–50% yield reduction during the fertilizer crisis, which was highly closer to 50%. About 16% of farmers observed 51–75% of yield damages and 4.8% of damages within 76–100% on average, and very few farmers faced yield reductions less than 25% in entire DS divisions.

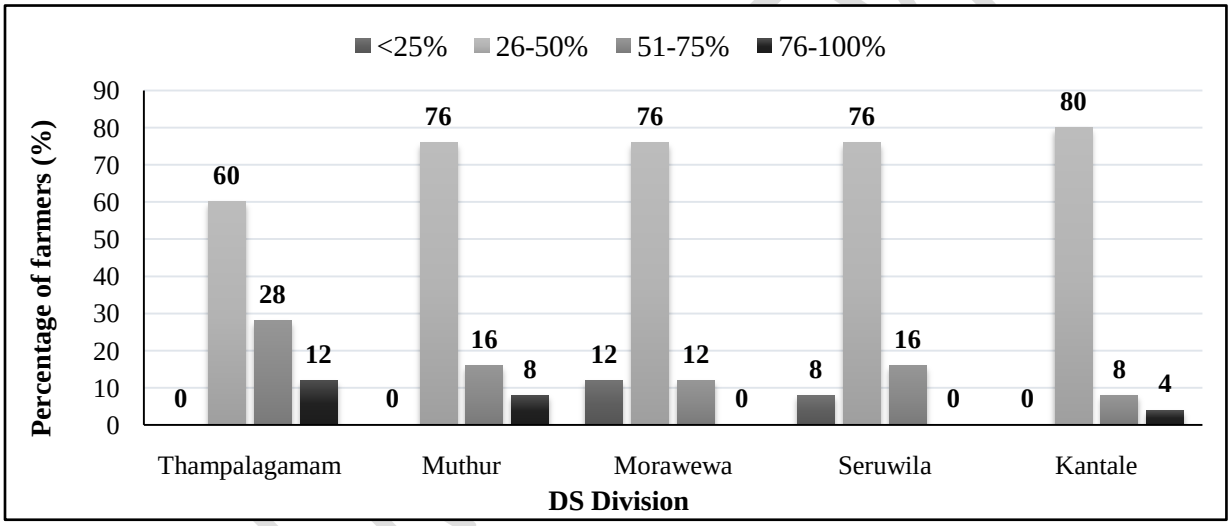


Figure 8. Percentage distribution of farmers based on the % yield reduction during Maha 2021/22 in paddy cultivation

Long-term fertilization can effectively improve crop yield and soil fertility. Bisht and Chauhan (2020) proposed that to increase agriculture production and maintain soil fertility, the application of chemical fertilizers is indispensable. However, insufficient or unnecessary application of fertilizer does not guarantee consistently growing yields, which can result in low efficiency of nutrient usage [25].

3.3.Effect of fertilizer crisis on paddy Production

As mentioned in the above figure 9, the majority of farmers received a 50% reduction in paddy production during the fertilizer crisis in the major cropping season Maha 2021/22 in all five DS divisions compared to paddy production before the fertilizer crisis in Maha 2020/21 in Trincomalee district, and there is also a significant difference at the 0.01 probability level on

paddy production due to inadequate chemical fertilizer application. The yield reduction from last year (Maha 2021/22) was higher in the Kantale DS division, followed by the Thampalagamam, Seruwila, Muthur, and Morawewa DS divisions.

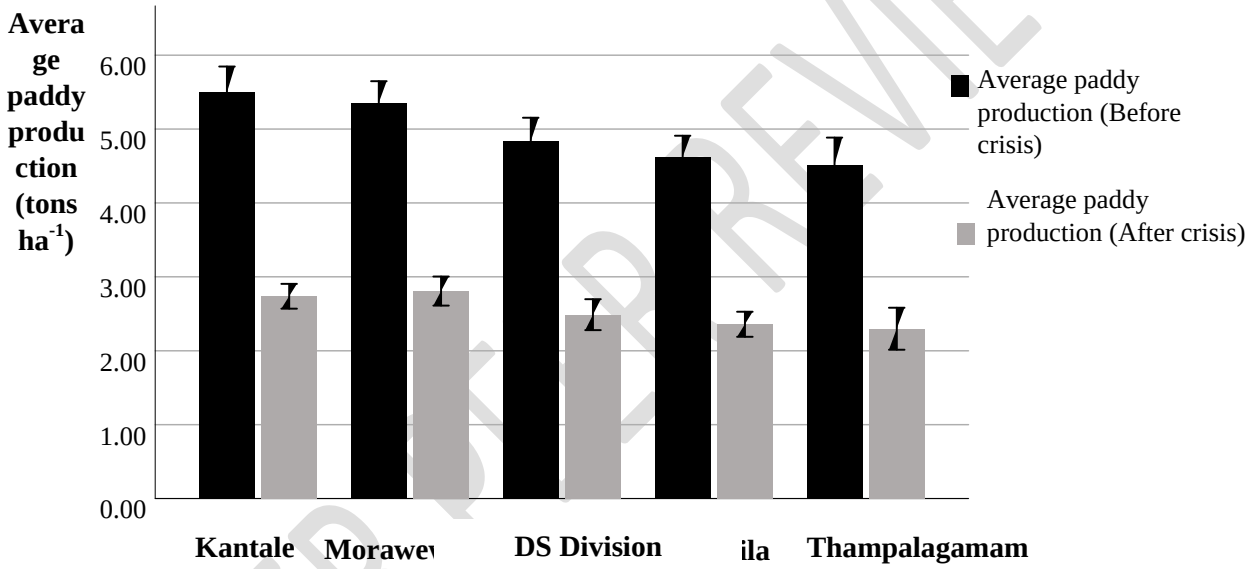


Figure 9. Average paddy production before and during fertilizer crisis in the study area

As confirmed by Ekanayake (2015) and Ranathilaka and Arachchi (2019), the introduction of high yielding varieties was the major factor that contributed to the increase in paddy production in the country. For that, successive governments provided support to stimulate paddy production by way of fertilizer subsidy schemes [26, 27]. In Trincomalee district, the majority of farmers (more than 90%) used improved varieties. Ekanayake (2015) pointed out that farmers had not been using the correct amount of fertilizer to maintain the N:P:K ratio of the field, especially when urea was subsidized [26]. Therefore, the soil is highly exposed to chemical fertilizers and has lost its native fertility. Hence, a sudden withdrawal of inorganic fertilizers severely affected the yield. In addition, lower crop nutrients, especially during the critical stages of rice plant growth, increase the incidence of crop insects and disease, and hence, grain yield is reduced [24]. It was also confirmed by the Department of Agriculture, (2022) that paddy production in Trincomalee district in Maha 2020/21 was 140,021.79 metric tons; however, paddy production during the fertilizer crisis in Maha 2021/22 was 80,214.92 metric tons. It was estimated that a 57% yield reduction was observed in Trincomalee district [2].

3.4.Quality of plant and yield attributes

All the farmers in the 5 DS divisions expressed some common characteristics of the growth and developmental features of plants, panicles, and grains that they observed during the fertilizer crisis, such as low germination, yellowing of leaves, weakening of stems, chaffy grains, low grain weight, shattering of panicles, and uneven maturity of panicles. **Potassium deficiency causes** greater lodging, a higher level of unfilled grain, and a lower grain weight. Hence, inadequate application of major nutrients obviously causes yield reduction in paddy, and when the soil fertility is too low in the same condition, it rapidly increases the severity of yield reduction [28].

Furthermore, chemical fertilizer is necessary for optimal growth and grain production in rice farming. N fertilizer promoted the accumulation of protein, decreased the accumulation of amylose in grain, and enhanced the gel consistency of brown rice. Appropriate N fertilizer management could increase micronutrient contents in grain and improve the nutrition quality of rice [19]. The dose of K fertilizer increased the quality of rice yield, but an increased dose provides improved, meaningful results [28].

Though a small number of farmers in Thampalagamam, Morawewa, and Kantale DS divisions stated that a low shattering percentage and bulging of grains were observed, These poor-quality grains impacted the marketing of the harvest. Anyhow, the private sector of Sri Lanka purchased harvested paddy at higher prices, which were comparatively greater than the previous one. This prevented most of the farmers from experiencing a heavy loss.

3.5.Effect of fertilizer crisis on cost of production during Maha 2021/22 in paddy cultivation

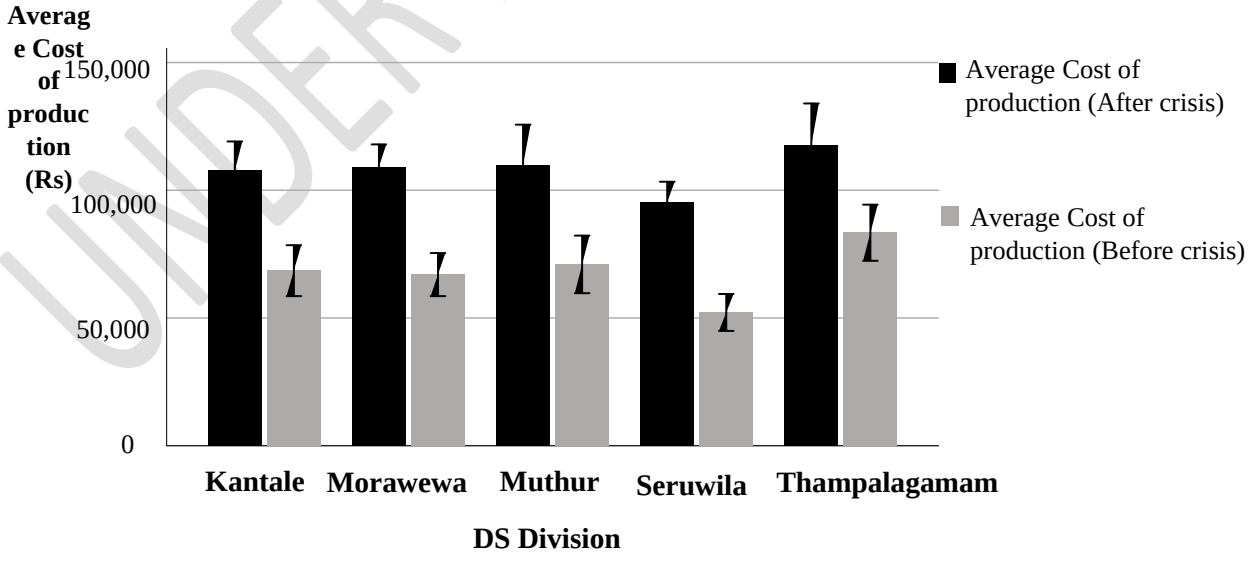


Figure 10. Average cost of production before and during fertilizer crisis (Maha 2021/22) in paddy cultivation

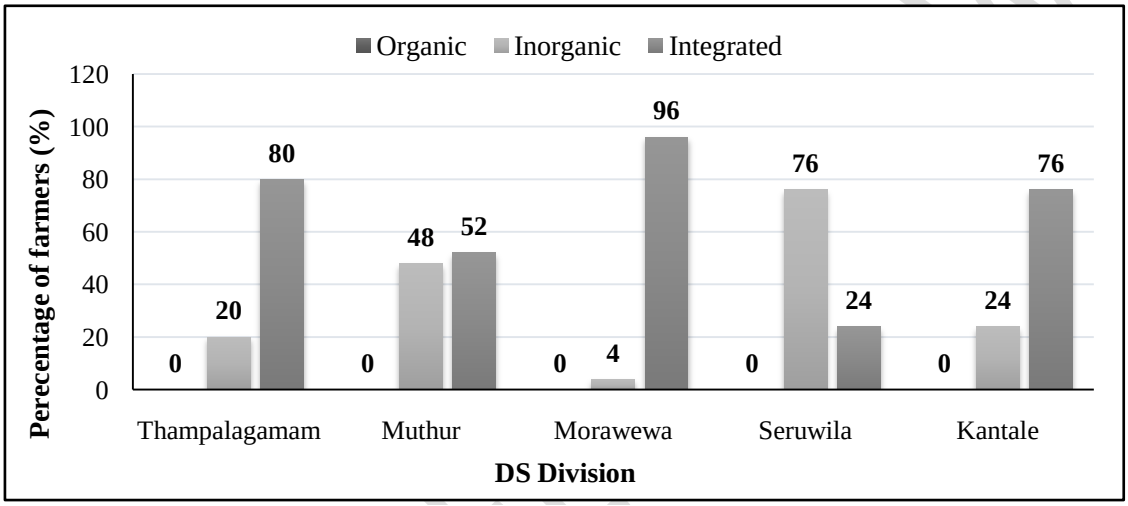
As shown in Figure 10, the cost of production was significantly increased (0.05 probability level) during the fertilizer crisis (in Maha 2021/22) widely in all 5 DS divisions. The cost of production increased by more than 50% compared to the cost involved before the fertilizer crisis in Maharashtra in 2020/21 in all DS divisions except Thampalagamam, which was closer to half the percentage (41.2%). A high cost of production was experienced in the Seruwila DS division, where it was increased up to 82.8%. This was mainly due to the purchase of inorganic fertilizers, especially urea, from black markets at higher prices, which ranged from Rs. 35,000 to Rs. 50,000 per 50-kg bag. These major inorganic fertilizers, such as urea, TSP, and MOP were provided at a subsidized price of Rs. 500.00 per 50 kg bag before the fertilizer crisis. Farmers received subsidy fertilizers for up to 5 acres of paddy cultivation. However, presently, the government provides urea at Rs. 1000/50 kg bag and MOP at Rs. 1900/50 kg bag, and no TSP has yet been provided according to current policy. Though it is far less than the present market price.

Furthermore, a considerable number of farmers partially adopted fertilizer policies, which means they also engaged in compost production in addition to using inorganic fertilizers purchased from older stock. However, due to the low and limited availability of quality raw materials like animal manures, farmers needed to collect the raw materials from neighboring areas or outstations. This caused high transportation costs. Also, some of the farmers who have other occupations, like government jobs, required labor for the preparation and application of organic manures. Anyhow, higher prices for harvested paddy during that particular season of paddy cultivation (Maha 2021/22) by the private sector somewhat prevented farmers. But they did not get enough profit like before the fertilizer crisis due to the adoption of non-cost-effective and inefficient methods of fertilizer practices. It was revealed that the majority of farmers faced net losses (maximum 96% of farmers in Morawewa DS division) and a low percentage of farmers received net profits who partially adopted government policy and were involved in the production of organic fertilizers. This proved that the combined use of organic and inorganic manures provided the most cost-effective way to cultivate paddy.

3.6.Government initiatives to overcome the fertilizer crisis

Due to the unpredictable ban on chemical fertilizers, paddy cultivation came to a standstill. A complete organic farming operation requires a minimum time interval for the preparation of organic manures. With the limited availability of raw materials for a huge acreage of paddy lands in the district as well as in the country, or with improved technologies, one can enhance organic manure production without exploiting the existing resources. Therefore, it requires a period of time for its reclamation through the application of organic sources [24]. These obstacles were reflected in the paddy yield and hit the country's GDP severely. Further, the government faced several objections through protests, and eventually the government officially got back to 100% organic farming. Furthermore, the present fertilizer policy was recommended by the Department of Agriculture by using 70 percent chemical fertilizers and 30 percent organic fertilizers for the 2022/23 Maha Season.

As per Figure 11, the majority of farmers have preferences for the sustainable farming system, namely, the Integrated Plant Nutrition System (IPNS). Almost 96% of farmers in the Morawewa DS division highly preferred IPNS. However, 76% of farmers in the Seruwila DS division had more preferences in the application of inorganic fertilizers than organic fertilizers, even though they were provided on a free basis due to high labor charges and other costs of production. Meanwhile, the paddy farmers who preferred this IPNS were also not interested in producing their own organic manure. They accepted due to government enforcement and the free availability of organic fertilizers.



Percentage distribution of farmers based on preferences in the Integrated Plant Nutrient System

With the application of NPK fertilizer and organic fertilizer, it is expected to improve the nutrient adequacy of rice plants so that crop yields will increase. The balanced use of fertilizers improves crop productivity and soil fertility in a sustainable manner without any environmental damage [17]. Rice growth and yield traits are affected by the integrated use of manure and inorganic fertilizers. Farmers should use a combination of organic fertilizers and reduced-inorganic fertilizers to increase rice yield and protect and improve soil health. A balanced and proper amount and timing of fertilizer application is an effective approach to increasing the growth and productivity of rice and ensuring environmental sustainability [19].

3.7.Suggestions for improvement

Eventually, some suggestions for improvement and to avoid these types of heavy losses caused by the fertilizer crisis were received from the farmers. Farmers expected that the government should be given the appropriate effects on the private property of those whose investments are affected. Farmers mentioned that the government should give advance notice to make necessary adjustments to minimize losses before taking such critical decisions in the future. Further, gradual reduction and recommended application of inorganic fertilizers are always better and the holistic way for a sustainable paddy cultivation practice in Trincomalee district. In addition,

farmers felt that the present fertilizer policy (inorganic: organic, 70%:30%) is far better than the complete banning of chemical fertilizers, and the government can spend money on the continuous supply of quality organic manures instead of spending more on importing whole inorganic fertilizer as they have low interest in their own compost production with adequate nutrient availability. Meanwhile, other farmers expressed some suggestions, like enhancing knowledge through standard government training programs in quality and enriched organic manure productions and methods of application, value-added and supercompost productions, regular soil testing procedures, and making close and easy contacts with extension officers.

CONCLUSION

The findings of this survey highlighted the impact of the fertilizer crisis during Maha 2021/22 on paddy cultivation in five DS divisions of Trincomalee district. Farmers encountered numerous difficulties in their paddy cultivation as a result of the ban on chemical fertilizers. Based on this study, it may be inferred that most farmers in all DS divisions experienced a yield drop of approximately 50% in comparison to the previous cropping season, 2020–21 Maha. The yield reduction from last year (Maha 2021/22) was higher in the Kantale DS division, followed by the Thampalagamam, Seruwila, Muthur, and Morawewa DS divisions. The application of fertilizer affected the rice's growth stage. In this regard, during the fertilizer crisis in paddy cultivation across all DS divisions, the seedling stage was significantly impacted. All farmers in the five DS divisions mentioned a few similar problems with the characteristics of plants that determine their quality. Furthermore, in comparison to the costs associated with Maha 2020–2021 in all DS divisions, the cost of production in paddy agriculture increased by more than 50% during the fertilizer crisis. Additionally, the results showed that there is very little potential for producing organic manure and that most farmers are interested in implementing the Integrated Plant Nutrient System, a sustainable farming system, through careful utilization of chemical and organic fertilizers that they receive as subsidies in accordance with the current government fertilizer policy, which calls for the application of 70% inorganic fertilizers and 30% organic manure in order to improve sustainability in paddy cultivation.

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