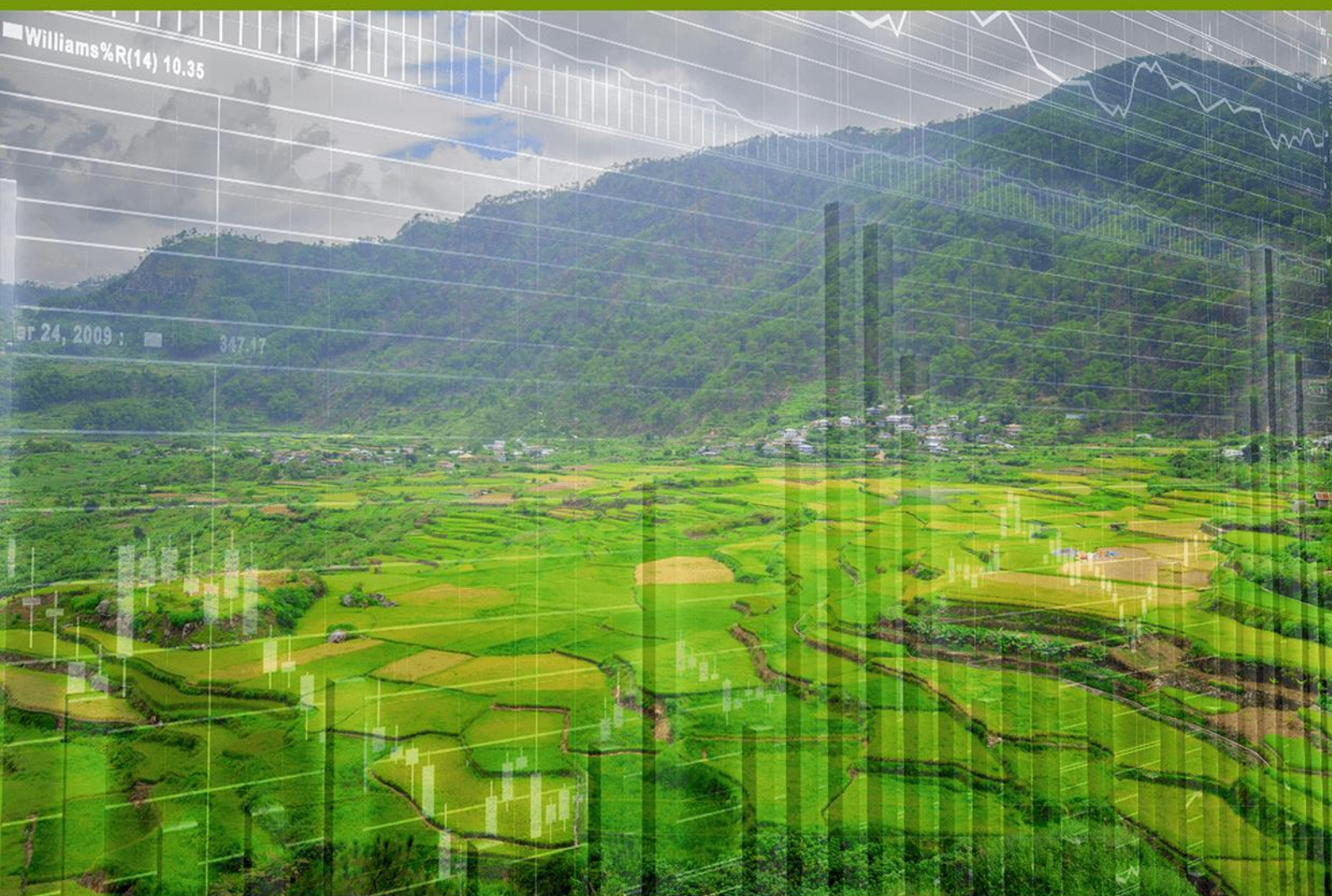


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Preface

In an era of rapid technological advancement, shifting global dynamics, and climate change, the agricultural sector stands at a crucial juncture. The challenge before us is not only to enhance productivity but also to ensure that agricultural systems are resilient, sustainable, and equitable. To address these challenges, it is vital to adopt innovative approaches and policies that integrate economic development with environmental sustainability and social inclusivity. Transforming research outcomes into actionable policy implications is a vital process that enables working towards evidence based practical decision making.

This policy compendium produced by the Department of Agricultural Systems, Faculty of Agriculture, Rajarata University of Sri Lanka seeks to address some of the crucial issues in the agricultural sector of the country by providing a comprehensive analysis of current trends, challenges, and opportunities in agricultural economics, extension, and systems. The four policy briefs included in this collection were developed by the undergraduate students from their final year research projects conducted in 2022 under the supervision of senior academics and researchers in the respective area of study. They bring together studies and analyses on various facets of Sri Lanka's agricultural sector, with topics ranging from entrepreneurial behaviour in farming, green investments in agriculture, women's empowerment in agribusiness, to the persistent issue of rice price volatility.

Policy recommendations focused on promoting entrepreneurial behaviour among farmers, such as the pineapple farmers in Sri Lanka, is essential for agricultural modernization and the broader development of the agricultural sector. The first policy brief has been produced addressing policy reforms required for pineapple farmers to enhance entrepreneurial behaviour. The second policy brief addresses green investments through public investments, which is an essential reform to build a more resilient, sustainable, and competitive agricultural sector. While addressing the urgent challenge of climate change, these investments will also foster innovation, improved food security, rural development, and reach long-term environmental goals. Policies aimed at empowering women entrepreneurs has been addressed in the third policy brief included in this collection. These policies are essential for promoting gender equality, economic empowerment, and sustainable development. These policies help women overcome structural barriers, gain access to resources, and seize new opportunities, ultimately benefiting not only individual women but also their families, communities, and the broader economy. As the staple food in the country, rice price volatility is associated with significant implications for food security, poverty, and the overall economy. Several factors, such as climate change, poor infrastructure, market inefficiencies, and global supply chain disruptions, contribute to this volatility. Effective policies addressing rice price volatility are essential for Sri Lanka for many reasons. The fourth policy brief contributes the policy dialogue of rice market in Sri Lanka.

The policy briefs presented here are not just theoretical exercises but a call for actionable, data-driven policies that will positively impact the agricultural community and the broader

economy. It emphasizes the importance of a resilient, modernized agricultural system for ensuring long-term national development. Hence, we hope that this volume will contribute meaningfully to ongoing discussions on agricultural policy reform in Sri Lanka and serve as a resource for both scholars and practitioners in the field.

Dr. S.N. Dissanayake
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NEED OF ENTREPRENEURIAL FARMERS FOR AGRICULTURAL MODERNIZATION IN SRI LANKA: ASSESSMENT OF ENTREPRENEURIAL BEHAVIOR OF PINEAPPLE FARMERS IN GAMPAHA DISTRICT

INTRODUCTION

Pineapple is one of the major commercial fruit crops cultivated in Sri Lanka which has huge potential for the export market in the world (Amarasuriya, *et al.*, 2013). Gampaha district contributed 34% of the national extent and 43% of national production from 2018 to 2021 (Department of Census & Statistics, 2021). The major issues faced by Sri Lankan pineapple farmers include low productivity, high cost of production, lack of profitability, poor quality, and limited value addition (Piumi & Hapuhinna, 2018). Although these issues have a direct link with the entrepreneurial behavior of farmers (Agbolosoo, 2021; Sachithra, 2020; Rosario, 2016), there have been no studies evaluated the entrepreneurial behavior of pineapple farmers in Sri Lanka. Hence, this study fills this information gap by assessing the level of entrepreneurial behavior of pineapple farmers in Sri Lanka. The findings of this study provide the information required to uplift pineapple production, processing, and marketing. Since pineapple is a major exportable fruit crop, the development in this sector will bring more foreign exchange into the country that will help resolving the foreign exchange problem facing the country now. Further, the study's findings are useful in formulating policies on agricultural modernization in Sri Lanka, a thematic area of the present government.

STUDY APPROACH

The case study research design was employed in this study by selecting the Gampaha district in Sri Lanka. It is one of the largest pineapple-growing districts in Sri Lanka contributing 38 percent to the national production. Moreover, the extent of pineapple cultivation in the Gampaha district was 1467 ha out of the total extent of 4463 ha in Sri Lanka in 2021 (Department of Census and Statistics, 2021). The study locations were areas of Diulapitiya, Mirigama, Minuwangoda, Attanagalla, and Dompe which are the highest pineapple-growing, Agrarian Service Centers (ASCs) contributing 56 percent of the total extent of the district.

The multi-stage random sampling technique was used as the sampling method in this study. The first stage was a selection of the Gampaha district. In the second stage, five DS division

areas were selected according to the highest cultivated extent of pineapple. In the third stage, five ASC areas were selected according to the highest cultivated extent of pineapple from selected five DS divisions. The fourth stage was the selection of Grama Niladhari (GN) divisions from the chosen ASC divisions. Then, ten GN divisions were selected from the selected ASC area according to the highest cultivated extent of pineapple. Finally, 100 farmers were selected from the selected GN divisions according to the highest cultivated extent of pineapple on a random basis. The field survey was carried out with the help of a pretested structured questionnaire in May and June 2023. In addition, key personnel interviews were conducted with farmer leaders field level officers such as Agricultural Instructors and Agricultural Production and Research Assistants to verify the survey findings and collect the supplementary information to explain the survey findings.

Factors affecting entrepreneurial behavior were examined using Principle Component Analysis (PCA). The Entrepreneurial Behavior Index (EBI) was then constructed to describe the degree of behaviour skills of pineapple farmers. Correlation analysis was conducted to determine the relationship between identified entrepreneurial attributes and socio-economic factors.

MAJOR FINDINGS

Socio-economic analysis found that most (50.6%) pineapple growers belong to the middle age group between 35-50 years with nearly 15% of the farmers aged below 35 years. Educational level of the pineapple farmers are relatively high compared to other farmers as evident by 80% having an education up to an ordinary level or advanced level. With regard to experience in pineapple farming, 41.3% of farmers in the sample had above 10 years. The average farm size was 5 acre but most of them are rented lands.

MAJOR FINDINGS

The PCA analysis reveals that seven factors explain 63.2% of the variance of entrepreneurial behavior of pineapple farmers. They are information-seeking behaviour, risk-taking, cosmopolitanism, self-confidence, leadership, decision-making ability, and market orientation. The EBI was constructed using these seven components. EBI values show that majority of pineapple farmers belong to the medium level of entrepreneurs. Respondents having a higher level of education, bigger land size of cultivation, and a high degree of experience possessed a greater degree of risk-taking ability. According to the results of the correlation analysis, farmers' education, farm size, and experience affect the development of entrepreneurship among farmers.

CONCLUSIONS

The study concludes that the medium level of entrepreneurial behaviour skills made small-scale pineapple farmers unable to perceive pineapple farming as a sustainable agribusiness venture and the need for entrepreneurship training for farmers to face the current challenges and exploit market opportunities.

POLICY RECOMMENDATIONS

As found from the study majority farmers are medium level entrepreneurs and hence upgrading the entrepreneurial characteristics is required. Up to now agricultural policies in Sri Lanka do not focus on behavioural changes of the farmers towards entrepreneurship and hence outcomes of the policies fail to achieve expected objectives that in turn resulted in prolonged problems of agrarian poverty, low youth participation in agriculture, high cost of production, huge post-harvest losses and inefficient marketing system. The present government policy in agriculture known as agricultural modernization focuses on the application of modern technology including artificial intelligence to boost agricultural production (Department of National Planning, 2023). Based on the findings of the study and success stories from the global literature the following recommendations are made to consider in the formulation in action plans in the due course.

1. *Policy supports for agricultural entrepreneurship development*

Government policy documents have not given due attention on agripreneurship development (Rupasena, 2023). In China, the concept of “mass entrepreneurship, mass innovation” was first proposed in 2014 to accelerate the entrepreneurial attitudes of the newly emerged market players. Under this concept, a series of central government support policies introduced such as construction of different types of high-quality innovation and entrepreneurship demonstrations and, provide of internship and training opportunities for entrepreneurs have created a favourable atmosphere for rural innovation and entrepreneurship (Yuxi Pan et al., 2024).

2. *Setting up agribusiness incubation centers*

There is a huge shortage of entrepreneurs in Sri Lanka. At present, entrepreneurs are only 2.58% of the labour force (Department of Census and Statistics, 2023). In countries like India, Vietnam, and Thailand the figure is over 10%. Hence, Sri Lanka needs to increase entrepreneurs to boost the economy. This is especially true for agriculture where the risk is high. In India, agribusiness incubation centers are functioning well and the government allocates money every year from the annual budget to increase the agribusiness incubation centers under the Agri-Business Incubation Programme (Karan, & Manisha 2019). In Sri Lanka, this can be started in agricultural faculties in the state universities as a pilot project.

3. *Establishment of agribusiness start-ups by newly passed out agricultural graduates*

Agricultural faculties in the state universities produce high-quality graduates equip with new technological knowledge but a majority of them are either unemployed or underemployed. There is no mechanism to absorb them into the agribusiness sector. In China, the government encourages new graduates to set up startups in their hometowns under the concept of “mass entrepreneurship, mass innovation” (Yuxi Pan et al., 2024). In India, a scheme of Agri-Clinics and Agri-Business Centers were introduced in 2002 to provide employment opportunities to fresh graduates (Vijaya B.G. 2023). Under this, agricultural graduates provide user-pay extension services to the farmers and undertake agribusiness centers such as seed production and services such as soil testing, and machinery supply. These graduates can start agricultural industrial parks, leisure agriculture, tourism agriculture, ecological agriculture, and

agricultural service centers. By doing this entrepreneurship in the farming community can be strengthened.

4. *Training extension staff in agricultural entrepreneurship*

Agricultural extension staff is responsible for dissemination of new knowledge to the farmers. Farmers cannot be motivated to apply new agricultural technology without cultivating an entrepreneurial mindset to them. Hence, new technology should go to the farmers with an entrepreneurship development program. For this, training of extension staff in agricultural entrepreneurship is necessary. The Faculty of Agriculture, at Rajarata University of Sri Lanka has already developed a certificate course on agripreneurship. Further, entrepreneurship should be included as a subject in the curricula in the diploma courses implemented by the Department of Agriculture.

5. *Establishing a well-functioning efficient information dissemination system*

Information plays a key role in entrepreneurship development because information-seeking behaviour is a major entrepreneurial characteristic found from this study. Studies found that existing information systems do not provide easy access to famers (Rupasena, 2023, Samantha & Wijesooriya, 2016) Also, provision of information limits to prices. Farmers need full package of information to take informed decision towards what to grow, when to grow, when to sell, where to sell, and at what price.

6. *Develop an entrepreneurial supply chain management system*

The current supply chain is characterized by fragmented, lengthy, untrusty, and poor governance. Donor-funded projects such as the Agricultural Modernization and the Smallholder Agribusiness Partnership programme have initiated development of efficient agricultural supply/value chain systems for agricultural products through the Public-Private-Producer-Partnership (4P) approach. However, the progress is not up to the standard because players in the supply/value chain are not entrepreneurs who work together, share resources, risks and benefits to achieve the common goal (Rupasena, 2023). The global trend is the application of blockchain technology to the agricultural supply/value chain to enhance the transparency and traceability. Blockchain technology is revolutionary innovation in which all the stakeholders in the chain link together from farm to end customers (Soumya & Sendhil 2023). It is a public ledger system and no one can change the transactions. Sri Lanka needs

entrepreneurship development among chain players to introduce newly developed technologies such as blockchain and artificial intelligence.

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GREEN INVESTMENTS:

BOOSTING AGRICULTURE THROUGH PUBLIC INVESTMENTS



INTRODUCTION

The magnitude and the quality of investment affect a country's economy. It is a significant contributory factor in driving the growth momentum creating a favorable environment. Public investment encourages economic activity through short-term effects on aggregate demand. Shocks to public investment have long-lasting consequences on output, supporting the idea that increasing public investment increases the economy's capacity for production (Miyamoto *et al.*, 2020). Investments can bring much-needed capital for agriculture and contribute favourably for economic growth and development (Wcpt and Ot, 2021). Especially public investment in agriculture plays a major role in the sense of economic growth (FAO and IISD, 2020). But approximately 60% of the total investment in Sri Lanka is allocated to commercial infrastructure development while the agriculture sector receives only around 5% of the total investment (Wcpt and Ot, 2021). Agriculture is a significant sector which plays a major role in the lives of many people but accounts for comparatively less contribution to the global economy (Alston and Pardey, 2014).

KEY MESSAGES

- **Allocate a considerable proportion of public investment to agriculture**
- **Implement effective and sound policies to encourage agricultural public investment.**
- **Create a proper database to get evidence for the sake of effective policy actions.**
- **Formation of a framework for monitoring and evaluation of policy actions on agricultural public investment**

Agriculture is also important for economic growth and accounted for 4% of global GDP in 2018 (World Bank, 2022). Improving agricultural production is also critical for accomplishing global goals of food security, poverty reduction and inclusive economic growth. Agriculture is a vital industry for Sri Lanka's economy, as well as being the key driver of poverty reduction. In 2020,

the agriculture industry accounted for 7.7% of GDP and employed more than 2 million people. The average growth rate from 2015 to 2019 was 3.7%, down from 6.8% from 2010 to 2014. Droughts in 2017-18, floods in 2017, and the Easter bombing in 2019 all led to a drop in the economy. The pandemic, which struck in 2020, exacerbated the economy causing it to decline by 3.6%. Furthermore, the country's economy has contracted and sliding to a lower middle-income level. Also, the agriculture sector's contribution to GDP has steadily decreased since 1950, from over 40% in 1950 to approximately 8% in 2020 (Wcpt and Ot, 2021).

POLICY BACKGROUND

Public investment is a major contributory factor for economic growth. According to the International Monetary Fund (IMF), an increase in public investment by 1% of GDP resulted in 2.7% increase in employment generation and a 10% increase in private investment (Wcpt and Ot, 2021). Also, there is a considerable impact on the economic growth of a country by the public investment in agriculture as well. It is not astonishing that public investment in agriculture is one of the most significant government instruments in the economy of many developing countries. As agriculture plays a major role in many developing as well as developed economies, it contributes to GDP and employment generation acting positively on economic growth (Benin *et al.*, 2008). According to the existing data figures, from 1989 to 2004, there was a constant trend of investments in agriculture with minor ups and downs. From that, an upward trend can be seen up to 2021. After 2004 there was a slight extension in the investments for agriculture in Sri Lanka because of flowing grants from abroad as aid for the tsunami disaster. Moreover, that upward trend had been retained during several governments ruled in Sri Lanka. At the same time, during the governance period of each government, continued low allocation of agricultural investment was seen compared to the beginning of each governance period. There was a slight drop in investment in 2021 compared to 2020 as an effect of the COVID-19 pandemic, which hit all economies in the world so hard.

POLICY RECOMMENDATIONS

1. *Allocating a considerable proportion of public investment to agriculture*

Approximately 60% of the total investment in Sri Lanka is allocated to commercial infrastructure development while the agriculture sector receives only around 5% of the total investment. Since the public investment in agriculture receives less allocation, it may directly or indirectly affect the insignificant contribution from the agriculture sector towards the economic growth in Sri Lanka. So it is essential to allocate a considerable proportion of investment to agriculture for a better contribution from the agriculture sector itself for the sake of the economic sustainability of Sri Lanka.

2. *Implement effective and sound policies to encourage agricultural public investments.*

Progressive policies and policy consistency are vital in creating a conducive environment for public investment. Also, it is essential to implement sound policies to encourage agricultural public investment. Because the need to implement those policies has been highlighted with short- and long-term effects that can be encountered in the field of agriculture. Especially, the contribution to the economic growth from agriculture itself does not show any clear significance from the findings. So, it depicts that there should be some modifications and developments in existing policies related to agricultural public investments.

3. *Creating a proper database to get evidence for the sake of effective policy actions*

Public Investment statistics facilitate the identification of problems and making sound evidence-based policy actions to sustain future directions of economic development of several industries including agriculture. There are limited existing data sources for public investment in worldwide and Sri Lanka as well. It has recognized the need to make public investment data on freely available online platforms and more easily accessible and editable formats to make data analysis easier. Failure to do so might negatively affect future decision-making, hardly in situations like pandemics and economic hardships.

4. Formation of a work framework for monitoring and evaluation of policy actions on agricultural public investment

Monitoring and evaluation are key factors in the sense of sustainability of any sector for the development aspects. Therefore, agriculture itself needs a proper framework for the investment aspects unless the allocations are not going to be utilized properly and sustained for the future. As a result of a lack of monitoring and evaluation, policies are often limited, and the same policies are frequently recommended with few amendments instead of new policies. So, it is recommended to implement a proper policy framework for Agricultural public investment.

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EMPOWERING WOMEN ENTREPRENEURS IN THE MAHAWELI SYSTEM L: PERSONALITY INSIGHTS, NAVIGATING CHALLENGES, AND SEIZING OPPORTUNITIES FOR INCLUSIVE POLICIES

INTRODUCTION

“A woman’s best protection is a little money of her own” quoted by Clare Boothe Luce, the first US woman Ambassador to a major European country (Italy), and she was a trailblazer for women in politics and diplomacy, paving the way for future generations of female leaders. Her words underscore economic autonomy is a cornerstone of women's empowerment. Women entrepreneurship plays a critical role in women’s economic autonomy and empowerment. Although the number of women entrepreneurs (WE’s) rise globally, two in three businesses are still owned by men. The share of small, medium, and large firms with a woman among the principal owners is lowest in South Asia (18%) (world 34%, Latin America and the Caribbean 50%) compared to that of other regions (Charlton, 2023).

The background of women entrepreneurship is multifaceted, shaped by various factors including socio-cultural and economic conditions and individual personalities. WE’s encounter numerous challenges, particularly in developing countries like Sri Lanka. These challenges include limited access to credit, capital, and technology, alongside cultural barriers and disparities in education and fewer skill development worsen these challenging situations (Medagama, 2016). Amidst such issues, WE’s contributions to agricultural and rural economies are substantial, highlighting their pivotal role in driving economic growth and enhancing household welfare. Moreover, WE’s involvement helps enrich the pool of human resources and talents within the country (Ummah & Jamaldeen, 2015). Therefore, equipping women with the means to control their financial destinies, will break down barriers and unleash a wave of entrepreneurial talent and innovation.

METHODOLOGY

This study was conducted in *Mahaweli* System L in 2022 to recognize WE’s unique socio-economic, and personality settings and their perceived challenges and opportunities. Data was collected among 100 WE’s via a phone survey followed with field observations. Data was analyzed using descriptive statistics, principal component analysis, and Pearson correlation in SPSS 20.

Based on the findings of the study following policy recommendations are suggested,

KEY FINDINGS

Background of WEs

- Middle-aged (43 years) and married. (75%)
- Have satisfactory education levels.
- Belong to Sinhalese ethnicity.
- Belong to medium-sized households.
- Family members are educated to some extent.
- One income earner in the family, primarily engaged in,
 - wage employment (27%),
 - farming (23%),
 - service sector (11%),
 - self-employment (6%).

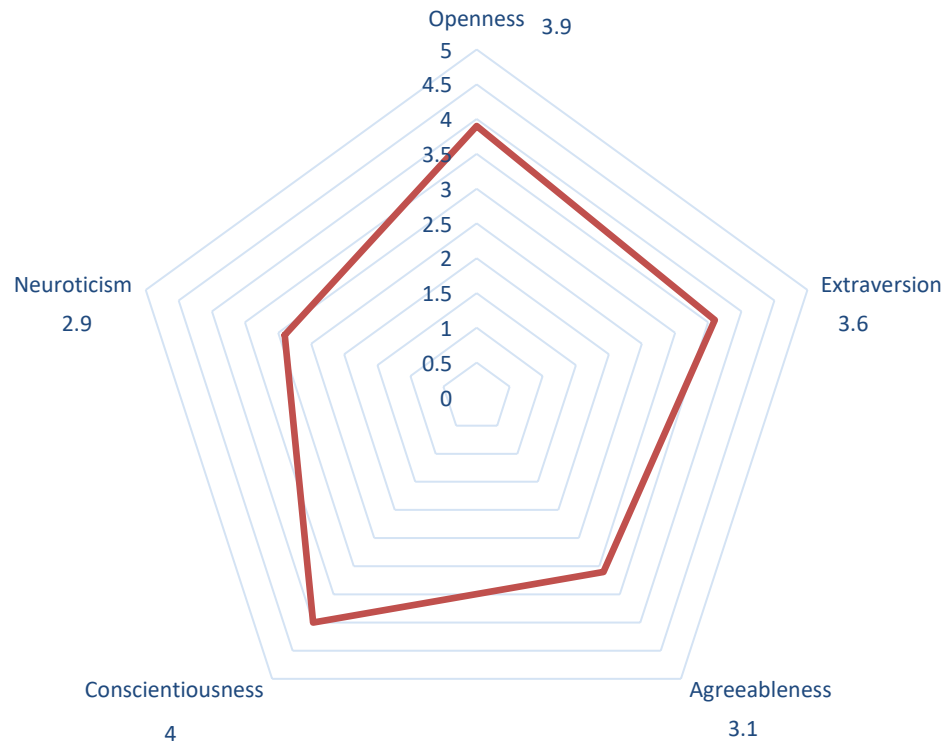
Background of WE's business

- Running for approximately 5.5 years
- Few are being formally registered.
- The primary source of initial capital is personal savings.
- Operate in various sectors mostly in farming (35%) and the textile industry (30%), following livestock, vending (fruits, vegetables, groceries), crafting, and various other sectors.



Personality Insights of WE's

Figure 1. Personality profile of women entrepreneurs



Having higher consciousness, openness, and extroversion following average agreeableness and lower neuroticism, they display determination, hard work, sympathy, and friendliness. These traits influence their decision-making processes and responses to challenges and opportunities within the entrepreneurial landscape.

MAIN PERSONALITIES

Goal Oriented

Adventurous

Emotionally Stable

Perceived challenges

- A lack of support from banks, such as complicated procedures to obtain loans, higher interest rates, and a lack of financial support.
- Challenges in rules and regulations, such as lack of law and legislation to protect women as well as WEs and complicated registration procedures.
- Limited capacity development opportunities, with a lack of training and awareness and poor social network.
- Challenges due to social beliefs such as mobility restrictions, and less respect from society.

Perceived opportunities

- Family support such as dividing work among members, and strong family bonds.
- Social support indicating non-kin social contacts and relations.

How different personalities perceive challenges and opportunities

- High conscientiousness, with ambitious, and goal-oriented behaviors, perceive that they need capacity development and facilitations for their personal and business development.
- Higher openness (adventurousness) personalities feel reformation needs in regulatory, and governance system and they tend to perceive support from their family and friends and other non-kin relations.
- Low neuroticism, who are emotionally stable, perceive that they receive less social support from distant social members yet more support from intimates.

While considering the key findings of the study it becomes evident that the WEs in *Mahaweli* system L exhibit maturity and ability in decision-making while having basic literacy for reading and writing. They are primarily running cottage-level enterprises and importantly they do not have a good financial support system to sustain their enterprises. Furthermore, they possess diverse personality traits and perceive multiple challenges and opportunities while running their enterprises.

Therefore, empowering WEs in the *Mahaweli* System L requires strategic policy interventions that consider both socio-economic factors and personality traits. By implementing customized support, fostering collaboration, advocating for regulatory reforms, and promoting gender equality, policymakers can create an enabling environment for WEs, driving economic growth and societal progress in both effective and efficient manner.

POLICY RECOMMENDATION

1. *Segregation and Tailored Support programs:*

Develop and implement categorization frameworks and support measures based on personality traits to effectively address their specific needs and preferences by Government institutes such as banks and NGOs.

2. *Financial Inclusion Initiatives*

Facilitate WE's, who lack access to formal banking services by providing financial literacy training and microfinance through Government and NGOs, and enhance access to loans, grants, and easy access via government policies and private sector collaboration.

3. *Collaboration and Capacity Building*

Foster collaboration between government entities, financial institutions, and non-governmental organizations to provide comprehensive support and mentorship opportunities by providing programs tailored to the needs of WE's, focusing on areas such as business management, technology adoption, and market access.

4. *Regulatory Reforms*

Advocate for governance reforms to streamline the process of starting and regulating businesses, particularly addressing regulatory challenges highlighted by WEs through responsible regulatory agencies.

5. *Gender Equality Promotion*

Develop and implement gender equality policies that empower WEs while promoting equal access to resources, opportunities, and decision-making positions through government and NGOs.

By working together, these stakeholders can create an enabling environment that supports and empowers WEs, ultimately driving economic growth and social progress.

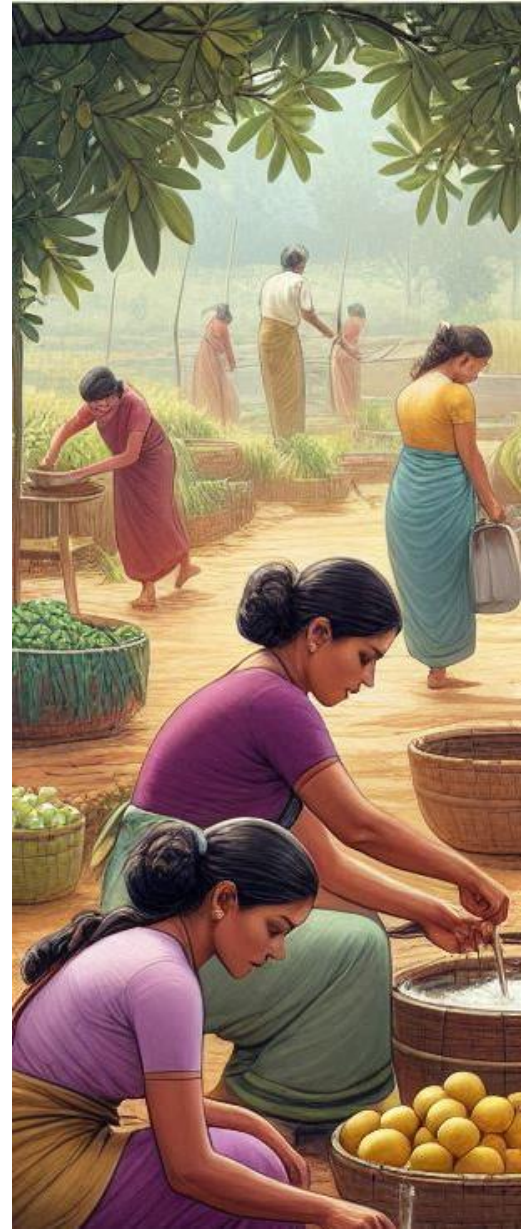
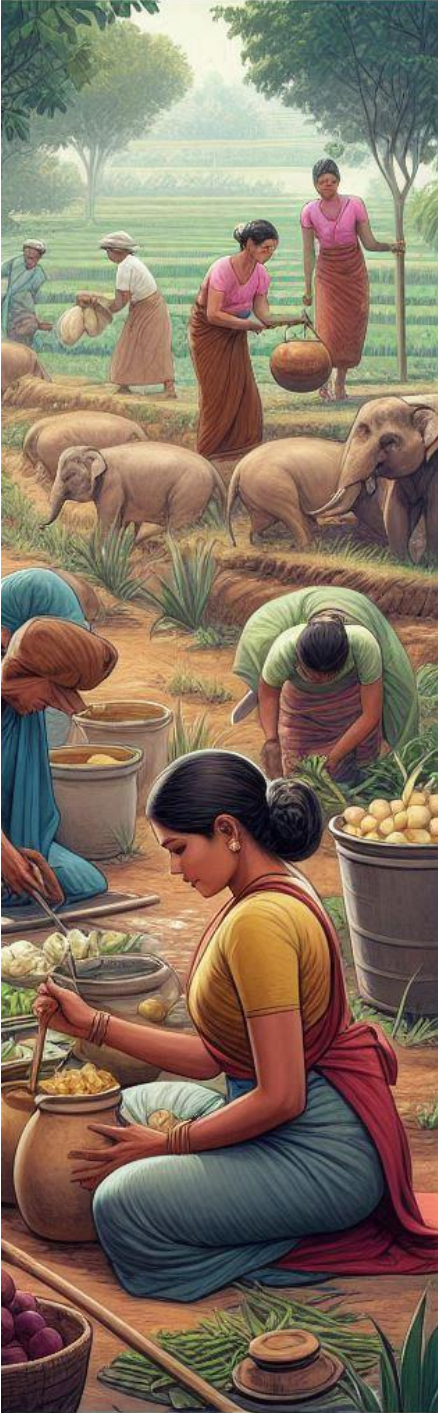
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RICE PRICE VOLATILITY IN SRI LANKA: CAUSES AND REMEDIES



INTRODUCTION

Rice price volatility can be defined as extreme price floatation in the market over time. It has become a national issue in Sri Lanka due to being a staple food for all Sri Lankans and its contribution to the development of the rural economy. Rice accounts for 45% of an average Sri Lankan's total calorie intake and 40% of total protein requirements (Suresh et al., 2021). Similarly, over 10% of the household food expenditure accounts for rice which is the highest among food items (HIES, 2019) From the income side, most rural households engage in paddy farming as their primary or secondary source of income. Paddy/rice industry involves nearly 3.6 million farmers and their families, thousands of input and service providers, millers, retailers, and individuals employed in the production, processing, and marketing of paddy and its related products (Wijesooriya, et al., 2021). Considering the seriousness of the price volatility in the rice market and the lack of studies undertaken to investigate the nature and pattern of rice price volatility in producer, wholesale, and retail markets over time, a study was carried out to measure the price volatility of rice, identify its root causes and to provide policy recommendations towards the mitigation of the price volatility. This policy brief describes the study approach, major findings and recommendations towards the mitigation of the price volatility in the paddy and rice market in Sri Lanka.

STUDY APPROACH

The study used the monthly prices of paddy and wholesale and retail prices of the *Nadu* rice variety which is the highest consumed variety for a period of 23 years starting from 1998 January to 2021 December. Price data was obtained from Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI). The monthly average producer price was computed from prices in major paddy-producing districts of Ampara, Anuradhapura, and Kurunegala while the monthly wholesale prices and monthly retail prices refer to the Colombo and its suburbs markets respectively.

All prices were taken as LKR per kilogramme. In addition to the prices, data on annual rice imports, annual paddy production, maximum retail prices, and guaranteed prices of paddy were also collected from HARTI to elicit major determinants affecting rice price volatility. For the estimation of the degree of price volatility, widely used techniques of coefficient variation

(CV), corrected coefficient of variation (CCV), log-standard deviation (LSD) and ARCH-GARCH model were applied. More than one technique was used to triangulate the findings. The regression analysis was employed to identify the major determinants affecting the rice price volatility.

MAJOR FINDINGS

Results of all three methods of CV, CCV, and LSD are comparable showing the highest volatility in producer prices and the lowest in retail prices. Results of the ARCH-GARCH model show that price shocks (increase or decrease) occurred several times during the period concerned and remained for a longer period once they happened. Also, the volatility of rice prices during the previous period affected the current price volatility and that the current price variance was dependent upon lagged price variances. According to the results of regression analysis, imports, guaranteed price, and maximum retail price are not significantly impact on price volatility. This means that the current policies are not effective for stabilizing the rice price volatility.

CONCLUSIONS

The study concludes prevalence of price volatility in the producer, wholesale, and retail markets, with the highest level of volatility in the producer market, increasing the level of price volatility over time, occurring volatility clustering and persisting volatility for a longer period after a shock.

POLICY RECOMMENDATIONS

As found from the study, rice price volatility happens from time to time and remains longer once it occurs. It is further found that this situation is worsening in the producer market. Hence, policy intervention is urgently required to minimize the price volatility otherwise paddy farming as well as the rice industry will be jeopardized. Sometimes bad signals such as low youth participation in paddy farming and the closing down of some rice mills creating a monopoly market situation can be observed. Empirical evidence including this study shows that conventional supply management policies such as government procurement and rice imports are ineffective in stabilizing rice prices thus innovative policies are required to rectify

this situation. Hence, the following section provides a series of policy recommendations based on the lessons learnt from other countries.

1. Promotion of the warehouse receipt financing system

The purpose of warehouse receipt financing system (WRFS) is to reduce distress sales by motivating farmers to hold the stocks without selling at harvest time till the market price goes up. Under the WRFS, farmers can store their paddy in a warehouse with a view of selling later and obtain a receipt that can be presented to the bank as collateral in borrowing a loan to meet immediate cash requirements. Ownership of the warehouse can be a farmer cooperative, a bank or private businessmen. For example, the Gujarat Cooperative Society owns and operates the WRFS successfully in India (National Institute of Public Finance and Policy, 2015).

Many countries including India, Thailand, Indonesia and the Philippines are implementing the WRFS successfully but not in Sri Lanka. The WRFS started in Sri Lanka in 2013 with financial assistance from the World Bank. As of 2023, the country has six warehouses operated by the Rural Development Bank (RDB) with a capacity of 48,000 Mt. but the capacity utilization is less than 5% and the number of beneficiary farmers is less than 3000 (Annual Report 2019, Ministry of Finance). The major reason for failure is a lack of cooperation among the stakeholders such as farmers, the warehouse operator, the bank and the regulating body (government). It is recommended to study how other countries implement the WRFS successfully and implement measures accordingly.

2. Introduction of the Blockchain technology to the paddy/rice supply chain for its sustainability

The existing paddy/rice supply chain is lengthy, fragmented, lacks of transparency and business trust. For a sustainable supply chain, business trust is necessary. For this, Blockchain technology is applied increasingly. Blockchain technology can be defined as a digitalized, decentralized and distributed public ledger system for storing and sharing information. In Blockchain technology, all the transactions enter the system and can be visible to the network partners. The advantages of the Blockchain use in the supply chain are transparency, tractability, and efficiency. Studies found that the growth in use of this technology for food value chain management is doubling every year mainly due to ensuring food safety and quality. The use of the chain blockchain

in supply chain management started in 2016 in China and India and its repaid use started after 2019 with the COVID pandemic (Vinay et al., 2020). In 2023, the European Union (EU) introduced Blockchain technology in the Common Agricultural Policy (CAP) (Monica Martínez Castaneda and Claudio Feijoo, 2023). The 2024 budget in Sri Lanka emphasized the need for agricultural digitalization in which the introduction of Blockchain technology to the paddy/rice supply chain should be prioritized.

3. *Regular monitoring of paddy/rice supply*

In the open market mechanism, monitoring of demand and supply is essential to stabilize prices. Demand for agricultural products is relatively stable and hence supply is the main factor that determines the price. Thus, supply monitoring plays a key role in price setting. At present, there is no proper monitoring system for food production in the country. At the time of the introduction of the open economy in 1978, a strong food monitoring system was established under the USAID project. Under this, the weekly Food Security Committee comprising high-level public and private sector officials was set up to monitor the country's food prices and supply situation. In addition, a monthly National Food Policy Committee (NFPC) chaired by the Prime Minister was set up to make decisions required to stabilize food prices based on the recommendations made by the weekly meeting. The Market Research Unit (MRU) was established at HARTI to provide necessary information to these two committees.

In 1985, the NFP was closed, and the recommendations made by the weekly meeting were submitted directly to the Cabinet of Ministers to make decisions without delay. This mechanism functioned smoothly till 2005 when politicians took over the responsibility of operating the system. Since then, weekly meetings have become a political meeting instead professional meetings. Meetings were not conducted regularly, and the system collapsed completely over time. Currently, there is no strong mechanism to address the food market issues, make interventions to address the issues, and monitor the progress. Against this backdrop, reactive policies are now made instead of proactive policies that are not effective as found from this study. It is suggested to reestablish the earlier mechanism for an effective food supply monitoring system at the national level. In addition, the food market monitoring

should be a main function of the district and the divisional agricultural committees conducted monthly and report the progress to the national committee.

4. *Direct sales to the end users through e-marketing*

In every village, some families purchase rice from the market. Innovative paddy farmers either individually or as a group can mill their paddy using existing rice mills and sell packed rice to the village consumers by getting orders using a mobile app. In African countries, direct selling to consumers, known as “farmers’ virtual markets”, functions well.

5. *Encouraging holding paddy stock at the farm level*

Most farmers sell their paddy at the paddy fields after harvesting and complain about low prices. Every effort should be made to avoid selling the entire paddy stocks soon after the harvest. One way to overcome this situation is the provision of storage facilities and post-harvest technology at the household level. This can be implemented with selected paddy households or selected farmer organizations. Marketing loans through banks can be organized to meet urgent cash needs. Extension staff should educate the farmers on when and where to sell in addition to advice on how to get the maximum production.

6. *Maintaining buffer stocks*

At present, there are no buffer stocks of paddy/rice to meet the emergency purpose. It is necessary to maintain buffer stocks either by the government or farmers or traders to meet the emergency needs.

7. *Operation of Paddy Marketing Board (PMB) as a commercial venture*

At present, PMB is running at a loss. Since PMB has necessary storage facilities and purchasing centres, it can operate competitively with the private sector. If open market prices come below the guaranteed price, PMB should purchase paddy at the guaranteed price to make the guaranteed price scheme (GPS) effective. Purchased paddy can be milled at registered rice mills and rice can be sold to the government institutions such as hospitals, schools and forces as done in Thailand. Countries in the region have government procurement programs due to inefficiency in the private marketing systems. In India, around 35% of paddy production is purchased by the government.

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