DOES GUARANTEED PRICE REGULATE THE MARKET PRICE OF PADDY IN SRI LANKA? EXPLORING THE PRESENT AND DIRECTING THE FUTURE

S L J E R

S M S Palitha Bandara

G C Samaraweera

T S L W Gunawardana

Abstract

An argument arises that the opportunistic behavior of leading millers controlling the paddy market harms the farmers, small and medium-scale millers, and consumers. Therefore, this study aims to examine the policy-level intervention required to regulate and monitor the supply and prices of paddy to secure producers and to assess the impact of guaranteed prices in regulating the market price of paddy. The study used production, imports, guaranteed prices, and market prices of major three paddy types in five selected districts for 7 years. The one-sample t-test was used for analysis. The results of the study provide new insights for policymakers to revisit strengthening of regulatory mechanisms in the industry to function competitively. Further, the study identified the lapses in the implementation of existing regulatory mechanisms that might be harmful to producers, SMS millers, and consumers. In addition, identified the possibility of policy-level interventions to enhance appropriate regulatory measures under the existing legal provisions to minimize the anti-competitive and opportunistic actions of key players in the industry if any, enabling market forces to operate smoothly while minimizing the impact on the performance of SMS millers.

S M S Palitha Bandara (Corresponding Author)
Paddy Marketing Board, Sri Lanka.
Email: samanpb@yahoo.com,   Tel: +94 71 190 9020
https://orcid.org/0000-0003-3116-3593

G C Samaraweera
Department of Agricultural Economics, University of Ruhuna, Sri Lanka.
Email: gangani@agecon.ruh.ac.lk,   Tel: +94 71 838 7487
https://orcid.org/0000-0001-7617-4048

T S L W Gunawardana
Department of Business Management, University of Ruhuna, Sri Lanka.
Email: gunawardana@badm.ruh.ac.lk,   Tel: +94 71 857 7625

INTRODUCTION

Rice is the staple food for more than half of the world's population, contributing to milled rice production of 503 million MT in 2022 (Shahbandeh, 2022). In the Sri Lankan context, rice is the dietary staple food and is the major domestic crop of approximately 1.8 million farmers engaged in paddy cultivation. Around 30 per cent of the population is directly or indirectly involved in the paddy/rice industry (Jayasinghe, 2010). Therefore, most researchers pay much attention to the performances of the industry and every successive government gave prominence to the allocation of resources. Therefore, it is imperative to study paddy / rice industry as Davis et al., (2016) state the possible improvements in rice production to feed 25.3 million, Sri Lankans, by 2050 which demonstrates the incorporation of avenues for improving resource use efficiency.

The determination of the price of paddy in the market is associated with availability which connects with the seasonal harvests (Maha and Yala). In certain periods of the year, higher price fluctuation in the paddy/rice industry is observed. From January, the prices of paddy decline gradually and reach their lowest in April with the reach of the Maha season harvest. Thereafter, the prices increase slightly from May and undergo a minor collapse during July and August with the harvest of the Yala season. From September onwards, a sharp increase occurs and reaches its peak in December and begins to decline again from January onwards (Senanayake and Premarathna, 2016, Thibbotuwawa, 2021). The lower market price (MP) can be observed during the harvesting period in which farmers inability to recover their costs as many farmers sell just after the harvest (Prasanna, 2019, Wijesooriya et al., 2021). The Maha season harvest reaches the market from February to April and Yala season harvest reaches the market from August to October. The Paddy Marketing Board (PMB) was established as per Act no 14 of 1971 as a parastatal with the aim to secure the producer while purchasing paddy at a guaranteed price (GP) and to secure the consumer while releasing stock during the off-season. However, after 1977, changes in the paddy and rice market occurred with the economic liberalization policies and private sector participation became prominent. Thereafter, PMB has not been actively involved in purchasing paddy, and a resolution was submitted on 5th April 2000 to the Parliament to dissolve PMB. However, the resolution had not been passed by the Parliament. Thereafter, the PMB functions remained at a standstill until 2007. In 2007, with the approval of the Cabinet of Ministers, PMB was re-established and has been carrying out the service of purchasing paddy from the farmers (Paddy Marketing Board, 2018).

Prasanna, (2019), Wijesooriya et al., (2021), and Thibbotuwawa, (2021) highlighted the anti-competitive practices of large-scale millers that harm paddy producers and consumers. Around 57 % of the produced paddy in the country is milled by 1,400 SMS rice mills and 33.8% of the market is contributed by 220 large and leading rice millers (Ministry of Health, Nutrition, and Indigenous Medicine, 2017). As 57% of the market is contributed by SMS millers, policy-level intervention is required to empower their performance to minimize the impact of opportunistic action of key players if any.

The PMB declares a Guaranteed Price (GP) for paddy and purchases paddy to enhance the livelihood of the farmers. However, an argument arises that farmers are not getting the benefit of declaring guaranteed prices and a few politically backed leading millers are controlling the market (Thibbatuwawa, 2021). Therefore, this study aims to examine the impact of fixing a Guaranteed price on the stabilized market price of paddy and to policy-level intervention required to regulate, facilitate, and monitor the supply and prices of the market to secure paddy producers.

LITERATURE REVIEW

Paddy Marketing Issues in Sri Lanka

The paddy marketing problem attained a wider interest among scholars in its negative impact on the food security of the country. Existing literature in the field does not provide sufficient information to address the problem sustainably, rarely outlines the root causes, and does not adequately support identifying alternative models. Weerahewa (2004) analyzed the impacts of liberal policies on the paddy sector and revealed that liberalization would support farmers to be more competitive as entrepreneurial farmers. The economic gains of paddy farming in Sri Lanka were studied by Henegedara (2006) and revealed that less competitiveness in paddy marketing is the leading cause for farmers to have an unfair price or a price below the Guaranteed Price (GP) during the harvesting period. His study confirmed that price determination is mainly done by private traders, and it is mostly below the GP. The study further revealed the lesser effectiveness of farmer companies, cooperative societies, and the Government mechanism in the realization of GP due to less capability in handling market risks. An empirical study conducted by Prasanna (2018), in the Huruluwewa Colonization Scheme, investigated the nature of the problem of poor earnings and confirmed that paddy farmers do not derive an adequate net income from paddy farming, and the majority of farmers are compelled to sell their harvest at a low price during the harvesting period, which may be insufficient to cover the cost of production adequately. Further, the study insisted that the oligopolistic market structure and pre-modern economic characteristics of the paddy marketing channel were identified which eventually weakened the farmers' bargaining power and forced them to accept the trading terms offered by traders.

Damayanthi (2006) conducted a study in Polonnaruwa and revealed the issues of the GP scheme and reported that 85% of sampled farmers sold their harvest to private traders and experiencing issues with fair prices at the harvesting time. These results indicated the ineffectiveness of the government paddy purchasing mechanism to meet the needs of producers and consumers. Wijesooriya et al. (2017) stated in their study that the market price (MP) of paddy during the harvesting months, is well below the GP, in areas with high supply, low storage facilities, fewer infrastructure facilities, fewer private millers, and low-income families. The results emphasized the need for conducting further research on different intervention methods in paddy marketing, such as the warehouse receipt financing system. The effectiveness of the Warehouse Storage Receipt System (WSRS)

in solving the paddy sector crisis in Sri Lanka was studied by Prasanna (2019) in the Huruluwewa in the Anuradhapura district. The results proved that WSRS could enhance the net income of paddy farming by adequately marketing their harvest, as it improves the harvest-holding capability of farmers until they realize an expected price. Further, results urged that the WSRS leads to improved market competition through supply management, thereby gradually increasing the price at the harvesting period and shortening the price movement period to create equilibrium, which has been the farmers' expectation.

Wijesooriya et al (2021), studied the paddy / rice value chain and urged that the rice milling industry has undergone vast structural changes mainly due to a high degree of credit affordability, a large quantity of paddy storage ability during the harvesting season, and established brand loyalty. As the four largest millers in Polonnaruwa share 30% of the total rice production in the country, the study considered the rice milling industry to be characterized by oligopsony power. However, Senanayake and Premarathna (2016) have studied the competitiveness and efficiency of the paddy market in Sri Lanka by applying a tracer survey methodology and provided less evidence on the exploitation of paddy farmers and rice consumers by the private traders using oligopolistic market practices. The large-scale millers are a specific actor in the paddy/rice value chain and could impose market power both upstream and downstream. Therefore, Wijesooriya et al. (2021) suggested that the government encourages medium-scale millers to establish modern automated private-sector mills in high surplus-producing rural areas. The study further, insisted that the rice prices become stable to a certain extent when the GP is implemented and the ratio between the market price of paddy and the retail price of Nadu rice ranged between 1.97-2.2. When the guaranteed price has not been implemented, the ratio between the market price of paddy and the rice retail price tends to exceed 2.2.

Theoretical Construct

Transaction cost economics (TCE) is an approach for a better understanding of economic organization joining organizational theory, economics, and law. TCE, explains that conducting a transaction incurs costs for negotiations of contracts, monitoring the performances, and resolving the disputes. In addition, organizing transactions either through the market or a firm entails different costs. Accordingly, particular transactions are to be conducted with a sound comparative analysis of transaction costs incurred in different modes of transaction (Rindfleisch, 2019).

Coase (1937) introduced the emergence of intermediary firms to reduce these costs and these firms operate with hierarchies and exercise authority that allocates resources more efficiently and effectively than a market. The Transaction Cost Economics (TCE) introduced by Coase (1937) was refined by Williamson, (1975) while introducing two main assumptions: bounded rationality and opportunism. Bounded rationality concerns the cost incurred in the collection of information and the limitation of the analytical abilities of economic actors. Opportunism is defined by Williamson (1975) as "self-interest seeking with guile," meaning that actors do not always share full information and

objectively assess possible outcomes. Further, he introduced three key attributes: asset specificity, uncertainty, and frequency. Asset specificity is referred to as the specialized investments made by actors to enable the exchange. Masten et al. (1991), and Zaheer and Venkatraman (1994) introduced different types of asset specificity. Uncertainty is referred to as the contracting parties' inability to predict environmental changes and behavior under unforeseen circumstances. Williamson (1975) is concerned with environmental uncertainty, which requires adaptation to unforeseen circumstances. Further, he urged that the effects of uncertainty on economic behavior are common and inescapable. Frequency is referred to as the volume of transactions occurring between the two exchange parties. Williamson (1985) proposed that the overhead cost of hierarchical governance is easy to recover in more frequently recurring transactions. Therefore, hierarchical governance is higher for more frequently recurring transactions than the less frequently recurring transactions. The study by Klein (1989) proved a positive relationship between transaction frequency and the degree of vertical control. In addition, Reuer et al., (2002) urged that repeated transactions caused to development of trust and reductions in information asymmetry which will develop routines.

Hobbs (1997) has classified the components of transaction costs: information costs as occurred before the transaction; negotiation costs as the costs of physically carrying out the transaction; and monitoring costs as costs of ensuring the adhered to terms of the transaction. Holloway et al., (2000) distinguished the transaction costs between tangible and intangible. He considered tangible costs such as transportation costs, communication costs, legal costs, etc., and intangible costs such as uncertainty, moral hazard, etc. Pingali et. al., (2005) contextualized the transaction costs based on the place it occurs such as farmer-specific, location-specific, and crop-specific. Farmer-specific means access to finance or the knowledge of market demand and location-specific means the same cost for all farmers in a particular location or road access to the market, and crop-specific means such as perishables, and grains. They urged that aggregation of these transaction costs determines market participation or commercialization. As an example, from a farmer-specific angle, transaction costs occur in both the input as well as the output markets. These costs on the input side can vary, with the choice of financings such as rural micro-finance as opposed to formal banks, money lenders, or commission traders, to bring down transaction costs in crop loans for small farmers in the developing world (Ahmed, 1989; Wijesooriya et al, 2021). On the output side, the use of brokers or collectors by farmers to search for market prices has been highlighted (Gabre-Madhin, 1999). In the case of location-specific transaction costs, transport infrastructure creates differences in costs. Based on the study of grain markets in Niger, Aker (2008) has stated, that low road density and low-quality infrastructure are associated with high transaction costs. Pingali (2005) urged that poor road infrastructure increases transportation time and costs, which reduces farmers' prices, which demotivates them to enter commercial agriculture. In terms of crop-specific transaction costs, high-value crops, such as vegetables, are usually associated with higher transaction costs than grains. Pingali (2005) further described household-specific variables that incur fewer transaction costs which

impact due to aversion to risk and uncertainty; social networks and organization; age, gender, education, etc. Key et. al., (2000) categorized transaction costs as fixed and variable transaction costs. Fixed transaction costs include the original search, negotiation, and enforcement costs which may vary with the volume of input or output and a farmer would incur the same search cost to sell either one ton or ten tons of produce. Variable transaction costs include costs of transferring the input or produce being traded, such as transportation costs to accessing markets. Transaction costs provide a macro perspective of the entire agriculture value chain from farm to plate. Unless the farmer sells produce to the wholesaler, there is no entry into the commercialization of agriculture.

Benkler (2002) records, "Coase…originated the transaction costs theory of the firm that provides the methodological template for the positive analysis of peer production that I offer". He highlighted that the emergence of free software development made a puzzle to organizational theory. With the reach of a millennium, transactions have been taking place in new types of economic arrangements. The digital revolution creates novelty mechanisms in organizing economic activities. The use of digital tools such as the Internet creates new forms of economic organization such as crowdsourcing, idea competitions, and user innovation (Benkler, 2017). With the present social movement, people seek to function economy in nonmarket models through the peer process. Under these changing circumstances a theory that focuses on markets vs firms began to face challenges. Benkler's version of TCE focused mainly on technology and to bring it to the digital world widening Coase's and Williamson's perspectives. With an interest and influenced by the technology of the digital age, Yochai Benkler tried to modernize TCE in response to the digital world (Rindfleisch, 2019).

METHODOLOGY

Data

Five focus group discussions were conducted with the staff of PMB regarding their mandated role, the existing practices, and their limitations. Two meetings were conducted with the senior staff members, who were involved in formulating national-level policies of the PMB head office. Thereafter, three meetings were conducted with the senior staff members of the regional level offices and identified the existing practices and the limitations encountered while implementing the national-level policies. In addition, GP was obtained from the annual reports of the PMB (Annual report of Paddy Marketing Board, 2021;2022). The MP of paddy and import quantities were obtained from the monthly food commodity bulletin published by the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) from 2015 to 2021(Monthly Food commodity bulletin, 2016;2018; 2020; 2021). Further, Annual paddy production was obtained from the Department of Agriculture (Crop Forecast, 2018; 2020; 2021). The study considered the MP of five major paddy producing Districts; Anuradhapura, Polonnaruwa, Kurunegala, Ampara, and Hambantota which had the highest surplus production.

Analysis of Guaranteed Price and the Market Price

The guaranteed price fixed by the PMB for the long grain white (LGW / white Nadu), long grain red (LGR / Red Nadu), and short grain white (SGW) paddy types were used in this study from the year 2015 to 2021 (Paddy Marketing Board, 2022). The selected three paddy types contributed to producing 98 per cent of the different rice types consumed in the country (Ministry of Health, Nutrition, and Indigenous Medicine. (2017). In addition, the monthly average retail market prices of the same paddy types published by the HARTI in major paddy-producing districts were used in this study (Monthly Food Commodity Bulletin, 2022). The districts were selected based on surplus production. and the surplus production in Ampara is 18%, in Polonnaruwa 17%, in Anuradhapura 20%, and in Kurunegala 11% which are used for analyzing LGW and SGW. The district selected for LGR is Hambanthota and the surplus production in Hambanthota is 6% (Wijesooriya et al., 2021).

Analytical Tools

The one-sample t-test is a statistical hypothesis test used to determine whether an unknown population means is different from a specific value (Oliver, 2014). Therefore, as the first step, one sample t-test through SPSS software was used to analyze the data. The parameters for the t-test are as follows.

Test value or the specific value = Guaranteed price (GP)

μ - Mean market price

$H_0: \mu = \mu_0$ (Null hypothesis) vs $H_1: \mu \neq \mu_0$ (Alternative hypothesis)

If t-value > Table-value then H_0 must be rejected and H_1 must be accepted.

Once the guaranteed price (GP) is imposed, market price $\geq$ GP in principle.

In the second step, the right tail test was conducted for the instances which accept H_1 and mean values are greater than the GP to identify the positive significant difference. Further, a Left tail test was conducted where H_1 was accepted and the mean is lower than the GP to identify the negative significant difference. The parameters for the left tail and the right tail test are as follows.

The left tail test - when the sample mean is less than μ_0

μ - Mean market price

μ_0 - Guaranteed price

$H_0: \mu = \mu_0 \quad vs \quad H_1: \mu < \mu_0$

If $t < 0$ then $p - value = sig/2$

If $t > 0$ then $p - value = 1 - sig/2$

The right tail test - when the sample mean is greater than μ_0

μ - Mean market price

μ_0 - Guaranteed price

$H_0: \mu = \mu_0 \quad vs \quad H_1: \mu > \mu_0$

If $t < 0$ then $p - value = 1 - sig/2$

If $t > 0$ then $p - value = sig/2$

If P-value for t-test < 0.05 then H_0 must be rejected or H_1 must be accepted.

RESULT AND DISCUSSION

Results of Focus Group Discussions

Analysis of Market Price and Guaranteed Price in Years 2015

The GP for the SGW was Rs. 50.00 and the GP for LGW and LGR was Rs. 45.00 in 2015. The results are shown in Table 1.

Table 1: Results of the Analysis of One Sample T-test in 2015

Paddy Type	District	T- value vs $t_{\alpha, df}$	P - Value	Result
SGW	Anuradhapura	-11.237 < 2.201	1.0	Accept H_0
SGW	Polonnaruwa	-7.864 < 2.201	1.0	Accept H_0
SGW	Kurunegala	-10.228 < 2.201	1.0	Accept H_0
SGW	Ampara	-7.913 < 2.201	1.0	Accept H_0
LGW	Anuradhapura	-10.670 < 2.201	1.0	Accept H_0
LGW	Polonnaruwa	-9.125 < 2.201	1.0	Accept H_0
LGW	Kurunegala	-11.445 < 2.201	1.0	Accept H_0
LGW	Ampara	-9.576 < 2.201	1.0	Accept H_0
LGR	Hambanthota	-4.521 < 2.201	0.995	Accept H_0

Source: Author calculated

Accordingly, H_0 can be accepted as the test value is lower than the table value in all districts and all paddy types. Therefore, the study confirmed that the MP of SGW and LGW paddy types in Anuradhapura, Polonnaruwa, Kurunegale, and Ampara and LGR paddy types in Hambanthota are not significantly different from the GP in the years 2015. The annual paddy production was 4.819MMT in 2015 and the potential rice production is 2.750MMT excluding the seed paddy requirement of 0.1MMT, 6% wastage, and considering 62% paddy into the rice conversion ratio. The annual rice requirement for consumption in the year is 2.27MMT (Crop Forecast, 2016). Even though the country had 0.48 MMT (21%) surplus production, 0.284MMT of rice was imported in 2015

(Monthly Food Commodity Bulletin, 2016). Therefore, the study identified that the absence of a significant difference between the MP and the GP is due to excess supply to the market beyond consumption requirement due to excess production and the importation of rice.

Analysis of Market Price and Guaranteed Price in the Year 2016

The GP was not revised in 2016 and according to the results shown in Table 2, it can be accepted H_0 as the test value is lower than the table value in all districts for all paddy types. Therefore, the study confirmed that the MP of SGW and LGW paddy types in Anuradhapura, Polonnaruwa, Kurunegale, and Ampara and LGR paddy types in Hambanthota are not significantly different from the GP in the years 2016 same as in 2015.

Table 2: Results of the Analysis of One Sample T-test in 2016

Paddy Type	District	T- value vs $t_{\alpha, df}$	P-Value	Result
SGW	Anuradhapura	-2.157 < 2.201	0.973	Accept H_0
SGW	Polonnaruwa	-0.821 < 2.201	0.785	Accept H_0
SGW	Kurunegala	-2.161 < 2.201	0.973	Accept H_0
SGW	Ampara	-1.023 < 2.201	0.836	Accept H_0
LGW	Anuradhapura	-2.370 < 2.201	0.981	Accept H_0
LGW	Polonnaruwa	-1.280 < 2.201	0.886	Accept H_0
LGW	Kurunegala	-1.893 < 2.201	0.957	Accept H_0
LGW	Ampara	-1.587 < 2.201	0.929	Accept H_0
LGR	Hambanthota	-2.345 < 2.201	0.980	Accept H_0

Source: The author calculated, (2022)

The annual paddy production was 4.42MMT in 2016 and the potential rice production was 2.517MMT. The annual rice requirement for consumption in the year is 2.27MMT (Crop Forecast, 2017). Even though the country has 0.247 MMT (10%) surplus production, 0.029MMT of rice was imported in 2016 (Monthly Food Commodity Bulletin, 2017). Therefore, the study identified that the absence of a significant difference between MP and GP is due to excess supply to the market beyond consumption requirement due to excess production.

Analysis of Market Price and Guaranteed Price in 2017

The GP was reduced in 2017 to Rs. 41.00 for SGW and Rs. 38.00 for the LGW and LGR. The results of the analysis as shown in Table 3, H_1 can be accepted as the test value is higher than the table value in SGW and LGW in Anuradhapura, Polonnaruwa, Kurunegala, and Ampara districts. Further, the same result was observed for the LGR in the Hambanthota district. Therefore, results proved that there was a significant difference between the MP and the GP in 2017.

Table 3: Results of the Analysis of One Sample T-test in 2017

Paddy Type	District	T- value vs $t_{\alpha, df}$	P - value	Result
SGW	Anuradhapura	6.975 > 2.201	0.00	Accept H_1
SGW	Polonnaruwa	5.998 > 2.201	0.00	Accept H_1
SGW	Kurunegala	5.938 > 2.201	0.00	Accept H_1
SGW	Ampara	6.157 > 2.201	0.00	Accept H_1
LGW	Anuradhapura	10.228 > 2.201	0.00	Accept H_1
LGW	Polonnaruwa	7.396 > 2.201	0.00	Accept H_1
LGW	Kurunegala	10.159 > 2.201	0.00	Accept H_1
LGW	Ampara	8.610 > 2.201	0.00	Accept H_1
LGR	Hambanthota	9.917 > 2.201	0.00	Accept H_1

Source: Author calculated

As the significant difference between the GP and the MP was observed and the mean value was higher than GP, the right tail test was conducted to identify whether the MP was significantly greater than GP. The results are shown in Table 4. Accordingly, it can be accepted H_1 in the right tail test as the P value is lesser than α (0.05). Therefore, results proved that MP was significantly greater than GP, which is highly beneficial to farmers in all three selected paddy types in all selected districts.

Table 4: Results of the Analysis of the Right Tail Test in 2017

Paddy Type	District	P value	P value Vs α	Result
SGW	Anuradhapura	0	$0 < 0.05^{**}$	Accept H_1
SGW	Polonnaruwa	0	$0 < 0.05^{**}$	Accept H_1
SGW	Kurunegala	0	$0 < 0.05^{**}$	Accept H_1
SGW	Ampara	0	$0 < 0.05^{**}$	Accept H_1
LGW	Anuradhapura	0	$0 < 0.05^{**}$	Accept H_1
LGW	Polonnaruwa	0	$0 < 0.05^{**}$	Accept H_1
LGW	Kurunegala	0	$0 < 0.05^{**}$	Accept H_1
LGW	Ampara	0	$0 < 0.05^{**}$	Accept H_1
LGR	Hambanthota	0	$0 < 0.05^{**}$	Accept H_1

Notes ** - 5% significance level.

Source: Author calculated

The annual paddy production was 2.383MMT in 2017 and the potential rice production was 2.146MMT. The annual rice requirement for consumption in the year was 2.27MMT (Crop Forecast, 2018) and the country had a 0.939 MMT (41%) deficit in production.

Further, 0.747MMT of rice was imported in 2017 (Monthly Food Commodity Bulletin, 2018). As the production and the import amount were inadequate for the requirement, the market prices showed a significantly greater increase than GP. An increase in MP benefited the farmers however, SMS millers are experiencing inconvenience due to the increase of MP.

Analysis of Market Price and Guaranteed Price in the Year 2018

The GP was not revised in 2018. The results as shown in Table 5, H_1 can be accepted as the test value was higher than the table value in SGW in Anuradhapura, Polonnaruwa, Kurunegala, and Ampara districts. Similarly, H_1 was accepted in LGW in Anuradhapura and Polonnaruwa which proved the existence of a significant difference between the MP and the GP. In contrast, with respect to LGW in Kurunegala and Ampara H_0 can be accepted as the test value was lesser than the table value which proved that there was no significant difference between MP and GP. Similarly, H_0 can be accepted in LGR in the Hambanthota district.

Table 5: Results of the Analysis of One Sample T-test in 2018

Paddy Type	District	T- value vs $t_{\alpha, df}$	P - Value	Result
SGW	Anuradhapura	11.888 > 2.201	0.00	Accept H_1
SGW	Polonnaruwa	11.798 > 2.201	0.00	Accept H_1
SGW	Kurunegala	6.887 > 2.201	0.00	Accept H_1
SGW	Ampara	10.650 > 2.201	0.00	Accept H_1
LGW	Anuradhapura	2.772 > 2.201	0.009	Accept H_1
LGW	Polonnaruwa	3.104 > 2.201	0.005	Accept H_1
LGW	Kurunegala	1.694 < 2.201	0.059	Accept H_0
LGW	Ampara	2.059 < 2.201	0.032	Accept H_0
LGR	Hambanthota	-1.007 < 2.201	0.832	Accept H_0

Source: Author calculated, (2022)

The right tail test was conducted to identify whether MP was significantly greater than GP for the instances that showed a significant difference in one sample T-test between MP and GP and the mean values of MP were greater than GP. As shown in Table 6, the results of the right tail test accepted H_1 as the P values were lesser than α (0.05) for all the tested paddy types; SGW in selected four districts, and LGW in Polonnaruwa and Anuradhapura districts. Accordingly, results proved that MP was significantly higher than GP, which was highly beneficial to farmers.

The annual paddy production was 3.90MMT in 2018 and the potential rice production was 2.214MMT. The annual rice requirement for consumption in the year was 2.27MMT (Crop Forecast, 2019) and the country had a 0.059 MMT (3%) minor deficit in production. Even though the deficit was around 3%, 0.248MMT of rice was imported in 2018 which is 4 times the deficit (Monthly Food Commodity Bulletin, 2019). As the

production of local rice types was not adequate, SGW in all four districts and the LGW in Anuradhapura and Polonnaruwa showed a significantly greater price than GP. Therefore, SMS millers are experiencing inconvenience due to the increase in paddy prices which leads to the high transaction cost.

Table 6: Results of the Analysis of the Right Tail Test in 2018

Paddy Type	District	P value	P value Vs α	Result
SGW	Anuradhapura	0	$0 < 0.05^{**}$	Accept H_1
SGW	Polonnaruwa	0	$0 < 0.05^{**}$	Accept H_1
SGW	Kurunegala	0	$0 < 0.05^{**}$	Accept H_1
SGW	Ampara	0	$0 < 0.05^{**}$	Accept H_1
LGW	Anuradhapura	0.009	$0.009 < 0.05^{**}$	Accept H_1
LGW	Polonnaruwa	0.005	$0.005 < 0.05^{**}$	Accept H_1

Notes ** - 5% significance level.

Source: Author calculated, (2022)

Analysis of Market Price and Guaranteed Price in the Year 2019

The GP was not revised in the year 2019. The results as shown in Table 7, H_0 can be accepted as the test value is lower than the table value in SGW in Anuradhapura, Polonnaruwa, Kurunegala, and Ampara districts. Further, LGW in Ampara and LGR in Hambanthota also accepted H_0, which means no significant difference between the MP and the GP. In contrast, LGW in three districts: Anuradhapura, Polonnaruwa, and Kurunegala accepted H_1 as the test value is higher than the table value, proving a significant difference between the MP and the GP.

Table 7: Results of the Analysis of One Sample T-test in 2019

Paddy Type	District	T- value vs $t_{\alpha, df}$	P -Value	Result
SGW	Anuradhapura	$0.942 < 2.201$	0.18	Accept H_0
SGW	Polonnaruwa	$0.953 < 2.201$	0.18	Accept H_0
SGW	Kurunegala	$1.413 < 2.201$	0.09	Accept H_0
SGW	Ampara	$0.306 < 2.201$	0.38	Accept H_0
LGW	Anuradhapura	$2.715 > 2.201$	0.01	Accept H_1
LGW	Polonnaruwa	$2.729 > 2.201$	0.01	Accept H_1
LGW	Kurunegala	$2.726 > 2.201$	0.01	Accept H_1
LGW	Ampara	$1.376 < 2.201$	0.09	Accept H_0
LGR	Hambanthota	$1.099 < 2.201$	0.14	Accept H_0

Source: Author calculated

As LGW in three districts, Polonnaruwa, Anuradhapura, and Kurunegala show a significant difference between MP and GP and the mean values are greater than GP, the right tail test was conducted to identify whether MP showed a significantly greater difference from GP. As the results of the right tail test shown in Table 8, H_1 can be accepted for LGW in selected districts as the P value is lesser than α (0.05). Therefore, results proved that market price showed a significantly greater difference than GP which is highly beneficial to farmers only for LGW paddy type in the Anuradhapura, Polonnaruwa, and Kurunegala districts.

Table 8: Results of the Analysis of the Right Tail Test in 2019

Paddy Type	District	P value	P value Vs α	Result
LGW	Anuradhapura	0.01	$0.01 < 0.05^{**}$	Accept H_1
LGW	Polonnaruwa	0.01	$0.01 < 0.05^{**}$	Accept H_1
LGW	Kurunegala	0.01	$0.01 < 0.05^{**}$	Accept H_1

Notes ** - 5% significance level.

Source: Author calculated

The annual paddy production was 4.592MMT in 2019 and the potential rice production was 2.618MMT. The annual rice requirement for consumption in the year was 2.27MMT (Crop Forecast, 2020) and the country had a 0.349 MMT (15%) surplus in production. Even with a surplus production of 15%, 0.025MMT of rice was imported in 2019 (Monthly Food Commodity Bulletin, 2020). The surplus production of local rice types of SGW in all four districts the LGW in Ampara, and LGR in Hambanthota has not shown a significant difference between the MP and the GP. However, LGW in Anuradhapura, Polonnaruwa, and Kurunegala showed a significantly greater MP than GP which impacted the performance of SMS millers due to high transaction costs.

Analysis of Market Price and Guaranteed Price in the Year 2020

The GP was revised in 2020 for all three rice types; SGW, LGW, and LGR as Rs. 50.00.

According to the results shown in Table 9, H_0 can be accepted as the test value was lower than the table value in all selected paddy types of SGW, and LGW in Anuradhapura, Polonnaruwa, Kurunegala, and Ampara districts and the LGR in Hambanthota proving that no significant difference between the MP and the GP. The annual paddy production was 5.121MMT in 2020 and the potential rice production was 2.926MMT. The annual rice requirement for consumption in the year was 2.27MMT (Crop Forecast, 2021) and the country has a 0.656 MMT (29%) surplus in production. Even with a surplus production of 29%, 0.024MMT of rice was imported in 2020 (Monthly Food Commodity Bulletin, 2021). As the country had 29 per cent surplus production, the result has not shown a significant difference between the market price and the GP in all selected paddy types in selected districts in the year 2020.

Table 9: Results of the Analysis of One Sample T-test in 2020

Paddy Type	District	T- value vs $t_{\alpha, df}$	P - value	Result
SGW	Anuradhapura	$-0.52 < 2.306$	0.52	Accept H_0
SGW	Polonnaruwa	$0.154 < 2.306$	0.44	Accept H_0
SGW	Kurunegala	$-1.778 < 2.306$	0.94	Accept H_0
SGW	Ampara	$-0.614 < 2.306$	0.72	Accept H_0
LGW	Anuradhapura	$-1.717 < 2.306$	0.93	Accept H_0
LGW	Polonnaruwa	$-1.522 < 2.306$	0.91	Accept H_0
LGW	Kurunegala	$-2.462 < 2.306$	0.98	Accept H_0
LGW	Ampara	$-2.490 < 2.306$	0.98	Accept H_0
LGR	Hambanthota	$0.826 < 2.306$	0.21	Accept H_0

Source: Author calculated, (2022)

Analysis of Market Price and Guaranteed Price in the Year 2021

The GP for the SGW was revised 4 times as Rs. 52.00, Rs. 54.00, R. 56.50, and Rs. 52.00. The GP of both LGW and LGR was also revised as Rs. 50.00, Rs.52.00, Rs.56.50, and Rs. 50.00 in 2021. Table 10 shows the results of the analysis and H_1 can be accepted as the test value is greater than the table value in SGW in Anuradhapura, Polonnaruwa, and Ampara districts proving that the MP was significantly different from the GP.

Table 10: Results of the Analysis of One Sample T-test in 2021

Paddy Type	District	T- value vs $t_{\alpha, df}$	P - Value	Result
SGW	Anuradhapura	$2.330 > 2.228$	0.02	Accept H_1
SGW	Polonnaruwa	$3.085 > 2.228$	0.006	Accept H_1
SGW	Kurunegala	$1.892 < 2.228$	0.04	Accept H_0
SGW	Ampara	$3.685 > 2.228$	0.002	Accept H_1
LGW	Anuradhapura	$0.610 < 2.228$	0.278	Accept H_0
LGW	Polonnaruwa	$1.487 < 2.228$	0.084	Accept H_0
LGW	Kurunegala	$0.322 < 2.228$	0.377	Accept H_0
LGW	Ampara	$0.273 < 2.228$	0.395	Accept H_0
LGR	Hambanthota	$0.943 < 2.228$	0.184	Accept H_0

Source: Author calculated

Therefore, as the mean MP was greater than GP, the right tail test was conducted to identify whether the market price showed a greater difference from GP. In contrast, SGW in Kurunegala, LGW in Anuradhapura, Polonnaruwa, Kurunegala, Ampara, and the LGR in Hambanthota accept H_0 as the test value was lower than the table value. Accepting H_0 proved that there was no significant difference between the MP and the GP.

According to the results of the right tail test shown in Table 11, can be accepted H_1 for SGW in Anuradhapura, Polonnaruwa, and Ampara as the P value is lesser than α (0.05). Therefore, results proved that MP showed a significantly greater difference than GP which was highly beneficial to farmers only for SGW paddy type in the Anuradhapura, Polonnaruwa, and Ampara districts.

Table 11: Results of the Analysis of the Right Tail Test in 2021

Paddy Type	District	P value	P value Vs α	Result
SGW	Anuradhapura	0.02	$0.02 < 0.05$**	Accept H_1
SGW	Polonnaruwa	0.00	$0.00 < 0.05$**	Accept H_1
SGW	Ampara	0.00	$0.00 < 0.05$**	Accept H_1

Notes ** - 5% significance level.

Source: Author calculated

The annual paddy production was 5.149MMT in 2021 and the potential rice production was 2.942MMT. The annual rice requirement for consumption in the year is 2.27MMT (Crop Forecast, 2022) and the country had a 0.672 MMT (29%) surplus in production. Even with a surplus production of 29%, 0.065MMT of rice was imported in 2021 (Monthly Food Commodity Bulletin, 2022). As the country had 29 per cent surplus production, the result has not shown a significant difference between the market price and the GP in SGW and SGR in selected districts in the year 2021. However, SGW in Anuradhapura, Polonnaruwa, and Ampara showed a significantly greater difference in market price than GP. However, as LGW and LGR prices are not significantly different the impact for the SMS millers was less.

Seasonal Paddy Production

Figure 1: Seasonal Paddy Production
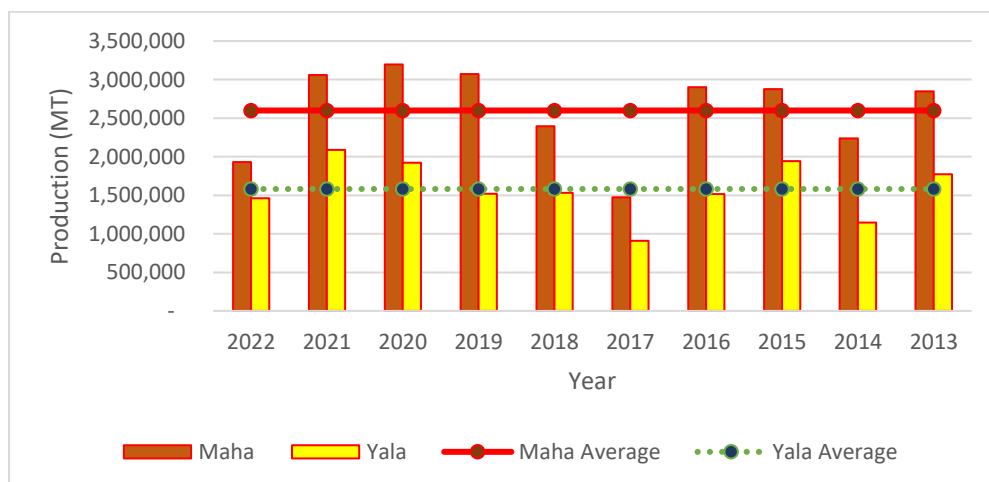
Source: Author calculated based on secondary data

According to the seasonal paddy production as in Figure 1 and the results of the analysis in considered 7 years proved that in case of excess production, the market price has not shown a significant difference with GP. Further, in the case of deficit production, market prices were significantly higher than the GP. SMS millers purchased a limited quantity of paddy during the harvesting time as per their funding capacity and storage capacity. They purchased paddy from the market throughout the year. However, leading millers purchased immense quantities during the harvesting period which has lower market prices. Since most of the stocks were held by the large-scale millers, SMS millers were compelled to purchase paddy at a higher price during off season. The higher market price in deficit production created a high cost of production for SMS millers which they were unable to sustain in the industry.

Results of the Focused Group Discussion Regarding Government Intervention in the Paddy and Rice Industry

Government intervenes in the paddy / rice industry to maintain food security in the country while purchasing paddy at a guaranteed price from farmers to enhance their livelihood and maintain buffer stock. In addition, intervene in the rice market to secure consumers while fixing maximum retail price, releasing government stock to the market to regulate market prices as well as allowing import to maintain rice at affordable prices. PMB has the exclusive right to purchase, sell, supply, transport, or carry on the business of hulling milling, or processing paddy and rice according to section 4 of PMB Act no 14, 1971. Accordingly, the Minister may publish an order through a gazette notification on the above functions of the board. Further, the exclusive powers of PMB can be vested to authorized purchasers to purchase paddy. In addition, PMB can fix a guaranteed price for any variety or grade of paddy. Accordingly, the authorized purchasers should purchase paddy at a guaranteed price as per section 7 of the PMB Act. PMB has regulatory powers in the paddy and rice milling industry as per sections 10 and 13 of the PMB Act. Accordingly, facilities for sale, supply, transport or distribution, and processing of paddy and rice are allowed only for authorized purchasers (Gazette of the Democratic Socialist Republic of Sri Lanka, 2010).

The findings of the Focused Group Discussion revealed that even though the PMB has an exclusive right to purchase, sell, supply, or transport or to carry on the business of hulling milling, or processing of paddy and rice according to section 04 of the PMB Act, after the re-establishing of PMB in 2008, an order has not been made through a gazette notification to legalize their exclusive right. Therefore, issuing licenses to authorized purchasers is not a mandatory requirement. The guaranteed price advisory committee has also not been established and even though the guaranteed price has been fixed, it has not been published as a gazette notification to become a law. Under these circumstances, any interested person or organization can perform the purchase of paddy at any price. Hence, the aim of fixing the GP to uplift the livelihood of the farmers from the sudden drop in the price of paddy due to an increase in supply during the harvesting season has not been achieved. The scholars: Henegedara (2006), Prasanna (2019), and Wijesooriya et al

(2017) also urged in their studies that the market price during the harvesting period is well below the cost of production.

The absence of legalizing exclusive rights and imposing GP as vested in the Act created a situation of regulating the industry for a few leading rice millers may be a result of opportunistic behavior. Under these circumstances, farmers are suffering due to low incomes, and SMS millers also lose the opportunity to purchase paddy at an affordable price. Wijesooriya et al., (2021) and Thibbotuwawa, (2021) highlighted this situation as the anti-competitive practices of large-scale millers which harm paddy producers as well as consumers.

Intervene to Regulate the Market Price of Rice to Secure the Consumer

According to sections 04 and 10 of the PMB Act, facilities for sale, supply, transport or distribution, hulling, milling, or processing of paddy and rice are allowed only for authorized purchasers who get a permit from the PMB (Paddy Marketing Board, 1971). Accordingly, an order has been published in the gazette by the Minister (The Government Gazette, 2010). Millers should report their processing condition and stock availability every month. However, PMB has not made any formal procedure to implement the regulation. If the PMB assesses the stock level, it will assist policymakers in ensuring food security and identifying import requirements. Due to the absence of information on stock availability, rice importers are getting an opportunistic advantage of importing rice by misguiding the policymakers. The importation of rice creates low demand in the market and impacts the market price. Therefore, SMS millers losing the opportunity to sell rice at a higher price will be limited due to importation. Further, SMS millers are complaining that they must sell rice at the maximum retail price which is not economical.

Even the processing of paddy and selling of rice is allowed only for authorized purchases, most of the rice processing millers do not get their registration from the PMB. The registered and authorized millers in PMB are around 750 in the entire country (Annual Report of Paddy Marketing Board, 2018). Even though the given authorization is to be renewed annually, such practices have also not been observed.

Research and Development

The research station was established under the PMB is currently functioning as a separate organization from the Institute of Post-Harvest Management and their mandate is widened to entire post-harvest to all grains, and perishables including fruits and vegetables. Accordingly, their attention to post-harvest research in the paddy and rice industry is very limited. After the re-establishment of PMB, it doesn't have the facilities or dedicated staff to conduct research in this industry as well. Therefore, the absence of a dedicated research arm is a huge drawback in the industry.

CONCLUSIONS

This study was conducted with the aim of examining the impact of fixing a Guaranteed price to the stabilized market price of paddy and to policy-level intervention required to regulate, facilitate, and monitor the supply and prices of the market to secure paddy producers. Certain scholars (Henegedara, 2006; Prasanna, 2018; Wijesooriya, 2021) argued that the market price is well below the cost of production and farmers are not making a profit. However, in contrast, the study proved that all selected paddy types; SGW, LGW, and LGR in the respective district have not shown a significant difference between MP and the GP in the years 2015, 2016, and 2020 which had surplus production. In 2017, all three paddy types in the respective district showed a significantly greater market price than the GP due to a huge deficit in production. In 2018, 2019 and 2021certain paddy types showed a significantly greater market price than GP, and certain paddy types did not show a significant difference between the MP with GP. In addition, the study identified that MP doesn't show a significant difference with GP in case of the surplus production and significantly higher MP in the case of deficit production.

Based on the legal provisions of an Act, the Minister can make regulations through a gazette notification. Legalizing the imposed maximum retail price has been done through a gazette notification (Gazette of the Democratic Socialist Republic of Sri Lanka, 2021). Further, authorizing the rice procession is also made through a gazette notification (Gazette of the Democratic Socialist Republic of Sri Lanka, 2010). Similarly, the Minister in Charge can make a regulation to enable the exclusive right of PMB to purchase, sell, supply, or transport or to carry on the business of hulling milling, or processing of paddy and rice according to section 04 of the PMB Act. Accordingly, PMB can issue licenses to authorized purchasers. The guaranteed price advisory committee has to be established and the guaranteed price needs to be published as a gazette notification to become a law. Under these circumstances, any interested person or organization can perform the purchase of paddy including the SMS millers after getting authorization, and only at a guaranteed price. Accordingly, the aim of fixing the GP to uplift the livelihood of the farmers from the sudden drop in the price of paddy due to an increase in supply during the harvesting season can be been achieved. In addition, if there is any impact on the SMS millers due to opportunistic action key players might be minimized through this regulating process.

The study identified that there is no relationship between the production deficit and import quantities, and rice imported to the country even with surplus production in certain years. Such experiences can be avoided by proper implementation of the existing regulations. Based on the existing regulation made according to sections 04 and 10 of the PMB Act, facilities for sale, supply, transport or distribution, hulling, milling, or processing of paddy and rice are allowed only for authorized purchasers who get a permit from the PMB. Accordingly, all the registered millers should report their processing condition and stock availability every month to PMB. Hence, PMB can assess the stock

availability monthly which will guide on getting the decision to Import quantities of rice to avoid the influence of opportunistic actions of key players if any. Further, the impact on the performance of the SMS millers also will be minimized due to the restriction of imports.

Limitations and Way Forward

Though the present study yields interesting findings, it has some limitations that may challenge the generalizability. The study solely depends on few Focus Group Discussions and the secondary data sources related to only five major paddy-producing districts; Anuradhapura, Polonnaruwa, Kurunegala, Ampara, and Hambantota which had the highest surplus production, where the analysis is mainly based on the published secondary data by respective organizations. It assumes that it reflects the actual market behavior. Therefore, the results may vary when it takes a holistic approach considering the farmers' view in all 25 districts in the country. Moreover, the peak harvesting time within the district is location-specific, and lower prices may be observed during peak harvest. MP can be in a range that may vary with infrastructure, number of buyers in the area, and production. The study recommended identifying the real impact on farmers as around 30 % of the farmers sell their harvest as fresh paddy in the field itself without adopting proper post-harvest operations. In addition, study recommends a comprehensive study to identify the impact of price variation on the performance of SMS millers.

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