Department of Economics and Statistics
Faculty of Arts, University of Peradeniya
Sri Lanka

PERADENIYA INTERNATIONAL ECONOMICS RESEARCH SYMPOSIUM 2017

PROCEEDINGS

Volume V

12th OCTOBER 2017

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VENUE
POSTGRADUATE INSTITUTE OF
HUMANITIES AND SOCIAL SCIENCES (PGIHS)
UNIVERSITY OF PERADENIYA

PIERS-2017

PROCEEDINGS

Volume V

5th PERADENIYA INTERNATIONAL ECONOMICS RESEARCH SYMPOSIUM
PIERS – 2017

Organized by

Department of Economics and Statistics
Faculty of Arts
University of Peradeniya
Sri Lanka

on

12th October 2017

at

The Conference Hall
Postgraduate Institute
of Humanities and Social Sciences (PGIHS)
University of Peradeniya
Sri Lanka

DEPARTMENT OF ECONOMICS AND STATISTICS
FACULTY OF ARTS, UNIVERSITY OF PERADENIYA
SRI LANKA

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MESSAGE FROM THE VICE CHANCELLOR
University of Peradeniya

It gives me great pleasure to send this message on the occasion of the **5th Peradeniya International Economics Research Symposium** (PIERS) – 2017 organized by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya.

Identifying the current trends and new developments in the field of economics both at national and international level would definitely be vital in formulating a national policy which will eventually decide the future direction of the country. My sincere wish is that being a well reputed research and higher educational institute in Sri Lanka with a legacy of renowned group of experts in various fields of study, the "University of Peradeniya" should be in the forefront and take the leadership, not only in the field of economics but also in all other disciplines with reference to future planning and development of our country. I have no doubt that this symposium will create a valuable platform for economists and all other relevant specialists to discuss their research findings, share the new knowledge thus gained, while exchanging their views among the professional colleagues.

As the Vice Chancellor of the University, I take this opportunity to wish the 5th Peradeniya International Economics Research Symposium a great success

Professor Upul B. Dissanayake
Vice Chancellor
University of Peradeniya
Sri Lanka

MESSAGE FROM THE DEPUTY VICE CHANCELLOR
University of Peradeniya

It is with great pleasure that I send this message for the sixth Peradeniya International Economics Research Symposium PIERS 2017. Peradeniya Research Symposium started in 2013 and has reached its fifth anniversary this year. It has now become an important event in the calendar of the Faculty of Arts.

Research symposia of this nature will highlight the output of research carried out by the respective researchers and present their new findings to a larger scientific community, enabling further refinement of the new knowledge thus acquired. I believe that this kind of events would undoubtedly help students to learn and develop communication skills, presentation skills and teamwork in addition to their academic work per se. In addition, the students will also get an opportunity to interact with a wider community. This is a great opportunity offered to students by the Department of Economics and Statistics and I hope students will use this opportunity very effectively to their maximum, for it to be more productive.

At this point in time, may I take this opportunity to congratulate the Head of the Department of Economics and Statistics and the organizers of this Symposium for an excellent job well done. I firmly believe that this Symposium will give an unforgettable experience to all presenters and participants and very specially to all students, and hope you will take home pleasant memories of this event.

Professor R. L. Wijeyeweera
Deputy Vice Chancellor
University of Peradeniya
Sri Lanka

MESSAGE FROM THE DEAN
Faculty of Arts, University of Peradeniya

It is with profound honour that I send this message of congratulations and appreciation, as the Dean, Faculty of Arts, of the Fifth Peradeniya International Economics Research Symposium (PIERS-2017) organized by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya.

PIERS has become an important annual event in the Faculty of Arts, University of Peradeniya. As creation of new knowledge and dissemination it to a wider audience is one of our main responsibilities as academicians, I believe the PIERS has been a forum for researchers and scholars to share the findings of their research and shed important insight into the current burning economic issues. The outcomes of the research in economics have a significant global relevance, given the current challenges faced by the world. I trust that the outcomes of this symposia will actively contribute to stimulating and enriching further research in economics among the students and academicians in the University system, as well as contribute to national and global policies.

I hope that this symposia will provide our participants with a truly transformative experience through a variety of knowledge and perspectives so that the complex problems in our society can be resolved.

I wish that you all will actively participate at this endeavor and generate fruitful results.

Professor O. G. Dayaratna-Banda
Dean, Faculty of Arts
University of Peradeniya
Sri Lanka

MESSAGE FROM THE HEAD
Department of Economics and Statistics, University of Peradeniya

I am very happy to issue this message on the occasion of the 5th Peradeniya International Economic Research Symposium – 2017. The Peradeniya Economics Research Symposium (PERS) was initiated first in 2013 and it has later become a regular feature in the University calendar. This year, this symposium was upgraded as Peradeniya International Economic Research Symposium (PIERS) after succeeding of the four symposiums since 2013.

The quality of higher education provided by universities influence by the contribution by research. Therefore, promoting the research-teaching nexus of the university education system is an important aspects. The 5th Peradeniya International Economic Research Symposium – 2017 organized by the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya provides an opportunity for Undergraduate and Postgraduate Students, Academia and Researcher from nationally and internationally to sharing of their knowledge created through research across different aspects of economic discipline.

Improving the quality of life of world's human-beings through building economic empowerment and economic institutions and ensuring equitable and just society will require a vast increase in the access to knowledge. I believe that PIERS 2017 will fulfill this expectation by contributing through new knowledge to the economic world.

I hope that this 5th Peradeniya International Economic Research Symposium – 2017 will generate new knowledge that will contribute to empower humanity and to sustain the nature. While I congratulating the presenters and the organizing committee, I wish the PIERS 2017 of the Department of Economics and Statistics, Faculty of Arts, University of Peradeniya all success.

Mr. S. Vijesandiran
Head, Department of Economics and Statistics
Faculty of Arts
University of Peradeniya
Sri Lanka

MESSAGE FROM THE COORDINATOR
Peradeniya Economics Research Symposium – 2017

Peradeniya Economics Research Symposium organized by the Department of Economics and Statistics, University of Peradeniya which started in 2013, has reached the fifth Symposium in this year. This year's symposium consists of twenty six research presentations and extended abstracts. It is expected that this symposium will broaden the opportunities available for students, academics and other researchers in the field of economics to present their research findings and disseminate knowledge among the wider society and policy makers.

On behalf of the organizing committee I take this opportunity to extend my sincere thanks to the Vice Chancellor and the Deputy Vice Chancellor of the University of Peradeniya and the Dean, Faculty of Arts, University of Peradeniya, for extending their fullest support and guidance to this event. I thank Keynote Speaker Professor Prof. Herath Gunathilake, Director, Environment and Safeguards Division, Sustainable Development and Climate Change Department, ADB for accepting our invitation to deliver the Keynote speech at the inaugural session. My special thanks should go to Professor D. N. B. Gunewardena, Professor Sumanasiri Liyanage, Dr. W. Wijewardena and Dr. Aminda Perera for accepting our invitation to participate in the panel discussion. Also I would like to thank Prof. A. S. P. Abhayarathne, Dr. S. Jayathunga, Mr. Bandula Sarath Kumara and Mr. R. M. W. Banda who helped us to organize a session on "Expert from Public Sector" which is a newly added component of the PIERS 2017.

This year PIERS received sponsorships from Magampura Port Mgt. Company (PVT) LTD, Colombo International Container Terminals Limited, Colombo Logistic Private Ltd and Ceylon Petroliam Corporation in addition to the INRC, PGIHS and the University of Peradeniya. While thanking all of those who helped us finding money for the PIERS 2017, special thanks should go to Prof. W. L. P. Perera

for his valuable support for arranging almost all the sponsorships recieved outside of the University.

I thank Head, Department of Economics and Statistics for the help and cooperation extended me to organize this event. I also thank all my colleagues in the Department, Junior Staff, Miss. Pasula Ekenayaka (conference secretary) and non-academic staff who worked with me extending their fullest cooperation. I extend my thanks to authors and presenters who are the major contributors to this event. My sincere thanks should go to the members of the editorial committee, reviewers, chairpersons, discussants of this symposium. I thank SAR and SAB of the Faculty of Arts for their cooperation extended to me. I thank the Director of PGIHS for his fullest support to this event by providing the symposium venue and his staff for their corporation. I also thank Curator and PRO of University of Peradeniya helping me with the venue arrangements and all the non-academic staff of the Faculty of Arts for their support for this event.

While extending my sincere thanks to all who devoted their time to bring this fifth Peradeniya International Economics Research Symposium to a reality today, I welcome the National and International Research Community, Industry, International Organizations and Governments' Representatives to discuss and suggest solutions that contribute as a better performing competitive country, Sri Lanka, in the global economy.

I wish everyone a fruitful time!

Dr. Wasantha Athukorala
Coordinator, PIERS - 2017
Department of Economics and Statistics
University of Peradeniya

5th Peradeniya International Economics Research Symposium

PIERS - 2017

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5th Peradeniya International Economics Research Symposium - 2017

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Keynote Address

Development Challenges in Asia

by

Prof. Herath Gunatilake

Director, Environment & Safeguards Division
Sustainable Development & Climate Change Department
Asian Development Bank

Asia is in the middle of a remarkable transformation, potentially ushering in the Asian Century. Based on historical trajectories, and the promising assumption that Asia's major economies will sustain their current growth momentum, the study predicts that, by 2050, the region's per capita income could rise six-fold in terms of purchasing power parity (PPP), attaining the levels found in the European continent. It likewise predicted a 52 % share of global gross domestic product (GDP) by 2050, nearly doubling its current rate, allowing the region to regain the dominant economic position it held before the industrial revolution some 300 years ago. Such a feat would make an estimated 3 billion additional Asians affluent by current standards.

However, the Asian Century is by no means inevitable, and will remain elusive when economies proceed according to business-as-usual. For along the way are challenges confronting the region, and Sri Lanka along with it, that must be overcome in realizing its rise to preeminence. Asia's leaders will have to manage multiple and interrelated risks including rising inequality, an infrastructure gap, an aging population, environmental and climate change constraints, the need to strengthen the rule of law, guard against economic nationalism, and the risk of being caught in the middle-income trap. These challenges are not mutually exclusive, and when influencing each other, they can exacerbate the risks, or give rise to new threats to Asia's growth, stability, and security.

The study investigates each of these challenges and proposes how to circumvent them or tackle them head on. Beyond the prescription for macroeconomic and financial stability, it examines the necessity of innovation and upgrading, structural and institutional reform, inclusive growth, green growth, and international economic cooperation. Ultimately, the study also reminds those in the economics profession of the critical role played by economic analyses in prevailing over the hazards of economic growth, and progressing towards economic prosperity for Sri Lanka's citizens and the region at large.

EXTENDED ABSTRACTS

PIERS – 2017

Volume V

The Impact of Public Debt on Private Investment in Sri Lanka

H. R. A. C. Thilanka and J. G. Sri Ranjith

Department of Economics and Statistics, Faculty of Arts
University of Peradeniya, Sri Lanka

***Keywords**: Public debt, Private investment, Crowding out/in effect*

Introduction

Government debt can be considered as one of the major sources for financing the government operational activities under the fiscal policy. If borrowed funds are used for long-term development it may lead to have higher returns. However, if borrowings are not efficiently utilized it may have detrimental impacts on the long-term economic development. Borrowings from domestic banking sources may affect interest rate and then the ability to access loanable funds for private sector may discourage. Also, a huge amount of debt service payment impedes the flowing resources towards economic development and broadening the fiscal deficit. Sri Lankan experience shows the accumulation of large public debt and recorded an increasing trend in both foreign and domestic debt over the last few decades. As a result, the economy has been led to a macroeconomic instability (Sanderatne, 2011). After significant changes happen in monetary policy with introducing liberalization economic policy in 1977, along with domestic debt foreign debt also increased for the purpose of development activities and to face the difficulties of the balance of payment. Then, total public debt was 68.6 as a percentage of GDP by 1977 and it increased up to 103.3 in 2001 with the economic recession and in 2015 domestic debt was 44.3 percent and foreign debt was 31.7 percent (Central Bank of Sri Lanka, 2015). Sanderatne (2011) reported that, along with public debt, large debt servicing cost, growing fiscal deficit, limited and low level of revenue and big losses on public

enterprises so have caused further borrowings by the government. Along with the government sector, the private sector which holds a major role of the economy can be affected through the increasing debt which may impede the availability of resources for the private sector.

With the end of civil war in 2009, investment has become one of dynamic forces leading the country to well-equipped economy through infrastructure. In order to contribute to the economic development of the country, private sector also has tended to hold a significant portion of the total investment. In 2014, private investment was 22.9 as a percentage of GDP, but public investment was only 6.8 as a percentage of GDP (CBSL, 2014). Hence, it is clear that both private and public investments are not at the sufficient level in order to accelerate the economic growth and development. Crowding-out effect is one of the main scenarios which can be used to explain how public debt affects private investment. Under the Ricardian Equivalence view there would be no crowding-out of private investment when the government borrows money. In contrast, Neo-Classical School shows that increases in budget deficits cause increases in interest rates. Thus, budget deficits "crowd-out" private spending since the private sector borrows less at high interest rates (Carassco, 1998). Keynesian economists argued that public investment crowds-in private investment because of the multiplier effect (Saeed et al., 2006).

When public investment increases aggregate demand increases and then it causes more motivations for private investment. Along with this theoretical back ground many researchers have focused their attention towards examining the crowding-out effect. A study conducted by Akomolafe et al. (2015) using Johnasen Co-integration test and Vector Error Correction Model (VECM) shows that domestic debt crowds-out domestic investment in both short-run and long-run while external debt crowds-in domestic investment in the long-run. In contrast, Apere (2014) pointed out in his study, domestic debt has a linear and positive impact on private investment while external debt has a U-shaped impact on private investment in Nigeria. According to a study

conducted by Dayrathna-Banda and Priyadarshanee (2013) there is no financial crowding-out effect of fiscal expansions in Sri Lanka because of accommodative monetary policy. With this theoretical and empirical back ground, it is worthwhile to examine that whether there is a crowding-out effect of public debt on private investment in Sri Lankan economy. Since the lack of consistency in conclusions, further research on this problem will help to provide clear policy directives for economic development.

Objectives

The primary objective of this study is to identify whether public debt crowds out/in the private investment through both domestic and foreign public debt in Sri Lanka. Secondary objective is to emphasize the importance of public debt management to increase the private investment.

Methodology

The theoretical framework constructed by Akomolafe et al. (2015) which considered public debt crowds out/in private investment using an econometric model (Johnasen Co-integration test and Vector Error Correction Model) has been modified appropriately to address this research problem regarding the Sri Lankan context including Debt Servicing Payments, Domestic Credit to Private Sector and Political Stability as new variables.

$$\mathrm{PI_t} = \beta_0 + \beta_1 \mathrm{GDP}_t + \beta_2 \mathrm{INT}_t + \beta_3 \mathrm{DSP}_t + \beta_4 \mathrm{DCP}_t + \beta_5 \mathrm{EXD}_t + \beta_6 \mathrm{DD_t} + \beta_7 \mathrm{PLS} + \varepsilon_t \quad (1)$$

Where PI is the Private Investment as a percentage of GDP, EXD is the External Debt as a percentage of GDP, DD is Domestic Debt as a percentage of GDP. GDP is the Growth Rate of Gross Domestic Product, INT is the Real Interest Rate, DSP is the Debt Service Payment as a percentage of GDP, DCP is the Domestic Credit to Private Sector as a percentage of GDP, PLS is the Political Stability, ε

is the error term, t is the time period (1988-2015). Data were extracted from annual reports of Central Bank of Sri Lanka and Ministry of Finance. Johenson Co-integration and Vector Error Correction Model were used to investigate the crowding out/in effect. Before doing these tests, ADF test and PP test are used to test the stationary property of time series data.

Results and Discussion

According to above mentioned two unit root tests, all variables are stationary at their first difference, suggesting that they are integrated in order one [1(1)]. Then, to examine the lag length SIC, LR, FPE, AIC and HQ criteria were used. As SIC criterion suggested that no lag length and other criteria suggested that one lag length, one lag length was used for other tests. Then, Johanson Co-integrating test was done to ensure that whether there is a long-run relationship between variables. According to this test, two co-integrating equations are identified at 5 % significant level which implies that there is a long-run relationship between variables. In order to identify the nature of the long-run relationship Johanson Co-integration technique is adapted and long-run adjustment and short-run relationship are examined using Vector Error Correction Model. According to co-integrating results, the long-run relationship between the variables is shown in Equation 2. Only significant variables were included into the estimated model which is given as below.

$$\hat{\text{PI}} = -49.14 - 0.234\text{INT} + 0.48\text{DSP} + 0.34\text{DCP} - 0.25\text{EXD} - 0.26\text{DD} \qquad (2)$$

$$[6.767] \quad [-7.192] \quad [-8.361] \quad [7.919] \quad [7.259]$$

As shown in Equation 2, the results of all variables are significant at 5 % level of significance in long-run. Since the primary objective of this study is to identify the crowding out/in effect using both external and domestic public debt, the impact of both kinds of debt on private investment was observed. When domestic debt increases by 1 % of GDP private investment decreases by 0.261 % of GDP and when

external debt increases by 1 % of GDP private investment decreases by 0.255 % of GDP. Then, it is clear that public debt crowds out the private investment in long run. By supporting to this effect interest rate negatively affects the private investment in long-run according to above results.

Since Error Correction term of the model is significant and negative the long-run adjustment relationship can be identified related to private investment. This result shows that speed of adjustment is 0.56 which means that after an external shock, private investment moves from short-run disequilibrium to long-run steady state with speed of 0.56 in each year. And also, as domestic debt variable is significant at 1 percent and positive long-run adjustment relationship exists between domestic debt and private investment.

Conclusion and Policy Implications

The empirical results indicate that both domestic and foreign debt crowd-out private investment in long-run, but not in the short-run. Also domestic credit to private sector and debt servicing payment positively affect the private investment in long-run. Furthermore, political stability seems to associate closely for the volatility of private investment in short run showing that private investment responses instantly for the instabilities in the economy. The results of this study can be contributed for policy making considering the impact of public debt on private investment. Hence, the government should make maximum effort to manage public debt appropriately in order to mitigate the pressure on interest rate. Also measures should be taken to improve revenue through appropriate tax policy reforms and using of non-bank borrowings in the long-run.

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Fiscal Policy and the Determinants of Private Investment in Sri Lanka

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***Keywords**: Fiscal policy; Domestic private investment; foreign direct investment*

Introduction

Although the government involvement in economic development has been substantially high in Sri Lanka, the investment has been highly dominated by the private sector accounting for 20 % of GDP on average over the proceeding decades. It apparently indicates that the fiscal policy and budget deficit is conducive for thriving private sector businesses. Hence public sector spending may have helped in developing infrastructure and work force development for encouraging private investment. With this move, fiscal policy influences the macro economy through a number of ways; it changes the level and composition of aggregate demand, changes aggregate supply and influences national savings and investments (through expenditure and taxation). As an emerging economy Sri Lanka and its government expenditures show the directions to develop productive investments and human capital infrastructure through the government economic policy packages. However, this field of study in economics have no clear policy direction given and highly debatable over the experience of different contexts (Biza, *et. al.*, 2013; Rathnasekara, 2016). With this background, this research therefore focuses on empirical study on how budget deficit and fiscal policy of the country effect on private investment maintaining macroeconomic stability to achieve sustainable growth. This study attempts to investigate whether there is an empirical

relationship between budget deficit and private investment. We consider two types of investment: Domestic Private Investment and Foreign direct investment.

Objectives

The main objective of this study is to assess the policy effectiveness of the government in achieving high and sustainable economic growth in compliance with fiscal consolidation effort.

The secondary objectives are to investigate the determinant factors of private investment and also to examine whether there is a crowding out or in effect between budget deficit and private investment.

Methodology

The empirical model constructed for this study is based on the regression model by Samwel (2016) that used for his study regarding the Tanzanian economy. We have modified that model by adding new variables suitably to conduct our study. We took log difference for all variables.

$$\mathrm{DPI}_t = \beta_0 + \beta_1 \mathrm{CPI}_t + \beta_2 \mathrm{ER}_t + \beta_3 \mathrm{BD}_t + \varepsilon_t \quad (1)$$

$$\mathrm{FDI}_t = \beta_0 + \beta_1 \mathrm{CPI}_t + \beta_2 \mathrm{ER}_t + \beta_3 \mathrm{BD}_t + \varepsilon_t \quad (2)$$

Where PI refers to Private investment which can be divided into two, those are DPI and FDI (Domestic Private Investment and Foreign Direct Investment respectively as a ratio of GDP); CPI refers to Consumer Price Index, ER refers to Exchange rate (LKR per $) and BD refers to Budget deficit. There is no surplus value for the relevant period. So we consider only absolute value of BD defined as a ratio of GDP. This study covers time period of 1990 to 2015. The relevant data were collected from annual Reports of Central bank of Sri Lanka.

At the first step of the estimation procedure, ADF test and Phillip Peron tests were used to check the stationary of data. Johansen co-integration test was used to identify the long-run relationship and also VECM was

used to identify both short-run and long-run relationship as well as long-run equilibrium among the variables.

Results and Discussion

Unit root test revealed that all variables were non-stationary at the initial level, but stationary at the First difference. According to lag length criteria, AIC and HQ criteria were selected 2 lags. LR, FPE and SC criteria were selected 1 lag. Most criteria were selected in 1 lag. So lag length test suggested 1 lag. Johnsen co- integration trace test has detected co-integration relationship for both model which implies that there is a long -run relationship, long -run speed adjustment and short-run relationship are examine using Vector Error Correction Model.

The Equation 3`and 4 show long-run relationship:

$$\widehat{\mathrm{DPI}} = \underset{[2.13]}{0.06} + \underset{[1.98]}{1.75}\mathrm{CPI} - \underset{[2.01]}{1.26}\mathrm{ER} + 5.27\mathrm{BD} \qquad (3)$$

$$\widehat{\mathrm{FDI}} = \underset{[2.08]}{0.22} - \underset{[1.99]}{1.97}\mathrm{CPI} - \underset{[2.02]}{4.35}\mathrm{ER} + 1.03\mathrm{BD} \qquad (4)$$

According to above results, all variables are significant at the 5 % significant level at the long-run. Therefore, this results show that government fiscal deficit positively impact on domestic investment and also on foreign direct investment. For instance, when BD increases in 1 %, DPI increases in 5.27 % and also FDI increases in 1.03%. As it similar to the findings of literature, (Coban and Tugcu, 2015) the empirical estimation results of our model reveals that there is a long-term relationship between private investment and its determinants specified in the model. Also it clearly shows that government budget has been favourable for investment.

Since Error Correction term of the both models are significant and negative the long-run adjustment relationship can be identified related to PI and FDI (See Table 2). According to Equation 1 speed adjustment

is -0.59 which means that after an external shock, domestic private investment moves, from short-run to long-run steady state after one year. And also According to equation 2, speed adjustment is 1.57 means that after an external shock, foreign direct investment moves from short-run to long-run steady state after one year.

Table 2(a):Results of Vector Error Correction Model 1

Variables	D(PI)	D(ER)	D(CPI)	D(BD)
CointEq1	-0.598056	0.057185	0.468096	0.200595
	[-3.27009]	[0.16198]	[1.23512]	[-1.98364]
D(PI(-1))	-0.227332	0.203101	0.950293	0.103896
	[-1.09818]	[0.50825]	[2.21526]	[0.86193]
D(ER(-1))	-0.081750	-0.160033	0.395966	-0.037117
	[-0.64036]	[-0.64938]	[1.49675]	[-0.49930]
D(CPI(-1))	-0.108050	0.203332	-0.280293	0.083918
	[-1.04957]	[1.02317]	[-1.31387]	[1.39992]
D(BD(-1))	0.690887	0.262355	-0.913076	0.199638
	[1.31020]	[0.25773]	[-0.83559]	[0.65018]
C	0.800881	4.678817	-2.427133	0.094491

Note: t values are in parenthesis

Table 2(b):Results of Vector Error Correction Model 2

Variables	D(FDI)	D(CPI)	D(ER)	D(BD)
CointEq1	-1.571298	-2.244077	0.801247	2.130264
	[-6.97364]	[-0.61001]	[0.27528]	[2.55627]
D(FDI(-1))	0.395101	0.785509	1.271670	-0.432030
	[2.44121]	[0.29726]	[0.60825]	[-0.72174]
D(CPI(-1))	0.010719	-0.264413	0.208139	0.060313
	[0.76536]	[-1.15638]	[1.15050]	[1.16440]
D(ER(-1))	0.016398	0.167695	-0.220233	-0.078755
	[0.95045]	[0.59532]	[-0.98817]	[-1.23420]
D(BD(-1))	-0.013435	-0.093364	0.602869	-0.259699
	[-0.23612]	[-0.10050]	[0.82021]	[-1.23405]
C	-0.052179	-1.329681	4.943202	0.229505

Note: t values e in parenthesis

According to above results there is no significant relationship among the variables at the short-run consider about DPI. However, Last year FDI and Current year FDI has positive significant relationship.

Conclusion and Policy Implications

The empirical results indicate that budget deficits have been favourable for both domestic and foreign direct investment in the long-run. Also budget deficits are favourable for foreign direct investment at the short-run. Under the current fiscal policy the government spends more on improving public welfare, physical and social infrastructure development. These expenditures will have a tremendous positive impact on investment potentials in Sri Lanka. And also, government established BOI and tax reduction and concessions have made an optimistic view for investors. Therefore, current phase of fiscal policy stance is conducive for foreign investment in the short-run and long-run. Also we can say that although there is a crowding out effect on

domestic private investment in the short-run, the current fiscal policy has a crowding in effect on domestic private investment in the long-run

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Basel III: Capital Adequacy Regulations and Domestic Banks in Sri Lanka: An Assessment of Current Implementation with Emerging Challenges

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Keywords: *Banks, Economic and financial crisis, Capital adequacy regulation*

Introduction

Financial stability is an important component in the global economy and plays a key role in maximizing real economic gains. This proves the continuous efforts taken by the international regulatory bodies to minimize the adverse effects due to the economic and financial crisis in 2007/2008. The Bank for International Settlements – Central Banker's Bank, located in Basel, Switzerland produced new set of banking regulations to avoid – at least minimize – the danger of another financial and economic crisis. The Basel Committee on Banking Supervision (BCBS) is an international financial regulatory body which was established in 1974 to structure the global banking risks by formulating guidelines and regulations relating to credit, capital, markets and operations. As an operational practice to overcome the effects of financial crisis, the Basel Committee collectively discussed and came up with a set of agreements. Its first accord issued in 1988 which named as Basel I and an updated version was published in 2004 as Basel II (Buddhipala, 2017). Basel III introduced in 2011 by reforming Basel II regulations to strengthen the global capital and liquidity rules with the goals of promoting more resilient banking sector. Capital adequacy, Liquidity Management, Risk Management and Market Discipline are the four major components that has been

regulated in the Basel III. According to Bank of International Settlements, lack of quality and quantity of the capital base was one of the main influential factors for the financial crisis. This resulted, the credit losses come out from retained earnings (a part of bank's tangible common equity base), inconsistency in the definition of capital across economies and lack of disclosure (Bank of International Settlements, 2016. Therefore, Basel Committee on Banking Supervision clearly defined the "Total Regulatory Capital" through Basel III accords as Tier one capital: Going-concern capital and Tier two capital: Gone-concern capital.

International regulatory bodies introduced a concept of "Systematically Important Banks" to regulate financial bodies effectively with more control, which represents a financial institution whose unmanageable failure, because of its size, complexity and systemic interconnectedness, would lead significant disruption to the wider financial and economic system. Domestic and Global are the two types of systematically important banks where the banks which are limited their operations within the originated country called domestic while the banks which provide a wide range of international coverage through branches defined as global. Existing researches recognized the impact of implementing Basel III in developed economies such as USA, Japan and European Union, but cannot be satisfied with the assessments carried out on local banking system. This research considered the domestic systematically important banks since the global systematically important banks carry out operations here are not originated in Sri Lanka.

Objectives

Assess the capital adequacy measurements of Basel III within the domestic systematically important banks and to identify the emerging challenges in implementing Basel III capital adequacy regulations when moving further.

Methodology

The capital adequacy ratio consists of three main ratios namely, Tier one capital ratio (Core capital ratio), Total capital ratio and Common equity ratio, defined as follows.

$$Tier1\ Capital\ Ratio = \frac{Tier1\ capital}{Risk\ weighted\ \ assets} * 100$$

$$Total\ Capital\ Ratio = \frac{Total\ capital}{Risk\ weighted\ assets} * 100$$

$$Common\ Equity\ Ratio = \frac{Common\ equity\ capital}{Risk\ weighted\ assets} * 100$$

A comparative ratio analysis of six Domestic Systematically Important Banks (DSIBs) been conducted using the secondary data from the respective annual reports for the period of 2011-2016.All six DSIBs in Sri Lanka namely Bank of Ceylon, Peoples' Bank, Sampath Bank, Commercial Bank, Hatton National Bank and Seylan Bank will be assessed in this empirical research. These six DSIBs represent 75 % of the commercial bank assets, 63 % of the banking sector assets and 36 % of the entire financial system's assets(Central Bank of Sri Lanka, 2013).

Results and Discussion

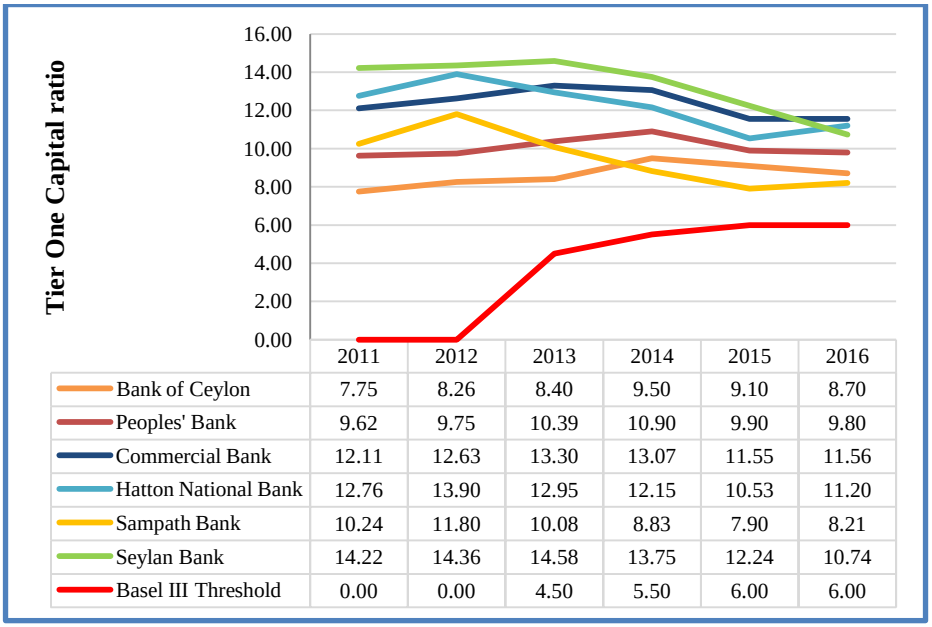
The Central Bank of Sri Lanka divided the banking sector by assigning an asset threshold of LKR 500 billion to regulate the financial intermediary system in a sophisticated manner. Table 1 illustrates the set targets which should be met in given time frames in order to satisfy Basel III capital adequacy regulations.

Table 1: Basel III Capital Adequacy Requirements (in Percentage)

Components of Capital	2013	2014	2015	2016	2017	2018	2019
Banks with Assets Less Than LKR 500 billion							
Common Equity Tier One including Capital Conservation Buffer	3.5	4	4.5	5.12	5.75	6.37	7
Tier I including Capital Conservation Buffer	4.5	5.5	6	6.62	7.25	7.87	8.5
Total Capital Ratio including Capital Conservation Buffer	8	8	8	8.62	11.25	12.87	12.5
Banks with Assets More Than LKR 500 billion							
Common Equity Tier Including Capital Conservation Buffer and Capital Surcharge on Domestic Systemically Important Banks	3.5	4	4.5	5.12	6.25	7.37	8.5
Tier I including Capital Conservation Buffer and Capital Surcharge on Domestic systemically Important Banks	4.5	5.5	6	6.62	7.75	8.87	10
Total Capital Ratio including Capital Conservation Buffer and Capital Surcharge on Domestic Systemically Important Banks	8	8	8	8.62	11.75	12.87	14

(a) Tier one capital ratio is the proportion of tier one capital to risk weighted assets of the bank which has Basel III threshold of 4.5 % to 6 % at the end of 2016. As shown in figure 1, all six domestic systematically important banks in Sri Lanka are in satisfactory level when meeting the core capital requirements of Basel III. Two state banks managed to continue stable capital ratio while Seylan, Sampath and Hatton National banks report slight decline in their capital ratio

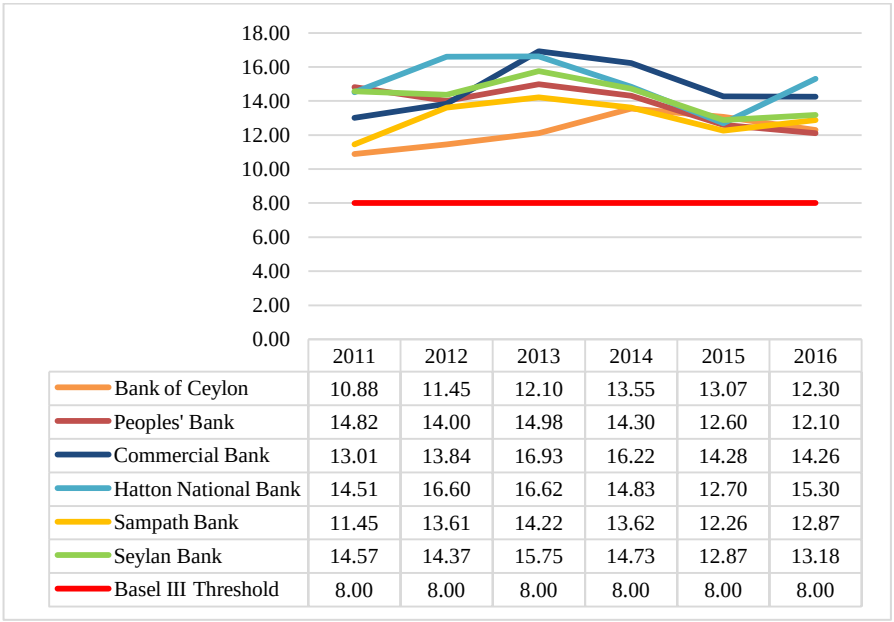
over the considered time period. Commercial bank is maintaining fairly high and stable capital ratio comparing to its' competitors.



	2011	2012	2013	2014	2015	2016
Bank of Ceylon	7.75	8.26	8.40	9.50	9.10	8.70
Peoples' Bank	9.62	9.75	10.39	10.90	9.90	9.80
Commercial Bank	12.11	12.63	13.30	13.07	11.55	11.56
Hatton National Bank	12.76	13.90	12.95	12.15	10.53	11.20
Sampath Bank	10.24	11.80	10.08	8.83	7.90	8.21
Seylan Bank	14.22	14.36	14.58	13.75	12.24	10.74
Basel III Threshold	0.00	0.00	4.50	5.50	6.00	6.00

Figure 1: Tier One Core Capital Ratio of DSIBs in Sri Lanka

(b) Total Capital ratio, is the ratio between total capital base and the risk weighted assets of the bank which the minimum requirement of Basel III accords is 8 %. The total capital ratios of domestic systematically important banks in Sri Lanka are also reports a satisfactory level. Figure 2 illustrates the behavior of total capital ratios of considered DSIB's and there we can clearly see The Hatton National Bank has sudden incline in capital ratio after three years of downturn by reporting 15.3 % in 2016.



	2011	2012	2013	2014	2015	2016
Bank of Ceylon	10.88	11.45	12.10	13.55	13.07	12.30
Peoples' Bank	14.82	14.00	14.98	14.30	12.60	12.10
Commercial Bank	13.01	13.84	16.93	16.22	14.28	14.26
Hatton National Bank	14.51	16.60	16.62	14.83	12.70	15.30
Sampath Bank	11.45	13.61	14.22	13.62	12.26	12.87
Seylan Bank	14.57	14.37	15.75	14.73	12.87	13.18
Basel III Threshold	8.00	8.00	8.00	8.00	8.00	8.00

Figure 2: Total Capital Ratio of DSIBs in Sri Lanka

(c) Common capital ratio provides the fraction between common capital to risk weighted assets, but most of the banks did not clearly differentiate common equity from core capital in their calculations which they publish in annual reports. Even all domestic systematically important banks pay their attention to clearly publish tier one capital ratio and total capital ratio, lack of data on common equity ratio created a challenge in this data analysis. Basel III accords require minimum 5 % common equity ratio without capital conservation buffer in 2016. This must be increased up to 8.5 % by domestic systematically important banks by 1st January 2019.

Conclusion and Policy Implications

As per the evidences drown from the research it can be conclude that all the domestic systematically important banks in Sri Lanka could manage to meet the international capital adequacy requirements drawn by Basel III accords, in terms of tier one (core) capital ratio and total capital ratio. Lack of proper disclosure created a challenge to assess the

level of implementation on common equity ratio. In addition to the findings drawn from the analysis, prevailing literature emphasizes several challenges emerged with new Basel III accords. Increased capital and liquidity requirements may limit the options to raise additional tier one capital with small equity market in Sri Lanka (25 % of GDP) comparing to other Asian economies such as India (70 % of GDP) and Thailand (88 % of GDP). Another challenge may arise is uncommon usage of convertible structures to claim additional tier one capital in future stages in Basel III implementation. Further investments on IT infrastructure and on data architecture will be needed in terms of fulfilling disclosing requirements assigned by Basel III and the local financial regulatory bodies and commercial banks should pay attention on these challenges when moving further.

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Exchange Rate and External Debt Nexus: ARDL Model Approach to Sri Lanka

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***Keywords**: Exchange rate, External debt, Bound testing, Cointegration*

Introduction

In recent decades a vast number of studies have focused on the link between exchange rates (ER) and different causal factors. The ER is one of the most crucial macroeconomic factors in the emerging and transition economies. It affects public debt, inflation, trade and other economic activities. The ER has long been thought to have significant impact on the import and export of goods and services. Therefore, ER is expected to stimulus the price of those products that are traded. Shaheed (2015) concludes that external debt, debt service payment and foreign reserves have a positive impact on ER in the long run. Although, most of the economies currently facing issue of currency depreciation, which makes the trade balance and balance of payment (BOP) favorable and moves towards the surplus and boosts the country's economy. However, the situation of Sri Lanka is totally different that it. Even though, Sri Lanka has experienced continuous currency depreciation since 1977, it has recorded that the deficits in the trade balance and BOP. The one way of solving the budget deficit (BD) or BOP problem is to allow the currency depreciation. Another ways are to use internal and external sources of deficit financing. Since Sri Lanka faces difficulties in accumulating the internal sources, the demand for external sources of deficit financing has been increased. As a result, external debt of the country has increased. On the contrary, BOP deficit and BD tend to decrease the foreign reserves (FR). The currency depreciation leads to increase the value of interest rate than

the real value. As a result, real value of debt servicing will be higher than value of debt.

The significant number of existing literature identified a positive relationship between exchange rate and external debt (e.g., Alam and Taib, 2013; Awan et al.> 2015; Shaheed et al., 2015; Draz and Ahmed, 2015). However, the quantitative assessment of the relationship between ER and external debt is inadequate and limited in the context of Sri Lanka. Thus, this study attempts to fill this gap by investigating the ER and external debt nexus in the context of Sri Lanka.

Objectives

The main objective of this research is to identify relationship between exchange rate and external debt in the long run and in the short run.

Methodology

Annual data of Sri Lanka over the period of 1977-2015 has been used in this study. The data of exchange rate (ER), external debt (ED), foreign reserve (FR), budget deficit (BD), and debt service payment (DSP) were extracted from annual reports of Central Bank of Sri Lanka (CBSL) and consumer price index (CPI) was collected from the World Development Indicator (WDI) data base. Further, political instability (PI) and exchange rate regime (ERR) were used as dummy variables. All the variables, except PI and ERR, are transformed in to natural logarithm. ADF and PP unit root test methods were adapted to test that the series are not containing I(2) variables. Akaike Information Criterion (AIC) is applied to determine the optimal lag length of each series. Following the empirical literature in determinants of ER, we develop the long-run relationship between the variable as below:

$$\mathrm{LER_t} = \beta_0 + \beta_1 \mathrm{LED_t} + \beta_2 \mathrm{LBD_t} + \beta_3 \mathrm{LFR_t} + \beta_4 \mathrm{LCPI_t} + \beta_5 \mathrm{LDSP_t} + \beta_6 \mathrm{PI_t} + \beta_7 \mathrm{ERR_t} + \varepsilon_t \quad (1)$$

where, ε_t is a white noise error term, $t = 1, 2, \ldots, \mathrm{T}$.

The Engel Granger method and Johansen method requires that the all of the variables in equation (1) should be integrated in same order and the error term should be integrated in order zero in order to form the long run relationship. However, if variables in equation (1) have different order, that is I(1) and I(0) we can use new co-integration method which was developed by Pesaran et al., (2001). This procedure, also known as autoregressive distributed lag (ARDL) approach to co-integration. The ARDL co-integration bound testing procedure is given by equation (2):

$$\Delta \mathrm{LER_t} = \rho_0 + \vartheta' \mathrm{LZ_{t-1}} + \sum_{i=1}^{\mathrm{p}} \eta_i \Delta\, \mathrm{LER_{t-}}_i + \sum_{i=0}^{\mathrm{p}} \pi_{\mathrm{i}}' \Delta \mathrm{L}\, \mathrm{Z_{t-}}_i + \delta' \mathrm{D_t} + u_{\mathrm{t}} \qquad (2)$$

where, $\vartheta' = [\vartheta_1, \dots, \vartheta_6]$ refers to the long run coefficients; $\mathrm{LZ_{t-1}} = [\mathrm{LER_{t-1}}, \mathrm{LED_{t-1}}, \mathrm{LBD_{t-1}}, \mathrm{LFR_{t-1}}, \mathrm{LCPI_{t-1}}, \mathrm{LDSP_{t-1}}]$ is the vector of explanatory variables with lag one; η_i and $\pi_i' = [\pi_{1i}, \dots, \pi_{5i}]$ refers to the short run dynamic coefficients, $\Delta \mathrm{LZ_{t-i}} = [\Delta \mathrm{LED_{t-i}}, \Delta \mathrm{LBD_{t-}}_i, \Delta \mathrm{LFR_{t-i}}, \Delta \mathrm{LCPI_{t-i}}, \Delta \mathrm{LDSP_{t-i}}]$ denotes the vector of explanatory variables with lag i and u_{t} is the white noise error term.

The equation (2) can be further transformed as in equation (3) to accommodate the error correction term with one period lagged($\mathrm{ECT_{t-1}}$):

$$\Delta \mathrm{LER_t} = \beta_0 + \sum_{\mathrm{i}=1}^{\mathrm{p}} \eta_i \Delta\, \mathrm{LER_{t-i}} + \sum_{\mathrm{i}=0}^{\mathrm{p}} \pi_{\mathrm{i}}' \Delta\, \mathrm{LZ_{t-i}} + \delta' \mathrm{D_t} + \gamma \mathrm{ECT_{t-1}} + \mu_{\mathrm{t}} \qquad (3)$$

where, γ: speed of adjustment, which should have statistically significant and negative sign to support the co-integration between the variables, μ_{t}: pure random error term.

To investigate the existence of long-run relationships between the variables, bound testing procedure is used, which is based on the F-test (Wald test). The F-test is actually a test of the hypothesis of no co-integration among the variables ($\mathrm{H_0}: \vartheta_1 = \cdots = \vartheta_6 = 0$) against the existence of cointegration among the variables ($\mathrm{H_1}: \vartheta_1 \neq \cdots \neq \vartheta_6 \neq 0$) in equation (2). Finally, we used Granger causality test to determine the direction of the causality between the variables.

Results and Discussion

The results of ADF and PP unit root test indicate that the variables are integrated in order zero (LER, LBD and LED) and order one (LCPI, LFR and LDSP). AIC advocated that to use ARDL (1, 0, 1, 2, 1,1) model for this analysis. The long-run results of the corresponding ARDL (1, 0, 1, 2, 1, 1) model are presented in Table 1 below:

Table 1: The results of ARDL (1, 0, 1, 2, 1, 1) Model

Dependent Variable: LER						
Panel A: The Results of Long run Coefficients						
Cons	LED	LBD	LCPI	LFR	LDSP	R^2
	0.072* (0.041)	0.135* (0.047)	0.363** (0.027)	0.097* (0.053)	−0.156** (0.048)	0.758
Panel B: The Results of Short run Coefficients						
Lag order	ΔLER	ΔLED	ΔLBD	ΔLCPI	ΔLFR	ΔLDSP
0		−0.0007 (0.993)	0.067* (0.066)	−0.014 (0.936)	0.026 (0.488)	−0.035 (0.550)
1	0.215 (0.339)		−0.027 (0.509)	0.535* (0.084)	0.022 (0.649)	0.025 (0.623)
2				−0.257 (0.315)		
Panel C: The Results of the Diagnostics Test						
Serial Correlation [LM Test: $\chi^2_{(df)}$]					Prob. = 0.634	
Normality Test (Jarque-Bera)					Prob. = 0.377	
Heteroscedasticity (BPG Test)					Prob. = 0.351	
Omitted Variable (Ramsey's RESET)					Prob. = 0.525	

Note: Probability values are given in the parenthesis. *, ** represents the variables are statistically significant at 10 % and 5 % level of significance respectively. Two dummy variables results are not presented here since they are not statistically significant even at 10 % level of significance.

As expected to the theory and most of the existing literature (e.g., Saeed et al., 2012; Awan et al., 2015; Draz and Ahmed, 2015) ED, BD, CPI and FR (at 10 %) have positive and statistically significant relationship with ER in the long run, whereas, DSP affects the ER negatively in the long run. At the same time BD and CPI have

significant (10 % level of significance) and positive impact on ER in the short run while other variables do not affect significantly.

The Lagrange Multiplier (LM) test of autocorrelation advocates that the residuals are not serially correlated. According to the Jarque-Bera (JB) test, the null hypothesis of normally distributed residuals cannot be rejected. The Breusch-Pagan-Godfrey (BPG) test of heteroscedasticity suggests that the disturbance term in the equation is homoscedastic. The Ramsey RESET test result confirms that there is no specification error in the estimated model (See Table 1, Panel C above). The CUSUM plots lie between the lower and upper critical bounds at the 5 % level of significance, which confirms the stability of the parameters. The result of Wald test confirms that there is long run relationship between ER and other variables under considered in this study since we reject the null hypothesis of no cointegration among the variables due to the computed F-statistics (3.92) greater than the upper bound critical value (3.79) at 5 % level of significance (The both results of stability and the Wald test are not presented here due to concerning the page limit).

Next, the results of short run dynamic and long run adjustment coefficients are estimated using Equation (3), which is presented in Table 2. The ECM model passed all the diagnostics tests (see Table 2, Panel B below). Panel A of Table 2 reports the short run dynamics coefficient estimates of ARDL-ECM. Accordingly, as expected, one period lagged value of ER and one and two period lagged value of CPI have positive and significant impact on ER in the short run whereas one period lagged value of FR has negative and significant impact on it. Further, ECT(-1) carries an expected negative sign, which is highly significant, indicating that, there should be an adjustment toward steady state line in the long run one period after the exogenous shock. That is, about 19.4 % of the disequilibrium in the ER is offset by short-run adjustment in each period.

Table 2: Error Correction Representation of ARDL Model

Dependent Variable: ΔLER			
Variables	Lag order		
	0	1	2
ΔLER		0.632*** (0.003)	
ΔLED	0.019 (0.772)		
ΔLBD	0.031 (0.290)	0.001 (0.998)	
ΔLCPI	0.003 (0.980)	0.278* (0.095)	0.281* (0.081)
ΔLFR	0.039 (0.153)	−0.12*** (0.000)	
ΔLDSP	0.004 (0.904)	−0.083 (0.015)	
PS	−0.004 (0.983)		
ERR	−0.010 (0.516)		
ECT(−1)	−0.194*** (0.000)		
R^2	0.774		
F − Stat	4.907(0.000)		
Panel B: The Results of the Diagnostics Test			
Serial Correlation [LM Test: $\chi^2_{(df)}$]			Prob. = 0.231
Normality Test (Jarque-Bera)			Prob. = 0.852
Heteroscedasticity (BPG Test)			Prob. = 0.268
Omitted Variable (Ramsey's RESET)			Prob. = 0.657

Note: Probability values are given in the parenthesis. *, ** represents the variables are statistically significant at 10 % and 5 % level of significance respectively.

Finally, Granger causality test detected only unidirectional causality that stemming from FR to ER and DSP to ER in the long run (The results are not shown here due to space constraint).

Conclusion and Policy Implications

This study concludes that the both cointegration approach to ARDL and error correction version of ARDL passed all the diagnostics and the stability test. The Wald test confirms that the variables are cointegrated. The CPI affects the ER positively and significantly in the long run and in the short run. ED, BD, and FR have positive and significant impact on ER in the long run while DSP has negative affect on it. But, lagged value of FR negatively affects the ER in the short run. Further, this

model confirms that whole system can get back to long run steady state line at the speed of 19.4 % in each year one period after the exogenous shocks. In sum, the government of Sri Lanka should take necessary action to reduce the BD, ED and CPI in order to bring the economy well off.

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The Impact of Trade Liberalization on Export: A Case Study of Sri Lanka

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Keywords: *Trade liberalization, Openness, Error correction*

Introduction

Trade liberalization is the removal or reduction of restrictions or barriers on the free exchange of goods between nations. This includes the removal or reduction of both duties and surcharges and non-tariff obstacles like licensing rule, quotas and other requirements (Hamad et al. 2014). Many high income countries follow the path of trade liberalization policy to protect their market, competitive with other countries and to achieve their goal fast (Jayatissa 1991).

Trade openness has been continuously increasing after trade liberalization policy introduced in Sri Lanka in 1977 and Sri Lanka is the first country to open up the economy in South Asia. In addition to that Sri Lanka started to move forward in direction of intra-regional and international trade by liberalizing its trade policies to some extent. Many researchers (Manni and Afzal, 2017; Kassim and Lanre, 2013) have analyzed the relationship between trade liberalization and the economic growth all over the word, and some in Sri Lanka using different approaches. However the quantitative assessment of impact of trade liberalization on export in the context of Sri Lanka is limited. Therefore, this study attempts to fill this gap.

Objectives

The main Objective of this study is to examine the impact of trade liberalization on export of Sri Lanka since 1977.

Methodology

We used annual time series secondary data covering the period 1977-2015 to analyze the objective of this study. The data of export, foreign direct investment, nominal exchange rate, foreign income (America's GDP), openness and consumer price index (It is using for price of exports) were obtained from word development indicators data base on the World Bank. All the data was transformed in to natural logarithm form to reduce the heteroskedasticity

ADF, PP and KPSS unit root test is applied to check stationarity properties of the time series data. Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Sequential modified LR tests statistics are adapted to determine the optimal lag length. The number of co-integrating relationship is examined using Johansen co-integration approach which is described as below,

$$\ln EX_t = \alpha_0 + \alpha_1 \ln FDI_t + \alpha_2 \ln OPENN_t + \alpha_3 \ln CPI_t + \alpha_4 \ln GDPus_t + \alpha_5 \ln NER_t + u_t \quad (1)$$

Where, lnEX: Export as a dependent variable in natural log, lnFDI: foreign direct investment in natural log, lnOPNN: openness in natural log, lnCPI: consumer price index in natural log, lnGDPus: foreign income in natural log, lnNER: nominal exchange rate in natural log and u is the white noise error and t refer the period of time. We used Error Correction Model (ECM) to identify the short run relationship as well as long run adjustment of the modelwhich is given below

$$\Delta \ln Z_t = \alpha_0 + \Pi Z_{t-1} + \sum_{i=1}^{p-1} \Phi_i^* \Delta \ln Z_{t-i} + \varepsilon_t \quad (2)$$

Where, $\Pi=\alpha\beta'$. α : is the (6×1) vector of speed of adjustment co-efficient, β': (1×6) vector of co-integrating coefficients, $Z_t=[EX_t, FDI_t, OPENN_t, CPI_t, GDPus_t, NER_t]'$ vector of dependent variables, Z_{t-i} : lagged value of Z_t and ε_t: white noise error term. We used STATA software to analysis the model.

Results and Discussion

According to the unit root test results, all three unit root tests confirmed that all variables are stationary at their first difference. Sequential modified LR tests statistics is suggested to use one lag as optimal lag length. The Trace Statistic of Johansen co-integration technique detected one co-integrating relation in the system of equation at 5 % level of significance. Following equation shows the long run relationship of Model.

$$\widehat{\ln EX} = 45.135 - 0.393\ln FDI - 1.812\ln ER + 2.948\ln CPI - 0.745\ln GDP_{us} + 0.991\ln OPENN \quad (3)$$

This results shows that FDI,CPI and OPENN has a significant effect on EX at 1 % significance level and ER and GDP_{us} does not has a significant effect on EX at any significant level. FDI has negative and significant long run relationship with EX and CPI ad OPENN have positive and significant long run relationship with EX. Many research support to our results (Onafowora and Owoye, 1998; Santos-Paulino, 2002)].

Table 1: ECM results of the long run adjustment

Error Correction:	D(lnEX)	D(lnCPI)	D(lnER)	D(lnGDPus)	D(lnFDI)	D(lnOPPEN)
CointEq1	-0.07425	0.04787	0.08485	0.03803	-2.26808	-0.05998
	[-0.8070]	[1.0095]	[2.1989]	[1.8795]	[-5.1969]	[-0.9048]

Note: t-statistics are given the brackets

Table 1 shows the results of long run adjustment of the Error Correction Model. According to the results of the coefficient of speed of adjustment of our dependent variable export is negative as expected

but which is not statistically significant. It means that the external shock do not bring the model to the steady state line significantly in the long run. Because there are many countries trying to catch the world market so, if Sri Lankas' exports affect by external shock, other country will catch the Sri Lankas' place. Therefore, external shock does not bring the model to the steady state line significantly in the long run.

Table 2: Short run relationship results between the variables

Variables	D(LNEX)	D(LNCPI)	D(LNER)	D(LNGDPUS)	D(LNFDI)	D(LNOPPEN)
D(LNEX(-1))	0.0672	-0.0656	-0.0969	-0.0532	-1.4976	0.368**
	[0.266]	[-0.505]	[-0.915]	[-0.960]	[-1.251]	[2.028]
C	0.0948	0.0733**	0.060*	0.0430*	-0.686*	-0.0289
	[1.736]	[2.605]	[2.655]	[3.580]	[-2.650]	[-0.735]

Note: t-statistics are given the brackets

Table 2 shows the results of short run relationship between the variables. According to the results the value of intercept 0.094 shows that the export value when the other variables are constant. There is no any short run relationship is identified between export and last year value of the variables.

$$\widehat{\mathrm{DlnEX}} = 0.094 + 0.067\mathrm{DlnEX}_{t-1} - 0.512\mathrm{DlnCPI}_{t-1} + 0.283\mathrm{DlnER}_{t-1} + 0.054\mathrm{DInGDPus}_{t-1} + 0.029\mathrm{DlnFDI}_{t-1} - 0.234\mathrm{DlnOPENN}_{t-1} \quad (4)$$

Conclusion and Policy Implications

This study examines the impact of trade liberalization on export in Sri Lanka. The all three unit root test results confirmed that all the variables are stationary at their first difference of logarithm. Sequential modified LR tests statistics is suggested one lag as optimal lag length. Johansen co-integration technique detected one co-integrating relationship between the variables which is used in this study. The co-integration results confirmed that EX has positive and significant relationship with CPI and OPENN while negative and significant relationship with FDI in the long run. According to the co-integration model long run relationship if openness increase by one percentage

Export will increase by 0.99 percentage. Based on the findings, trade openness has significant and positive effect on export of Sri Lanka so, if Sri Lanka wants to increase the export Sri Lankan government should use openness as a policy tool.

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Impact of Exchange Rate Depreciation on Balance of Payments: Empirical Evidence from Sri Lanka

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***Keywords**: Exchange Rate Depreciation, Balance of Payments, Co-integration, Error Correction Model*

Introduction

Exchange rate is a fundamental macroeconomic variable that has various impacts on balance of payments as well as other macroeconomic variables (Odili, 2014). Exchange rate plays a major role in the international economic integration because all nations are not hold autarky equilibrium so they are holding an international economic relation with other countries (Oladipupo and Onataniyohuwo, 2011). Exchange rate refers to the price of one currency in terms of another foreign currency. Sri Lanka's exchange rate policy has gradually evolved from a fixed exchange rate regime in 1948 to an independently floating regime by 2001. Sri Lanka, which followed a managed floating exchange rate regime with crawling bands since 1977, shifted to an independently floating exchange rate regime in January 2001 due to the strong need of maintaining a large stock of international reserves (Central Bank o Sri Lanka, 2016).

The exchange rate is a key determinant of balance of payments (BOP) of the country (Oladipupo and Onataniyohuwo, 2011). Balance of Payments is a balance of international monetary transactions engaged in during a specific period of time; government, residents and non-residents individuals and institutions in the rest of the world can be involved in such transactions. In Sri Lanka, the current crisis in the BOP of the country is fundamental weaknesses in the structure and

performance of the economy over a period of time. Sri Lanka faces the BOP crisis again because current account balance remains stable but the financial account weakened with the resumption of capital out flows, inability to attract foreign investments and the country's net international foreign reserves fell short of the target and deficit trade balance which lead BOP crisis in Sri Lanka. A sound economic and financial policy is imperative to resolve the current crisis of BOP; therefore, in this study test whether exchange rate is an adoptable variable to remove this imbalance BOP situation from the country.

There are number of empirical studies have been carried out the impact of exchange rates on BOP, although with mixed results. Ahmad et al. (2014) and Odili (2014) estimated the impact of exchange rate on the BOP by using auto regressive distributed lag (ARDL) and they found exchange rate has a statistically significant and positive impact on BOP in the long-run as well as short run. However, Ontaniyohuo and Onataniyohuwo (2011) found the result which is contradictory with Ahmad et al and Odili. Iyoboyi and Muftan (2014) confirmed a long-term relationship with associated variables and bidirectional causality between BOP and other variables employed. In Sri Lanka, Alawattage (2002) examined the effectiveness of exchange rate policy of Sri Lanka and he found that there is a long-run relationship between trade balance and the real effective exchange rate.

According to the Sri Lankan data, it is difficult to identify the clear relationship between exchange rate and budget deficit. This motivated to do the quantitative assessment between these variables since the quantitative assessments between these variables are inadequate and limited in the Sri Lankan context. Therefore, this study attempts to fill this gap by investigating the impact of exchange rate on BOP position in Sri Lanka.

Objectives

The main objective of this study is to empirically analyze the impact of exchange rate depreciation on BOP in Sri Lanka.

Methodology

There are two main theories explained the behavior of exchange rate (Olidi, 2011). First, aspect of elasticity approach to BOP and exchange rate relationship is the Marshall-Lerner condition. Elasticity states that devaluation helps to improve BOP deficits of a country by increasing its exports and reducing its imports. When the sum of price elasticity of demand for exports and imports in absolute terms is equal to unity, depreciation has no effect on the BOP situation will remain unchanged $(\varepsilon_x + \varepsilon_m = 1)$. where: ε_x is the demand elasticity of exports and ε_m is the demand elasticity for imports. The sum of price elasticity is greater than unity; depreciation will improve balance of payments$(\varepsilon_x + \varepsilon_m > 1)$. On the other hand, if the sum of price elasticity is less than unity, depreciation will worsen on the balance of payment because which increase the burden of the balance of payment deficits$(\varepsilon_x + \varepsilon_m < 1)$. Second, monetary approach focuses on both the current and capital accounts of the BOP (Ontaniyohuo and Onataniyohuwo (2011). In this approach also indicates the depreciation leads to correct the BOP imbalance situation. Another thought is the IS-LM model, suggest depreciation is theoretically expected to have positive effect on export and it would reduce import (Iyoboyi and Muftan, 2014).

In this study has been used the time series data gathering from World Bank and Central Bank Reports spanning from 1978 to 2015. We employed the data of balance of payment (BOP), current account (CA), exchange rate (ER), inflation (INF), lending interest rate (LIR), real gross domestic product (RGDP), inflation of USA (INFUS) and lending interest rate of USA (LIRUS). Following general specification of theoretical framework was developed by Fedderke (2002) and it was expanded by Vinayagathasan and Priyatharsiny (2017) adopted to examine the above objective.

$$\mathrm{BOP}_t = \delta_0 + \delta_1 \mathrm{CA}_t + \delta_2 \mathrm{ER}_t + \delta_3 \mathrm{INF}_t + \delta_4 \mathrm{LIR}_t + \delta_5 \mathrm{RGDP}_t + \delta_6 \mathrm{INFUS}_t + \delta_7 \mathrm{LIRUS}_t + \varepsilon_t \quad (1)$$

Where, ε_t is the white noise error term. Auto Regressive Distributed Lag (ARDL) co-integration technique developed by Pesaran et al. (2001) was adapted to examines the above equation. Once we confirmed the co-integrating relationship between the variables using bound testing method, then we employed error correction version of ARDL model to examine the short run relationship and long run adjustment between the variables.

Results and Discussion

The both ADF and PP unit root test approaches confirmed that none of the variables are I(2). Akaike information criterion (AIC) suggested that to use ARDL (2, 2, 2, 0, 1, 2, 0, 0) model[1] for this analysis. Our ARDL bound testing model passes the all the diagnostic testing (see Panel B in Table 1 below).

The CUSUM test concludes that the model is stable and result of Wald test suggests that there exist co-integrating relationships between the variables under considered in this study[2]. As expected to the theory and some of the existing studies (Ahmad et al, 2014; Odili, 2014 and Iyoboyi and Muftan, 2014), the ARDL bound testing results found that ER has positive and significant impact on BOP in the long-run. Whereas CA affect positively and significantly on BOP in the long run, which implies that positive and higher balance of CA will bring BOP surplus to domestic economy but RGDP affect negatively and significantly on BOP which implies increasing RGDP encourage to rely on imports more and reduce the export activities because of the feeling of enough income (see Panel A in Table1). The error correction version of ARDL model also passes the all the diagnostic testing (see Panel B in Table 2 below) and the stability test.

[1] The best model was selected from among the top 20 models based on the AIC. However, due to the page constraint, the results are not presented but available upon request.

[2] The results of CUSUM and Wald test are not presented but available upon request

Table 1: The Results of Long run Relationship

Panel A: Long run Coefficients

Cons	CA	ER	INF	LIR	RGDP	INFUS	LIRUS
	0.000001*	7245.0*	−744.2	−71.83	−0.00002*	−660.3	−2294
	(0.001)	(0.0003)	(0.6502)	(0.805)	(0.0003)	(0.8977)	(0.624)

$R^2 = 0.9555$

Panel B: Diagnostics Test

Serial Correlation (LM Test)	Prob. = 0.1125
Normality Test (Jarque-Bera)	Prob. = 0.6371
Heteroscedasticity (BPG Test)	Prob. = 0.8476
Omitted Variable (Ramsey's RESET)	Prob. = 0.8268

Note: Probability values are given in the parenthesis. * Represents the variables are statistically significant at 5 % level of significance respectively.

CA, ER and LIRUS in current values have a positive impact on BOP and CA in lag 2, ER in lag 1, LIR in current and RGDP in current, lag 1 and 2 affect BOP negatively in the short run (see Panel A in Table 2). As expected, the coefficient of ECT is significant and negative implies that the dependent variable can get back to long run steady state line at the speed of 99.2 % in each year one period after the exogenous shocks.

Table 2: The Results of ECM-ARDL (3, 4, 4, 4, 1, 4) Model

Panel A: Short run Coefficients			
Variables	Lag order		
	0	1	2
ΔBOP		-0.721 (0.1729)	1.489 ** (0.0000)
ΔCA	0.00000038 ** (0.0049)	-0.0000003 (0.5154)	-0.000002** (0.0000)
ΔER	7198.1** (0.0270)	-6008.9 ** (0.0157)	3336.8 (0.1454)
ΔINF	-446.6 (0.7154)		
ΔLIR	-14926.9 ** (0.0141)	4628.4 (0.3038)	
ΔRGDP	-0.00004 ** (0.0026)	-0.00006 ** (0.0001)	-0.00002* (0.0597)
ΔINFUS	-16777.8 (0.1158)		
ΔLIRUS	15099.4 * (0.0618)		
ECT(-1)	-0.9919** (0.0209)		
R^2	0.96799		
$F-$Stat	28.46234 (0.0000)		
Panel B: Diagnostics Test			
Serial Correlation [LM Test: $\chi^2_{(df)}$]			Prob. $= 0.0952$
Normality Test (Jarque-Bera)			Prob. $= 0.5004$
Heteroscedasticity (BPG Test)			Prob. $= 0.8320$
Omitted Variable (Ramsey's RESET)			Prob. $= 0.9022$

Note: Probability values are given in the parenthesis. *, ** represents the variables are statistically significant at 10 % and 5 % level of significance respectively.

Conclusion and Policy Implications

The both co-integration bound testing approach and the error correction version of ARDL model passes the all the diagnostic test and the stability test. Our results of Wald test imply that long-run (LR) co-integrating relationship exists between the variables. ER has positive and significant impact on BOP in the short run (current value) as well as in the LR while GDP has a negative and significant impact on BOP in the short run (current, lagged 1 and 2) as well as in the LR (It

followed the results of Ahmad et al, 2014; Odili, 2014 and Iyoboyi and Muftan, 2014). Further this model confirms that dependent variable can get back to long run steady state line at the speed of 99.2 % in each year one period after the exogenous shocks. In sum, this study confirms that the exchange rate depreciation improves the BOP (reduce the BOP deficit) of Sri Lanka. Sri Lanka relies on the exchange rate depreciation it can reduce the crisis of expanding BOP deficit. In sum, this study confirms that the exchange rate depreciation improves the BOP (surplus) of Sri Lanka. Sri Lanka relies on the exchange rate depreciation it can reduce the crisis of expanding BOP deficit.

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Link Between Admission Standards and Student Undergraduate Performance at the Faculty of Arts of Sri Lankan Public Universities

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Keywords: *Education-production-functions, Students' ability, Enemployment*

Introduction

Sri Lanka's Arts graduates have the lowest employment rate among graduates of the Sri Lankan (public) higher education system (Graduand employability census, 2012) and the problem of unemployment among Arts graduates has been persisting for the past few decades and has been the subject of much debate. The issue has been examined through the perspectives of students, the university system, and the private sector and government (as potential employers). Many studies point to structural unemployment, as the cause of the issue. A tendency on the part of the government to resolve the issue by hiring arts graduates is said to have led to more problems such as under-employment and relatively low salaries. Therefore, current solutions look to the private sector and require graduates to make themselves more 'employable' by acquiring skills required by the private sector, such as I.C.T and English language skills (Ariyawansa, 2011).

In the neo-classical model of human capital, engaging in education is seen as a form of investment in human capital where benefits accrue in the long term, in the form of higher earnings. Furthermore, the neo-classical human capital model elaborates that, irrespective of investments in human capital, different levels of innate ability of

individuals will be translated into different levels of productivity at the work place. Here ability is defined in relation to the demands of employment and therefore could mean physical strength or intellectual capabilities. Alternatively, there is also the idea that education performs a signaling function (Arrow, 1973), where educational attainment of prospective candidates may not necessarily have a direct relationship to productivity, but nevertheless acts as a signal of ability to interested employers. Accordingly, employers will therefore use education as a screening device as they believe it reflects innate ability.

Hanushek (1995) builds on the idea of education production functions which is similar to a (physical) production function relating inputs to outputs. Hence an education production function shows that student outcomes – schooling attainment (usually measured as years of schooling) or schooling achievement (reflected in a score in a standardized test or examination), depends on a multitude of input factors that affect student learning. A study by Harmon et al. (2011) with regard to the Irish tertiary education system, analyzes the relationship between socio-economic status and student outcomes at university level. The study analyses student outcomes (performance in their degree program) as a function of parental socio-economic status, prior educational attainment, characteristics of the institution and course attended and characteristics of the student (gender, age, personality measures, etc).

Recent studies in education, particularly by James Heckman, indicate that a variety of outcomes are determined not just by years of schooling, but also by cognitive and non-cognitive skills (Heckman et al. 2006). The latter include not just technical skills or "employability" skills like English and Information Technology, but also socioemotional skills sometimes known as personality traits. Kautz et al. (2014) argue that these are malleable, and therefore should be considered skills that can be acquired rather than traits that cannot be changed.

We argue, that the (low) initial (entry level) ability of arts/humanities undergraduates is a significant constraint in ensuring high performance outcomes at university level, leading to a problem where the majority of students are not competent enough to secure themselves jobs (especially in the private sector) upon leaving the university. We follow Harmon et al.'s (2011) approach, to explore the link between initial ability of students' (at the point of entering the faculty of arts), their socio-economic status, and their outcomes of academic achievement. We include in the analysis the effect of personality traits, also known as non-cognitive skills, on student outcomes. The results of this study provide an indication of whether the faculties of Arts of Sri Lankan universities (as proxied by the University of Peradeniya) are absorbing the right input to ensure an output of a higher quality – an employable graduate.

Objectives

The primary objective of this study is to identify the nature of the relationship between the GPA (outcome) and the Z – Score received at A/L as a measure of initial ability. Secondary objectives included, identifying the effect of the socioeconomic background of a student on performance at university level and ascertaining the impact of socioemotional skills or personality traits on academic performance of a student.

Methodology

The model is a form of an education production function. The left-hand side variable is student outcome and the right-hand side variables are student inputs. Variable definitions are provided in Table 1.
Student outcome = f (Entry requirement, S.E.S, Personality traits)

$$CGPAi = \alpha + \beta(Zi) + \theta(MNYEi) + \chi(FNYEi) + \mathrm{Ч}(GGY) + \varphi(SOC) + \lambda(Oi) + \gamma(Ci) + \rho(Ei) + \kappa(Ai) + \omega(Ni) + \varepsilon i \quad (1)$$

Table 1: Definitions of Variables

Variable	Definition	Variable	Definition
CGPA	Current grade point average	C	Conscientiousness
Z	Z-score	E	Extraversion
MNYE	Mother's no: of years of education	A	Agreeableness
FNYE	Father's no: of years of education	N	Neuroticism
GGY	Dummy variable for geography students	E	Error term
SOC	Dummy variable for sociology students	α ,β, θ, χ, ϰ, φ, ϫ, ϭ,	Estimates of
O	Openness	λ, γ, ρ, κ, ω	parameters

Here the student outcome is the current grade point average of a student, which is dependent on, the entry requirement - the Z-score, the number of years of education of the father and mother (included as two separate variables) is used as a proxy for a students' socio-economic status and the personality test scores of the big five personality traits. The scores were computed and standardized to facilitate comparison. Additionally dummy variables for the area of specialization were included as well.

Primary data was obtained from 60 students specializing in the areas of Economics, Geography and Sociology from the Faculty of Arts University of Peradeniya, through a questionnaire designed for the purpose of the study, which collected information on the variables listed in Table 1. Measures of socioemotional skills were obtained from questions based on the survey instrument of the STEP Skills Measurement Surveys – World Bank (2014). Students were selected using a random stratified sampling method, where subject specializations formed the strata. Sub-samples of students were randomly selected where class lists provided the complete listing of all students within the strata.

Results and Discussion

The results show that Z-score is significant at 10 % level of confidence, father's number of years of education is significant at 1%, dummy variable for Geography is significant at 0.1%, personality traits of conscientiousness and agreeableness both are significant at 5% level of confidence. A change in the Z-score of a student by one point has a positive effect of 0.242 points on the CGPA, which is equivalent to 80 % of the interval between letter grades including + or – (for example, a B is 3.0 while B+ is 3.3) while an increase in the father's number of years of education by one year increases the CGPA by 0.0312 points.

The performance of a student specializing in Geography is 0.354 points less than of a student specializing in Economics. The performance of students specializing in Sociology and Geography are a class (second upper vs. second lower) below the performance of students specializing in Economics. For example the average Z-score of a student specializing in Geography is 1.72 and their average CGPA is 3.11 vs. the average Z-score of a student specializing in Economics is 1.76 and their average GPA is 3.48). Therefore it can be said that there is a tendency for students to be segregated into departments according to initial ability, where some departments absorb more able students than others. This may be a point of concern as a lack of distribution of students according to ability among the fields of specialization may mean that there is a chance of graduates specializing in a particular field being prone to unemployment than others. This may also be reflected in the claim that some programs within arts faculties lack quality.

Additionally, Conscientiousness has a negative effect on performance where a student who is more conscientious will lose 0.0888 points for having such a disposition while agreeableness is rewarded by the addition of 0.0737 points into their CGPA. Conscientiousness is defined as "the tendency to be organized, responsible, and hardworking" the fact that not only are hard-working students not rewarded but that

they are penalized, as pointed out by the regression analysis should be a point of concern.

It is observed that the Z-score cut off point for the Arts stream fluctuated around 1.3 points for decades. This was the case till 2014, when the cut-off point for the Faculty of Arts of the University of Colombo, started to pick up and stood at 1.7 in 2015. A similar development can be observed for the University of Peradeniya (1.6) in 2015 as well. There are signs of other universities following this trend (Sri Jayawardanapura 1.5) but as of now the cut-off point to enter the arts faculty of most other universities lies between 1.1-1.3. Given the results of this study a continuation of this trend of advancing of the standard is a welcome development. Furthermore, raising the quality of education received by school level students may contribute in producing more competent students. Drawing from the neo-classical model of human capital, it can be deduced that better learned parents are also higher earners (investment in human capital is made with the aim of maximizing life time earnings potential). Therefore, the results also imply that children of richer parents perform better.

Conclusion and Policy Implications

The Z-score cut-off point depicts the average performance of the cohorts of students entering into different universities. Currently, there is a large variation in the Z-scores (cut-off points) of students entering into the Arts Faculties of the public universities. Thus, when considering the policy implications of this study, given the positive relationship between the two variables, it is advisable to take steps to reduce the large variation in the standard of admittance into the Faculty of Arts, by raising the standard up to a common higher standard acceptable by all universities.

The current variation in the cut-off points of Z score maybe attributed to the variation in quality between degree programs offered by universities. Thus steps need to be taken to reduce the drastic difference in the acceptable standards between universities by standardizing

degree programs. Also, raising the standard of admittance cannot be done exogenously; artificially setting a higher standard will not be beneficial to either the universities or the students. What is needed is an endogenous increase in the standard of performance of students engaging in education through the arts stream at the school level (Advanced Level class).The results of the study also indicate a positive relationship between parental educational achievement and the child's performance.

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Identifying the Factors Affecting the Growth of Small Scale Manufacturing Industries in Sri Lanka: A Case Study in Kuliyapitiya DS division

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***Keywords**: Manufacturing Sector; Growth; Regression Model*

Introduction

At the economic development, process economist has commonly considered that industrial sector has been a leading sector in the economy. Because industrial sector provides the main contribution to economic development process through produces goods and services, value addition for agriculture products, foreign exchange earnings by export, increase in employment, etc. Sri Lanka as a low middle-income country, the manufacturing sector is a primary component within the industrial sector. According to the Central Bank report in 2016 manufacturing sector contributed 15.2 % of GDP in Sri Lanka. At the same time, many official economic and social reports provide evidence that small and medium scale industries have been providing major proportion from above contribution. Therefore it is important to keep considerable attention on small and medium scale industry in Sri Lanka to achieve economic development goal.

There are many academic works which examine about the growth of SMEs internationally. Afande (2015) identified that access to credit, firm age and level of education of firm's owner effect positively and significantly on the growth of small-scale manufacturing industry. According to the Yasuda (2005) investigates the relationship between firm's growth and size of the firm, firm's age and firm's behavior in Japanese manufacturing firms. And also Pherson (1994) identified the

negative relationship between firm's growth and firm's age. Heshmati (2001) examined the relationship between the size, age and growth rate of firms is for a large sample of micro and small firms in Sweden. However, while concentrating on local studies, Dayarathna-Banda and Sri-Ranjith (2014) examined the relationship between characteristics of entrepreneur and success of small business. Varothayan (2013) examined six factors namely financial, management, marketing, technology, infrastructure and government regulation that influence the performance of SMEs. Lingesiya (2012) studied the factors which to indicate the business performance of small-scale industries. In this study he identified that customer satisfaction with managing change, growth at business and income level, growth in profitability, growth in turnover, growth in a number of employees are the main indicators of the business's growth.

Performance of small-scale industries, the growth of industry and performance of industry are completely different concepts. When we referred Sri Lanka's research works on small-scale manufacturing industry, there is a lack of studies in the area growth of small-scale manufacturing industry. Therefore, the purpose of this study is to examine the growth of small-scale manufacturing industries.

Objectives

The objectives of this study are to identify the growth of small-scale manufacturing industry in Sri Lanka and to examine impact of access to credit, firm's age, level of education of firm's owner, gender of firm's owner, vocational training of firm's owner and technology applied in firm on growth of small-scale manufacturing industry.

Methodology

According to the research objectives, we used both primary and secondary data for the analysis of this study. The primary data were collected through questionnaire. The primary data was gathered in this study using a sample of 60 small-scale manufacturing firms selected

through random sampling method in kuliyapitiya DS division. The secondary data was extracted from annual reports of the Central Bank of Sri Lanka and registries in kuliyapitiya DS division office. The study applied a multiple regression model using OLS techniques. I have developed my model based on Afande (2015). The model is given below.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 D_{1i} + \beta_5 D_{2i} + \beta_6 D_{3i} + u_i$$

Where u is the random error term.

We considered firm growth (Y), access to credit (X_1), firm's age (X_2), level of education of firm's owner (X_3), dummy variables were used for gender of firm's owner (D_1), vocational training of firm's owner (D_2), technology applied in firm (D_3) there, D_1 takes the value 1 if firm's owner is male, 0 if firm's owner is female, and D_2 takes the value 1 if firm's owner received vocational training, 0 otherwise and D_3 takes the value 1 if firm used new technology, 0 otherwise.

Results and Discussion

According to the survey, the firm profit was used to measure the growth of small-scale manufacturing industry. In order to measure the growth rate, we used firm profit both of 2014 and 2015 years. We categorized them according to the growth rate. That results are depicted in Figure 1.

According to the result in Figure 1, all firms have maintained considerable growth rate. Most of the firms in the sample obtained between 10 %-15 % growth rate at considering the time period. However, some firms obtained 35 % level growth rate but some firms obtained 5 % growth rate.

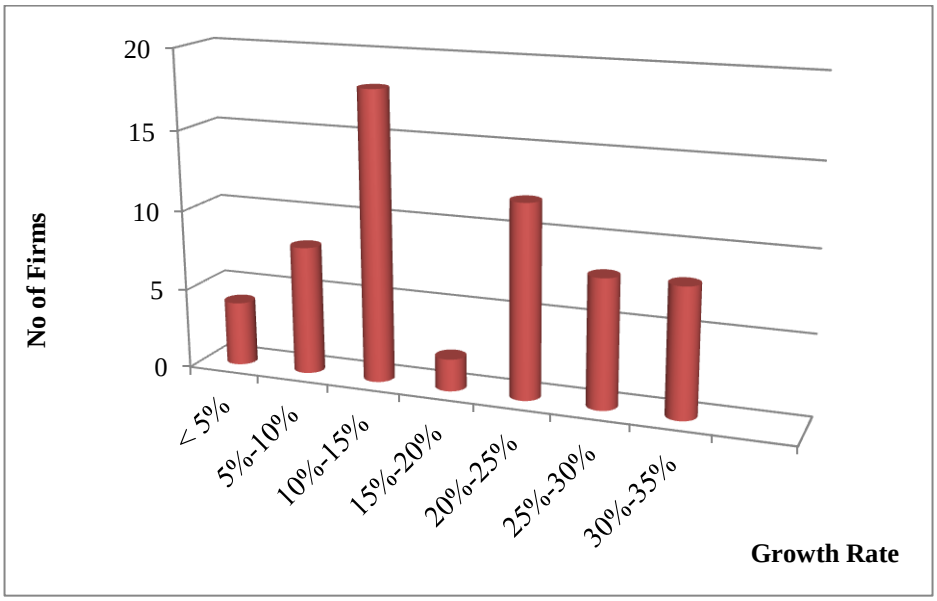

Figure 1: Results of Growth of Firms

To estimate above-mentioned multiple regression 60 observations were employed. The estimates show that overall multiple regression model is significant at 5 % confidence level and the overall fitness as the R^2 value is equal to 0.7279, It indicates that the independent variables used to explain about 73 % variation in growth of the small-scale manufacturing industries in the sample. The results show that there is a significant positive relationship between access to credit and growth of Small scale industries. It implies that provision of credit facilities effect to increase the growth of these firms. However, evidence showed that 50 % of small-scale industries did not use credit due to many reasons such as ignorance, dislike, institutional problems and so on. It was also identified short-term (2 or 3 days) repayments loans between some small-scale businessmen and suppliers of inputs and purchases. This has been a powerful factor for each of them.

Table 1: Results of Multiple Regression Model

Variable	Coefficients
Credit	0.00002***
	(2.90)
Firm age	0.2889
	(1.26)
Edu. year	0.0408
	(0.10)
Gender	5.3658**
	(2.01)
Training	5.1458**
	(2.56)
Technology	7.4214**
	(1.09)
cons	3.0416
	(1.09)
R-squared	0.7279
Adj R-squared	0.6971

Note : *** is 1 % and ** is 5 % significant level

According to results, it shows that gender of firm's owner positively significant at 5 % level. Further evidence shows that male-owned 80 % of Small scale industries in the sample. It may happen due to nature of small-scale industries in this area. The vocational training of firm's owner is positively significant at 5 % level. According to farm's owners, few of them received specific training from government and non-government organizations. It helps them to improve both quality and quantity of particular products. Especially it improved their compatibility with homogeneity products. According to the literature review, it shows that adoption of new technology helps to increase labor productivity of small-scale industries. Further increase of labor productivity makes surplus which helps to the capital accumulation of this sector. the results of this study show that the technology applied in the firm is positively significant at 5 % level. Even though modern technology improves productivity and increased the profit of small-scale industries in the area, more than 57 % of firms have used

traditional technology for their production activities. It was also found that firm age and level of education of firm's owner displayed positive relationship but not significantly. Majority of firm's owners passed GCE (O/L) or (A/L) level but it does not help them to increase the growth of firms. These kinds of education systems will not provide vocational training, which will help to improve the productivity of a firm.

Conclusion and Policy Implications

Small-scale manufacturing industries face working capital difficulties to conduct their business. They seek to obtain loans as a solution to the capital shortfall. But only 50 percent of the sample has obtained credit from the formal sector. They obtain a short-term loan from private sector especially input suppliers and businessmen. This situation may affect negatively to their profit and growth of small-scale industries. Therefore, credit facilities under a low-interest rate from the formal sector could make a positive impact on the growth of small-scale industries. Therefore, government and formal private sector credit institutions have a significant role to develop small-scale industries in the rural areas.

According to the study results, male-owned small-scale industries have relatively higher growth rate compared to female-owned ones. Further small-scale industries that were included in this sample characteristically non-female owned industries. It implies that unutilized female entrepreneurs in the rural sector and need to introduce suitable industries with necessary guidelines and training.

The study was revealed that the owners of small-scale manufacturing industries were given vocational training in their business activities and these training programs positively effect on the growth of the industry. The study is recognized that most of the small-scale entrepreneurs who included in the sample have been conducting their production activities using their own experiences, which they learned from parents or their inborn abilities. It is important government and non-government

agencies intervention to facilitate formal training and consultancy programmers for small-scale producers, which is positively impact on the growth of these industries.

According to the result, most of the small-scale industries in the sample use traditional technology. That technology is a labor-intensive manufacturing process. Further, it was observed that according to the nature of these industries they compel to use conventional technology. However, in comparison with conventional technology, the industries which use modern technology have been able to produce higher amount within the particular time period and higher quality products. Therefore, the introduction of suitable and practical new technology related with these small-scale industries will help to improve productivity and increased the profit of small-scale industries in the area.

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Dengue - Identifying the Disease Pattern in Sri Lanka

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Keywords: *Dengue fever, Disease pattern, Population density*

Introduction

Dengue is a vector borne arbo viral disease and it is transmitted by two mosquito species namely *Aedes aegyptii* and *Aedes albopictus*. Dengue virus is named as DENV and it belongs to the *genus flavivirus* in *family flaviviridae.* It has 4 antigenically different serotypes, DENV1, DENV2, DENV3, and DENV4. Infection with a single DENV serotype leads to long-term immunity against that particular serotype, however, not against the other serotypes. Therefore, prior infection with a single serotype of DENV only provides a homotypic protection (Sirisena 2013).

All serotypes of DENV have been seen in Sri Lanka for more than five decades and their distribution has not changed significantly in the last 30 years. Although the Sri Lankan population had been exposed to DENV for a long time, the severe forms of DENV infection (DHF and dengue shock syndrome (DSS)) were very rare before 1989. There was an island-wide epidemic of DF associated with DENV serotypes 1 and 2 from 1965 to 1968. This epidemic caused 51 DHF cases and 15 deaths.5 DENV-1 and DENV-2 were isolated from the outbreaks in 1965 and 1966 (Sirisena 2013).

The disease is seen in tropical countries and the burden of disease has increased by 30-fold over the past 50 years (Ebi 2016). By 2017, this is the most concerned public health issue in Sri Lanka. The reported numbers of cases have increased gradually and the increment is

840.5 % since 2002 through 2016. There are various numbers of reasons for this including urbanization, climate change, and poor waste management. 57 years have passed since Sri Lanka started to experience Dengue but 2017 is the year that recorded the highest numbers of patients and it's only for 6 months.

Numbers of studies have already been undertaken to investigate the various aspects of the link between climate change and the spread of dengue fever in different countries Rigau-Perez et al. (1998) observed that high humidity is favorable for increased dengue disease transmission, hatching and activities of mosquito vectors. According to findings of Tun - Lin et al. (2000) development rates of Aedes aegpti eggs, larvae, pupae, increased with increased temperature. Their findings are similar to observations of Rueda et al. (1990). Cyclical nature and seasonal increase of dengue disease was studied Reiter (2001) and he found a condition between climatic changes and disease occurrence. It is clear that dengue transmission is influenced by several factors related to households, individual and environmental. Similar findings were made by Hoeck et al. (2003) who observed that monsoon rains in neighborhood areas increased the population of mosquitoes. According to Sukri et al. (2003) as well as Wilder - Smith and Gubler (2008) ideal conditions for dengue fever transmission were stated to be enhanced by high population density of both humans and mosquitoes. While Siqueira-Junior et al. (2008) reported that spatial distribution of dengue cases depended on the community status of individuals, additional factors such as demographic density, population motility and sanitation contributed to the spread of mosquitoes and dengue incidence.

The above review of the previous studies shows that these studies have only provided limited information on the disease pattern. Accordingly, it is obvious that more conceptual and theoretical work is needed to develop a better understanding of this field.

Objectives

The objective of this study is to analyze the seasonal pattern of Dengue in Sri Lanka. There are numbers of diseases which show seasonal pattern ranging from childhood diseases such as measles, chicken pox and faeco-oral infections to vector-borne diseases such as Leptospirosis and Dengue (Grassly et al. 2006). Only a few numbers of research papers could be found on this subject. Therefore, it is important to study the epidemiological dynamics of a disease in terms of planning control strategies.

Methodology

Nationally accepted data on reported dengue cases and population were used as secondary data in this study. As far as the data on Dengue reported cases are concerned, monthly as well as biweekly reported numbers were used and they were categorized based on districts and MOH (Medical Officer of Health) areas. The data were analyzed using Excel to evaluate the spatial distribution and the relationship with population variables. Various charts and graphs are used to describe the relationships between variables as well as the disease prevalence across the year and districts.

This study used two type of data. They are reported dengue cases and population data. The data on reported dengue cases used in this article were retrieved from the information published by the Epidemiology unit of Sri Lanka ministry of health. Those are freely available in their official website(www.epid.gov.lk). Population data which are used while preparing this article were taken from the official website of the Department of census and statistics of Sri Lanka (www.statistics.gov.lk). The data on reported dengue cases from January 2002 to June 2017 were used to analyse of this study.

Results and Discussion

Dengue fever is an infectious tropical disease caused by the dengue virus and it is transmitted by several species of mosquito that breed under different climate situations(Athukorala, 2016). Infection with a different type increases the risk and there is no available vaccine, to prevention reducing the habitat and the number of mosquitoes and limiting exposure to bites. According to the WHO report (2012) approximately 2.5 billion people, two fifths of the world's population is now at risk from dengue and estimates that there may be 50 million cases of dengue infection worldwide every year. The disease is now endemic in more than 100 countries.

As far as the reported dengue cases since 2002 in Sri Lanka are concerned, it is noteworthy that there is an increasing trend over the time. There were 8,931 cases in 2002 and it was increased up to 55,150 by 2016. The difference is 46,219 and it was 517.5 % increment. More steep increment is observed in 2009 and it was 35,095 cases island's cumulative. The dengue cases were increased by 20,055 and the increment is 57.14 % from 2009 to 2016. More intensive increment can be observed from 2009 to 2016 and more in 2017 making cumulative cases 83,997 only till June.

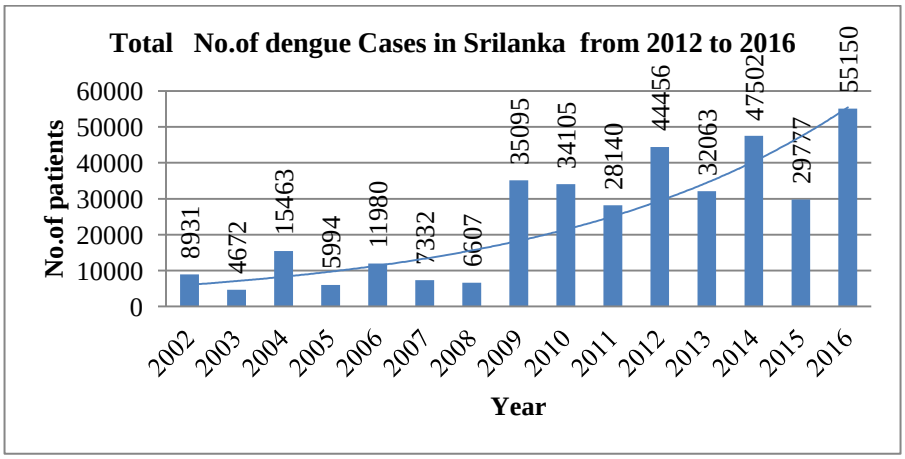

Figure 1: Reported Dengue cases in Sri Lanka 2012 - 2016

There is distinctive pattern of dengue disease throughout the year. This is generally equal in almost every year. There are two dengue case peaks in a year while no zero case months. One peak is in June/ July while other peak is in December/ January. This characteristic “W" pattern is evidenced in every year from 2012 and this is clearly seen in monthly average of dengue cases in Sri Lanka. The height of the peaks is becoming increased over the years. Usually the middle year peak is higher than the early/end year peak but this pattern was differed in 2013 and 2015 making the early/end year peak higher. There is a slight difference of peak month between months in district level case analysis. But the general pattern can be observed in almost all districts.

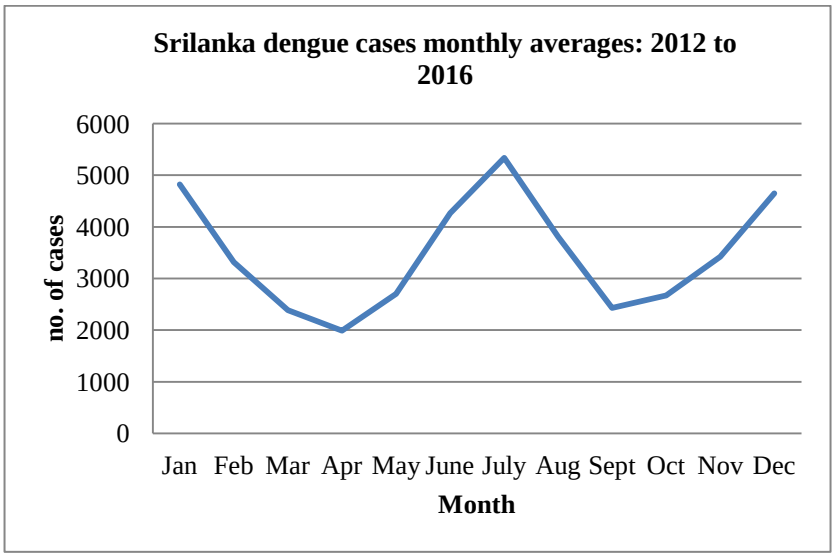

Figure 2: Distinctive **W** pattern: 2012 to 2016

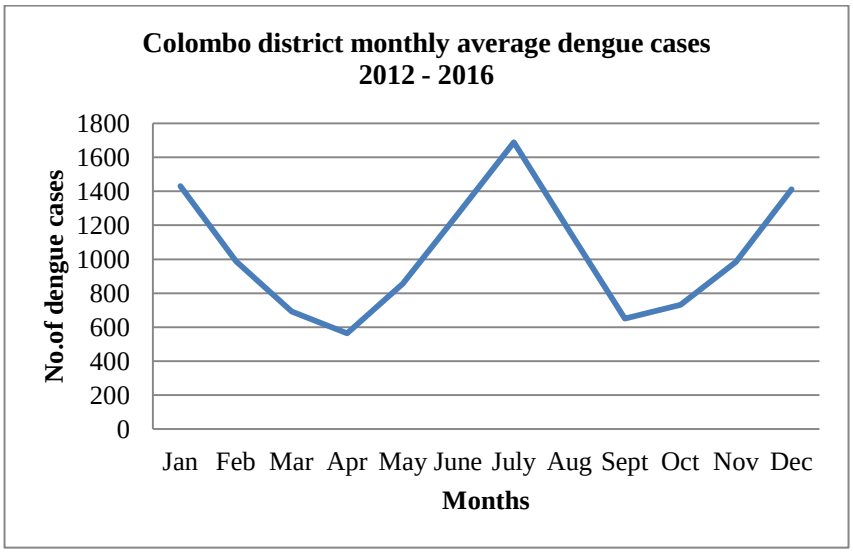

Figure 3: Monthly average dengue cases from 2012 to 2016 in Colombo district.

The cause for this phenomenon might include several factors including climate change and the virulence of the causative agent. More researches are needed to solve this problem. There is a strong relationship between cumulative dengue cases and population density in district level analysis. Every year, Colombo district records the highest numbers of cases and it has a population density of 3330 people's per km^2 in 2001 census which is the highest of the island. Interestingly this trend can be observed in every district.

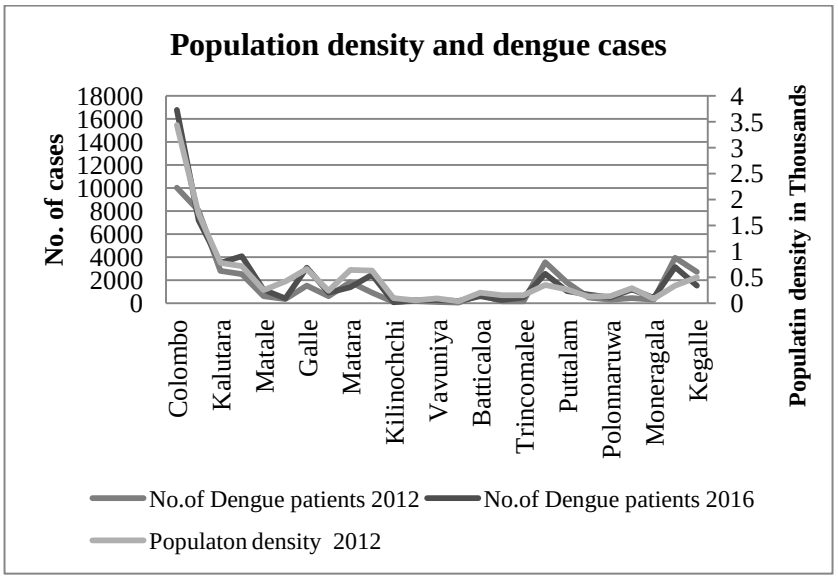

Figure 4: The relationship between population density and the prevalence of dengue cases in district level

Conclusion and Policy Implications

Dengue represented a significant economic burden on the communities. It can result in loss of lives, considerable expenses to the family for the hospitalization and care of the patient, in addition to travel costs, loss of work among patients and their career, considerable expenses to ministry of health and local government authorities for mosquito control activities and disruption of health care services and economics, including loss of tourism revenue. Government in Sri Lanka allocate over Rs. 300 million as the direct cost of control measures for dengue in each year.

Dengue has a distinctive disease pattern over the time. This is similar in almost every year. Characteristic " W " pattern is observed with two peaks. There is a strong relationship between dengue numbers of cases and population density in district level. Reason for these characteristics should be analyzed furthermore and more research are needed.

According to the result of this study it is clear that the selection of high risk areas for dengue transmission should be based on population density rather than the reported numbers of cases. A threshold value should be assigned in terms of risk area selection and it will be helpful in dengue prevention programs. The threshold values can be decided up to Divisional secretariat level and it needs more expertise researches.

A study of this nature helps develop a program for changing peoples' behavior with the changes of climate in any country while minimizing the social cost of climate change. The overall findings of this research will help implement policies to reduce spread of dengue related diseases that is increasingly posing a major challenge in the health sector in the country. The results of the study will provide an opportunity to make necessary policies that provide incentives to reduce of spreading dengue related diseases at the household and district level which generate regional as well as global benefits in the future.

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Trends in Non- Communicable Diseases in Sri Lanka

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Keywords: *Non-communicable disease, Demographic transition, changing life styles*

Introduction

In general there are two types of diseases, communicable diseases (CD) and non communicable diseases (NCD). Communicable diseases are diseases which spread by organisms, like bacteria, viruses, fungi and spirochetes (Athukorala, 2016). Some examples for CDs are Malaria, Dengue, Cholera, Tuberculosis, Encephalitis and Urinary tract infections. NCDs are the diseases which do not spread by organisms and occur due to some imbalance or activity problems in human physiology or anatomy. Some examples for NCDs are Chronic Heart Diseases, Diabetes Mellitus (DM), Hypertension and Bronchial Asthma. Among these NCDs, DM is a common and a problematic condition for the humankind. DM can go unnoticed and undiagnosed for years. It can lead to serious complications and even to death. Examples for some complications are; Coronary Heart Diseases and strokes, Diabetic Retinopathy, Diabetic Neuropathy and Renal Failure.

Non-Communicable-Diseases (NCD) is a medical condition or disease which is non- infectious (Athukorala, 2016). The prominent characters of these diseases are long duration and slow progression. Diabetes, Hypertension, Heart disease (Ischemic heart disease and Myocardial infarction), Stroke (Cerebro-vascular accidents), Neoplasms, Dyslipidaemia, Chronic kidney disease, chronic respiratory conditions are the key conditions in NCD. All these conditions require long term

management. World Health Organization declares NCDs possess the highest mortality rate among all other diseases globally which is equally applicable to Sri Lankan context. Nearly one in five people die prematurely due to NCDs (World Bank 2011).

There are a list of risk factors for NCDs in which majority of them are modifiable. Low physical activity, stress, bad food habits, use of alcohol and smoking, are among them. NCD's are easily preventable by changing sedentary life style and food habits as well as by cessation of smoking and alcohol use. According to the new report (WHO and World Bank) the NCDs have already become the largest disease burden (85 % ill health and premature death) in Sri Lanka. As per the available statistics, it shows that considerable proportion of population is suffering from these diseases. This might affect badly for their livelihoods as well as Sri Lankan economy.

National Sleep Foundation has carried out a survey in America in 2003. They have revealed that 83 % of the respondents reported one or more of 11 medical conditions such as depression, heart disease, bodily pain and memory problems were associated with more prevalent symptoms of insomnia. Other conditions such as obesity, arthritis, diabetes, lung diseases, stroke and osteoporosis were associated with other sleep-related problems such as breathing pauses, snoring, daytime sleepiness, restless legs or insufficient sleep (<6 h nightly). The Department of Census and Statistics has conducted a similar survey in 2014 namely National Survey on self-reported health.

Objectives

This study investigates the recent trends of chronic non-communicable diseases in Sri Lanka. It is clear that cchoices and decisions about today's healthcare environment is extremely complicated as increasing health care costs; limits on health care resources, changing reimbursement patterns and debate over the effectiveness of health care treatments. Therefore, a study of this nature helps to develop a program which enables to minimize increasing trend of NCD in Sri Lanka.

Methodology

In this article, we referred nationally available and reliable data from the Department of Census and Statistics of Sri Lanka. In addition annual Health Bulletins of Department of Health of Sri Lanka which are published annually were used to gather data on NCDs mainly on Diabetes, Hypertension, Heart diseases and Neoplasms (cancers). We have also conducted informal interviews with key informants in Health Planning Unit at the Ministry and Provincial Health Offices to gather information. The data gathered were analysed as per the impact on environmental, economically and socially. Finally, the root causes were identified and suggested solutions to reduce the number of cases reported in NCDs discussed here

Results and Discussions

Each year, non-communicable diseases (NCDs) cause more than 36 million deaths worldwide, representing around 63 per cent of all mortality. Four categories of NCDs are responsible for more than 80 percent of NCD deaths globally: cardiovascular diseases, cancers, diabetes and chronic respiratory diseases(United Nation Report,2012). The burden of non-communicable diseases (NCDs) is increasing in Sri Lanka largely due to prevalence of various risk factors, which can be controlled.

According to the United Nations Report on NCD(2012) as populations age, NCDs cause a growing proportion of all deaths. Rapid reductions in fertility combined with improvements in survival lead to population ageing, wherein an increasing proportion of the population is concentrated among older age groups (United Nations Report, 2012). Because susceptibility to NCDs increases with age, populations with older age structures tend to experience a greater share of deaths due to NCDs compared to populations with very young age structures where communicable diseases such as pneumonia and diarrhoeal diseases disproportionately affect children and produce a large burden of mortality (United Nations Report, 2012). Therefore, trend of the age

structure of Sri Lanka were analyzed first in this study and it is given in Table 1.

Table 1: Percentage distribution by population by age group

	Age 6-14	Age 15-59	Age 60 and above
1911	40.9	54.8	4.4
1946	37.9	57.4	5.4
1971	39	54.7	6.3
1981	35.2	58.2	6.6
2001	26.3	64.5	9.2
2012	25.2	62.4	12.2
2015	25.2	62.4	12.4

Source: Department of Census and Statistics in Sri Lanka

By observing above figures, in 1911, the percentage of child population was 40.9 while percentage of elderly population was 4.4. In 2015 the percentage of child population was 25.2 and percentage of elderly population was 12.4 which shows three fold increment. It is evidenced that the elderly population is increasing gradually and the proportion of youngsters is decreasing in the country. Differences in population age structure mask the disproportionately high risks of NCD mortality experienced in the developing regions. Exposures to risk factors that accumulate over the life course such as tobacco use, unhealthy diets, physical inactivity and harmful use of alcohol of elder group which is likely to be higher can increase the risk of morbidity and mortality due to NCDs in this group.

Table 2: Life expectancy at birth in Sri Lanka

	Male	Female
1920-1922	32.7	30.7
1945-1947	46.8	44.7
1955	57,6	55.5
1962-1964	63.3	63.7
1970-1972	64.2	66.7
1980-1982	67.2	72.9
2001-2002	68.8	76.2
2011-2013	72.0	78.6

Source: Department of Census and Statistics in Sri Lanka

These figures indicate gradual increase in life expectancy at birth since 1920 to 2013. This is mainly because development of quality of health care service as well as the increasing literacy of the people in the country. This shows significant high figure of female life expectancy than men. Increasing life expectancy and good health services of country in turn has an impact on increasing elderly population in Sri Lanka (Demographic transition). As NCDs are common among elderly population this has a great impact on trends in non-communicable diseases.

Table 3: Trends in hospitalisation of selected non-communicable diseases 2005-2014 (No of hospitalisation per 100,000 population)

	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014
Diabetes	231	246	265	296	307	296	343	357	411	394
Isch. heart disease	341	336	353	399	427	423	450	478	494	506
Hypertensive disease	444	413	429	480	469	466	438	476	486	489
Neoplasm	301	282	289	329	359	368	403	470	492	484

Source: Annual health bulletin Sri Lanka -2015

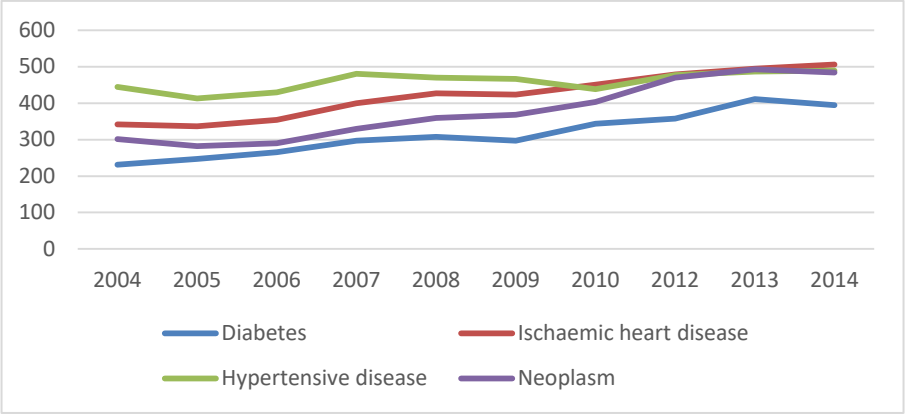

Figure 1: Trends in hospitalisation –Several NCDs.

This shows gradual increasing pattern of NCDs in the country. Almost all the NCDs has an increasing trend over the time. Out of those, neoplasm (cancers) is increasing in a higher rate. It affects the person itself his family, society and country's economy in several ways. Initially someone who affected by the NCDs has to spend his money for treatment investigations and other interventions (out of the pocket expenditure). And inability to attend their work it affects the individual income too. It directly affects to their families drastically, where the skilled manpower withdrawal from work force in the country affecting productivity (Value of lost productivity due to illness or premature mortality or indirect medical costs). Relatively young people who are directly contribute to development are most susceptible for NCDs. NCDs will increase the fiscal costs of pensions NCDs will increase the costs of long term care of affected individuals (Direct non-medical costs).

The Government has to increase the allocation of funds for health sector annually. This causes increasing the direct and indirect taxes on the society. As Sri Lankan society mainly depend on government health facilities government has to spend a considerable amount of money for treatment as well as rehabilitation of the affected individuals. And also unwanted medicines spread throughout the medical market and addition

of continues usage of medicine and treatments affect all aspects of the society including the social stability, productivity, social capital, investments on other income generating activities, social & cultural activities, education, knowledge sharing as well as losing of foreign exchange.

Conclusion and Policy Implications

According to the Department of Census and Statistics of Sri Lank, the current population of the country is nearly 2.1 million. During the period of 1981 and 2014, the age composition shows a drastically change. The population below 15 years of age has decreased by 10 percent and population aged 60 years of age and above has increased by 5.8 percent. Accordingly, the population of Sri Lanka seems to be gradually shifting to an aging population. The life expectancy for both male and females in Sri Lanka has been increased during past few decades. Increasing life expectancy as well as shifting to aging population has an impact on increasing number of incidents of chronic non-communicable diseases among the population in Sri Lanka. The older population often gets diseases which are more chronic and costly to cure. As a result, our country faces high health care costs to face this problem. The identified main risk factors are obesity, smoking, high sugar and salty diets and alcoholism. This problem will further rise in future due to further aging of the population resulting doubling of the population over the age of 65 years within next thirty years (World bank report 2015).

Reducing risk factors Tobacco usage and excessive alcohol usage, active life style and improved healthy diet will go for a long way towards healthy life. More effective legislation on the use of tobacco, alcohol and Trans-fat and public education to reduce salt intake would help delay the onset of this diseases. Especially healthy life style clinics all over the country launched a screening and awareness programme to those vulnerable groups. It is very successful. Well-women clinics which are conducted throughout the country do the screening of common cancers of females. These activities are done by national NCD

Surveillance System of Sri Lanka. National Cancer Early Detection Centre is responsible to conduct screening programmes for cancers. This could not be achieved by government alone. General public has the responsibility to change their life styles dietary habits regular health check-ups getting away from stressful lives in order to overcome this problem.

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Actuarial Modeling for Epidemiological Diseases Spread in Sri Lanka: The Case of Dengue Fever

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Keywords: *Actuarial Modeling, Dengue, Epidemic Seasons, Level Premium Payment*

Introduction

This study is done based on a developed actuarial model of Susceptible, Infected and Recovered (SIR) compartments, which describes the transfer dynamics in an insurance contract of a given population (Abramson, 2001). The SIR model created by Kermack and McKendrick (1927) set the mathematical and theoretical foundation for these epidemic models. Further research has been done to extended thresholds of these models using advanced analytical viewpoints (Mollison, 1995; Allen and Burgin, 2000; Kaddar et al., 2011; Bhattacharya et al., 2015).

The actuarial bases of epidemic disease spread are used with the intention of how to address the financial and economic possessions of such a venture. A book written by Slud (2001) provided imperative information of insurance and life annuity contracts. Feng (2005) developed an actuarial based model for epidemiology with the intention of building a bridge between epidemiology modeling and actuarial mathematics. His theory was utilized to design insurance contracts for the Great Plague in England and SARS epidemic in Hong Kong (Feng and Garrido, 2006). This was an imperative contribution made in literature of epidemic modeling which has open the gates of another testing ground for economic and financial analysts. In the context of Sri

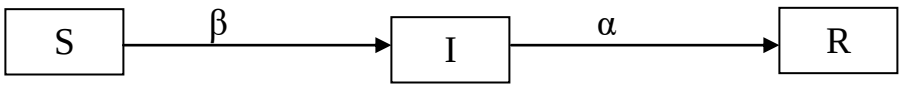
Lanka, few studies have been done for modeling the epidemic disease spread (Briët et al., 2008; Pathirana et al., 2009) and it is even more difficult to discover an analysis centered on actuarial based models. Hence, this study provides pioneering steps to the actuarial based model building for Sri Lankan epidemic profiles.

Objectives

While putting fore steps for the actuarial based modeling in relation to the epidemic disease spread in Sri Lanka, this study intends to revisit the theory by Feng (2005) and to obtain an expanded version of it based on SIR infection which describes the transfer dynamics in an insurance contract considering the highest total case recorded epidemics in Sri Lanka.

Methodology

A simple SIR model describes the conversion between sub-populations of susceptible, infectious and those who recovered. If recovery is permanent and recovered individuals are no longer susceptible to that pathogen then SIR model can be shown as follows,



β is the infecting rate for an individual per unit time and simultaneously α is the recovering rate from the diseases per unit time. SIRS model is more general than SIR model. The only difference when compared to SIR model is defining a new parameter called *f* which represents the rate of recovered individuals who are again susceptible per unit time due to the temporary recovery from the infectious disease.

Actuarial mathematics concepts are used to describe the financial transactions between two parties called insurer and insured.

Equivalence Principle:

$$E[Present\ Value\ of\ Benefits] = \mathrm{E}[Present\ Value\ of\ Benefit\ Premiums]$$

For a continuous Whole Life Insurance Policy with a unit benefit the Level Premium Payment can be determined using equivalence principle as,

$$\bar{P}(\bar{A}_x) = \frac{\bar{A}_x}{\bar{a}_x} \tag{1}$$

Where $\bar{A}_x$ is the actuarial present value of future benefit payments and $\bar{a}_x$ is the actuarial present value of future premium payments. An actuarial based model has developed for the epidemiological diseases and the following equations are given for the annuity for hospitalization plan which has defined by using the whole life insurance policy. When δ is the force of interest, γ is the rate of recovering of susceptible (s) and infectious (i) compartments at time t,

The total discounted future claim:

$$\bar{a}^i = \int_0^\infty e^{-\delta t} i(t)\, dt \tag{2}$$

The total discounted future premium:

$$\bar{a}^s = \int_0^\infty e^{-\delta t} s(t)\, dt \tag{3}$$

The force of infection:

$$\mu_t^s = \frac{-s\prime(t)}{s(t)} \tag{4}$$

The force of infection:

$$\mu_t^i = \frac{-i\prime(t)}{i(t)} \tag{5}$$

The level premium for the unit annuity for hospitalization plan:

$$\bar{P}(\bar{a}^i) = \frac{\bar{a}^i}{\bar{a}^s} = \frac{\delta \bar{a}^i}{1-(\delta+\gamma)\bar{a}^i} \qquad (6)$$

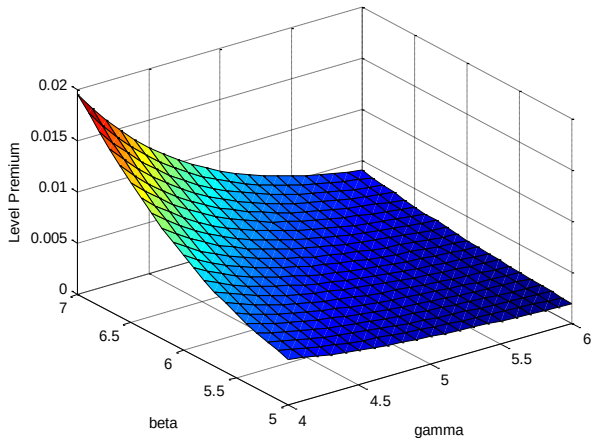
MATLAB statistical software and recorded epidemiological data from the official website of Epidemiological Unit, Sri Lanka are used as the materials of this study. Data were collected weekly for 40 weeks period beginning from 26th December 2015 to 30th September 2016.

Results and Discussion

Sensitivity of Level Premium Payment with respect to the parameters

Determining the level premium payment with positive benefit reserve is mainly focused when the actuarial model is developed. According to the observation of this study, there is an effect from the parameters, γ and β to determine the level premium payment.

Figure 1: Sensitivity of Premiums to Parameters



Source: Authors' Simulation using MATLAB

The rates taken at a monthly basis vary from 5-7 for infecting rate and 4-6 for recovering rate. Simulation shows a simultaneous decline in the recovery rate and increase in the infecting rate leaning the level premium rates towards zero. Premium rate reaches the highest possible level when a simultaneous increase in recovery rate and improvement

in infecting rate occur. Therefore, independent as well as simultaneous changes in the rates of getting infected and recovery specify the characteristics of level premium payment to be considered for a hospitalization plan. Above results were obtained while developing MATLAB simulation for the actuarial based model for SIR infectious disease developed by Feng (2005) for SARS epidemic.

Adjusting Level Premium Payment

According to retrospective approach the individual benefit reserve at time and t for the annuity for hospitalization plan with unit benefit can be formulated as follows,

$$\bar{V}_t(\bar{a}^i) = \int_0^t \left[\bar{P}(\bar{a}^i)s(t)e^{\delta t} - i(t)e^{\delta t}\right] dt, \qquad t > 0 \qquad (7)$$

However to satisfy the requirement of positivity of the benefit reserve curve, for all $t > 0$

$$\bar{P}(\bar{a}^i) \geq \frac{\int_0^t i(t)e^{\delta t} dt}{\int_0^t s(t)e^{\delta t}\, dt} \qquad (8)$$

Feng (2005) has found out some results by setting up δ=0 and those results do not make sense of the time value of money. Since the complexity of solving equations without neglecting the force of interest, an algorithm is defined and developed a MATLAB program through this study to calculate the minimum adjusted level premium for the hospitalization plan to satisfy the above condition. This program could be used to calculate the level premium of diseases which has a permanent immunity with the absence of Vector-Host transfer dynamics. Otherwise it will not be adequate to obtain 100 percent accuracy in results. Henceforth, it is important to identify the nature and characteristics of Sri Lankan epidemic diseases to recognize the applicability of the program developed.

Feasibility of SIR model to represent epidemics in Sri Lanka

This analysis is based on only the top 10 epidemics which have the highest number of total recorded cases for the selected period.

According to the data, highest recorded number of cases is Dengue and it is 72.65 % from the total top 10 epidemic cases. This implies that the probability of being infected by Dengue for a person is very high than the other diseases. However, there are considerable percentages for the diseases called Chickenpox (6.64%), Leptospirosis (5.44 %), Dysentery (4.83 %) and Typhus (3.29 %).

There are several patterns which can be seen when constructing time plots for the above 10 diseases. Some have clear seasonal patterns (Dengue fever). Also, some have very short-term fluctuations and it is difficult to determine the length of a season (Dysentery, Meningitis and etc.). Additionally, some diseases have declining patterns (Leptospirosis, Typhus and Leishmani). However, it is a huge area to study the reasons behind those patterns. Thus, this study is focused on developing an actuarial model for epidemiological diseases spread which can be used more generally to reduce the impact of several patterns. Dengue fever only contains a clear seasonal pattern based on the data for a 40-week period. APPENDIX provides further evidence on the seasonal behavior presence with dengue epidemic with a comparison of actual data with estimated measures for a given optimal lag length of 20 weeks for each season. Therefore, dengue fever has got expected seasonal features and it appears as a testing ground to practice feasibility of the insurance contract improved at the previous section of this study.

Actuarial Based Model for Dengue Fever Spread using SIR (Vector-Host) Model

There are some questions still to be addressed through further advancements of actuarial model considering long term effects such as Vector-Host transfer dynamics embedded with epidemic disease spread. According to the data it can be estimated the length of an epidemic season for some diseases such as dengue. But the SIR model defined by neglecting the type of disease which can be transferred by a vector. Dengue fever is the major epidemic disease in Sri Lanka which is generally spread by mosquitoes. Hence it is important to expand the

SIR model by including the Vector-Host transfer dynamics to find out an actuarial model for diseases such as Dengue fever. Using the same procedure carried out to obtain Result in 4.2 it can be easily shown that,

$$\bar{a}^{s_h} = \frac{1-(\delta+\gamma)\bar{a}^{i_h}}{(\delta)} \qquad (9)$$

and it yields to the level premium payment which formulated for the SIR infection model without the Vector-Host transfer dynamics being same here. Hence, it is reasonable to use the MATLAB program developed earlier through this study to calculate the minimum adjusted level premium for the hospitalization plan for Dengue fever.

Actuarial Model using SIRS Model

Moreover, other diseases have consisted of very short-term fluctuations and it is difficult to determine the length of the epidemic period. Also some people can be infected by the same disease more than once for the considered time period. On other hand, usually an insurance contract is drawn up for annum or a period of six months and it is rarely possible to adjust it with the epidemic season. Hence, the transformation within compartments for a long term can be described more generally using SIRS model than SIR model. But SIRS model is expressed using Delay Differential Equations and this study was not focused on simulating that model.

Conclusion and Policy Implications

This study is done based on a developed actuarial model of SIR infection which describes the transfer dynamics in an insurance contract in a given population. At the initial stage, we satisfied key assumptions and observed that the rate of infecting is positively related and the rate of recovering is negatively related to the level premium payment. Further, we developed a MATLAB program to calculate the minimum adjusted level premium for a hospitalization plan. Secondly this study obtained expanded models for the basic model to eliminate

some problems which occurred such as the Vector-Host relationship due to unsatisfied assumptions for real data. It is reasonable to expand the SIR model by including Vector-Host transfer dynamics to find out an actuarial model for Dengue fever, as it can be estimated for the length of an epidemic season for Dengue for the sample period. Results show that there is no impact from Vector-Host to determine the level premium payment. Finally, we suggest the SIRS infection model with delayed differential equations as an appropriate solution which arises as a result of difficulties to identify seasonal patterns clearly for other diseases.

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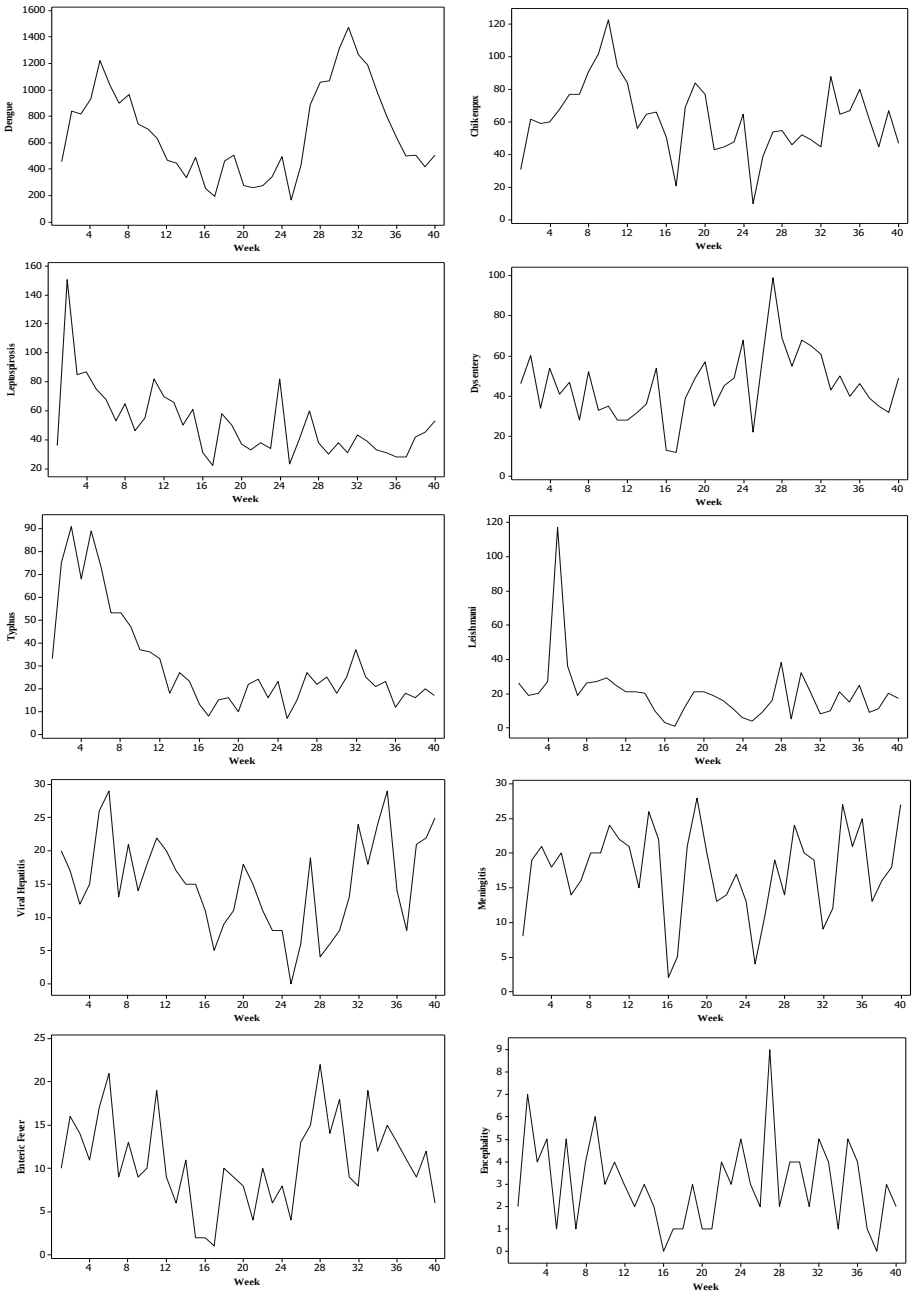
Appendix

Time Series Plots for Epidemiological Data



Climate Change: Awareness, Attitudes and Actions : A Sri Lankan Perspective

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Keywords: *Climate Change, Awareness and attitudes, Sri Lanka*

Introduction

Climate change[3] is happening and is felt deeply globally. Sri Lanka is already facing the adverse impacts of climate change in the form of droughts, unprecedented and rising temperature, floods, unseasonal rain, and coastal erosion. As a small island nation, Sri Lanka falls into the UNFCCC and IPCC's category of 'vulnerable' Small Island nations which are under serious threat from various climate change impacts, such as sea level rise and severe floods and droughts (Climate Change Secretariat, 2014). These threats are considered to have significant negative consequences on various sectors within Sri Lanka (Athukorala, 2015).

Sri Lanka is a negligible contributor to global warming. However, as a nation, we are highly vulnerable to the impacts of climate change. Sri Lanka has ratified the United Nations Framework Convention on Climate Change (UNFCC) in November 1993 and became a party to the Kyoto Protocol in 2002. The national Climate Change Policy of Sri Lanka aims to sensitize and make aware the communities periodically

[3] "Climate change" means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. (United Nations Framework Convention for Climate Change 1992)

on the country's vulnerability to climate change and to enhance knowledge on the multifaceted issues related to climate change in the society and build their capacity to make prudent choices in decision-making.

A number of research were done in Sri Lanka on the different causes of climate change. However, there is little literature to understand Sri Lankans' awareness about climate change to determine if they act as responsive citizens to their share of emissions. According to Margaret Gardner, "in the next 55 years the greatest threat to Sri Lanka will be from climate change. Sri Lanka is particularly vulnerable to rising sea levels and weather-related disasters have the potential to set back any gains made in agriculture, fisheries and even services such as tourism" (Fernando, 2017). This paper helps to determine the success of using the environment valuation methods as a pragmatic approach to monitor the 'nationally determined contributions'.

Objective

The objective of this paper is to understand people's awareness on climate change and its impact, to investigate the relationship between household income and the level of awareness on climate change and to investigate the demand for climate change mitigation action by their willingness to pay to compensate their emissions and damages to the environment.

Methodology

The survey was done from May to June 2017 by gathering primary data using a semi-structured questionnaire in both local languages as well as an online survey. The respondents represented different age groups, gender, education status and income levels. 120 respondents from 15 districts consisted of farmers, government and non-government employees, school children, self-employed and unemployed. They are between the ages of 15 to 67. 87 % represent rural sector and 13 %

represent urban sector. Also 55 % of the respondents are females. The secondary data on climate change was gathered from on-line sources.

Average imputation and common-point imputation are being used to fill the missing vital data. These methodologies analyses the association between categorical variables. Microsoft Excel and Minitab were used to obtain an accurate assessment of relationships, and possible contradictions found in the data by generating graphs, charts, cross tabulation and descriptive statistics. The contingent valuation method was applied in this study by asking the respondents for their Willingness to Pay (WTP) to offset their contribution to climate change and damages to the environment.

Results and Discussion

People's awareness on climate change and its impact

In our sample 99 % of the respondents have stated that they are aware of the concept of climate change irrespective of gender, age, educational background, income level or their locality. Among those who are aware of climate change 41 % had come to know through media, 35 % have felt it and 14 % have heard it from other people. The survey indicate that 14.5 % respondents thought climate change was caused only by humans, while 9.6 % thought it happens naturally. 75 % of the respondents indicated that the cause for climate change is both by human and natural reasons.

When the respondents were asked to rate top three environmental issues; first rated issue was deforestation with 93 %, second highest was extreme weather conditions i.e. rains and droughts (82.5 %). Third rated with 75 % was water pollution. Findings also reveal how respondents conceptualize climate change; while majority of them interpret it as the rise in temperature and global warming, droughts, heavy rains, irregular rain patterns and floods, others interpret it as storms and strong winds, strange weather patterns, irregular climate, rise in sea water level, spread of diseases, Tsunami, disturbance to

natural cycle, presence of Elnino and Lanino, failed agriculture and change in harvest patterns. While few relate it with melting of glaciers, depletion of Ozone layer and GHG emissions. Likewise, people's beliefs about air pollution, factory / vehicle emissions, deforestation, and unplanned development are also again a way of anchoring climate change. The survey finding also indicated that the respondents are aware that the prevailing climatic conditions are impacts of climate change. Majority of the respondents felt that drought, floods and global warming are impacts of climate change; 36 %, 26 % and 25 % respectively.

The relationship between household income and the level of awareness on climate change

Results indicate there is no relationship between household income and the level of awareness on climate change (figure 1). Of those who are aware of climate change 28.3 % are very low, 28.3 % are middle, 24 % are average and 7.5 % are upper class income earners. 93 % of people agree that climate change is a common problem for everyone. Again, their income level and answers do not show any relationship. However, 39 % involved in farming strongly agree that climate change to be a common issue.

When judgments of other issues are solicited, climate change is invariably not the highest or most important priority for many people. Only 17 % of the respondents believed that environment was a pressing issue in Sri Lanka. Environmental problems were rated seventh place of ten other current problems given. Understanding people's perceptions as contributors for the climate change is an important indicator of awareness. It is evidence that 90 % of people believe they contribute to climate change in some way. Of the respondents, 48 % are females and 48 % are involved in farming. Comparing it with the level of income, 28 % of very low-income holders, 20.8 % of average and 23 % of middle income earners believed that they are contributing to the climate change (figure 2). Neither gender, age, education nor income level or if farmer or not suggest a correlation.

The demand for climate change mitigation action by their willingness to pay to compensate the damage caused by them to the environment.

The respondents were introduced to a hypothetical fund called 'Green Future' which will be exclusively used for tree planting to compensate for the anthropogenic effects. The respondents were asked for their WTP for the fund and if they were willing, the maximum amount they can contribute annually. Further, 78 % of the respondents were willing to pay for the green future fund and out of them 42.5 % were females and 40.8 % were advanced level students and 15 % of them were graduates. The youth are sensitive to the climate change and proactive to make an action. A correlation cannot be observed between income level and peoples' WTP. Approximately 22 % of those who were not willing to pay, stated their reason as their income being low or them willing to spend the money on other things. Further, 83 respondents stated a maximum amount they are willing to contribute annually to offset their emissions and harm to the environment. The amount ranged between Rs. 50 to Rs. 12,000. Out of those who are willing to pay and who earn more than Rs. 1,000.00 monthly income; people are willing to contribute 0.69 % (on an average) of their monthly income for the 'Green Future' program. Their average annual contribution in rupees amounts to Rs. 2,154.

Conclusion and Policy Implications

Sri Lankan's awareness on climate change is in satisfactorily high level. Media is the main source people had come to know about climate change. The way people have described climate change varied from bringing out real-time examples, to attempts for text-book definitions. Placed among other problems country currently faces, their ranking for the environment as a topic was towards the lower side.

There is no relationship between Sri Lankan's awareness level on climate change and their income. The conclusion holds still with the farmers and non-farmers responses. 78 % of the respondents were willing to pay for a hypothetical fund that will be used for replanting

trees. Of the people who are able to pay, and have suggested an amount, it is about 0.69 % of their monthly income and annually it will amount to Rs. 2,154.41. Despite high awareness level, when it comes to action, the youth are keen to express climate change and even ready to take action. As a recommendation, the respondents suggest that Sri Lankans have to change the lifestyles to reduce energy consumption in order to address climate change.

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Table 1: WTP among different income groups

Income Level	Average Amount of WTP (Rs.)	Average of Amount as a Percent of Monthly Income
Average	1061.1	0.4456
Low	1108.3	1.3079
Middle	1460.9	0.3199
Upper Class	6581.3	0.5931
Upper Middle	4866.7	0.6348
Very Low	757.1	2.1944
Grand Total	2154.4	0.6932

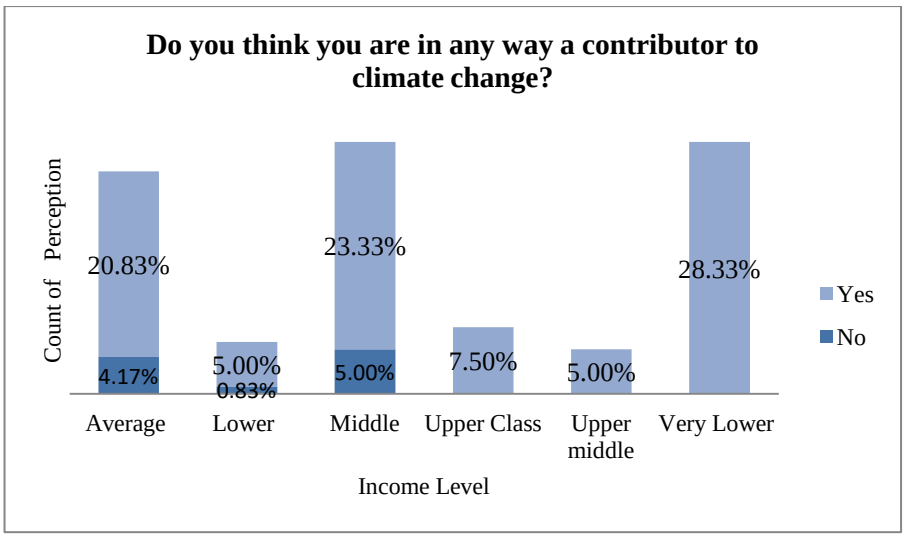

Figure 1: Perceptions towards the contribution to climate change

The Impact of Ground Water Depletion on Land Values in the Affected Areas of *Uma Oya* Multipurpose Development Project

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***Keywords**: Groundwater depletion, Development, Land value*

Introduction

The controversial *Uma Oya* multipurpose Development project (UOMDP) in Uva Province, Sri Lanka which commence the constructions in 2012, is proposed to divert water from *Uma Oya* to *Kirindi Oya* in order to develop hydropower, drinking water and to irrigate the dry and less developed Uva and southern regions of the country. The expected capacity of the electrical power generation of this project is 120 MW and it was estimated to have irrigation of approximately 25,000 acres of paddy lands.

The project is facing an unforeseen setback as major water seepages has developed in the main underground tunnel runs from *Dyaraba Dam* to *Karadagolla*. The first massive water leak into the tunnel began in 2014. That was only a few months since the underground drilling of the tunnels began. Water, at the beginning, was flowing at a speed around 500 liters per second. The second water leak began in June 2017. It is estimated that 976 liters of water is seeping into the tunnel every second. As a result of drastic decrease of ground water table in the area due to continues water seepage in to the tunnel, estimated number of 7,030 buildings, including houses, business places and religious places, have been damaged (approximately 2,000 building completely damaged). At the same time 3,112 wells, streams and water ways have dried up. These belongs to five divisional secretariat regions – *Uva Paranagama, Welimada, Hali Ella, Bandarawela and Ella.* Thus,

people in more than 30 villages[4] have been affected adversely with no safe drinking water, housing and means of livelihoods, mostly agriculture, including tea, vegetable, fruits, minor export crops and cut flower farming.

Objectives

This paper describes the finding of a study conducted, in selected villages from affected areas due to water seepage of the UOMDP, to examine the impacts of increased water scarcity on land market price.

Methodology

The methodology for analysis the data is quantitative. Ten affected villages as shown in the Table 1 selected for this study and 10 villagers from each selected village also selected arbitrarily for informal interviews. During the interviews prices of the agricultural, commercial (suitable for business purposes) and residential (suitable for housing purposes) land plots before the commencement of UOMDP and after the arise of water scarcity issue due to UOMDP were gathered. These collected price figures utilized to build the discussion of this study and standard formulas derived from the literature used to calculate the total land value loss or gain of the 10 villages. Total land area used in this study in each village is given in Table 1.

[4] Makulella, Heeloya, Kurukudegama, Beddearawa, Liyangahawela, Weheragalathenna, Kurudugolla, Egodagama, Udaperuwa, Medaperuwa, Ampitiya, Palleperuwa, Karagahawela, Boralanda, Rajakotuwa, Puhulpola, Dikkapitiya, Ihala Kotawara, Pahala Kotawara, Abadandegama, Thanthiriya, Keenigama, Dowa, Dikkarawa, Medahinna, Bidunuwewa, Watagamauwa, Gediyaroda, Eththalapitiya, Samachethiya, Panangala, Mirahawaththa and Abhayapura

Table 1 -Total approximate land area in the selected villages

No.	Village Name	Total Land Area (Perches)
01.	Makulella	67,608
02.	Heeloya	12,4145
03.	Udaperuwa	48,234
04.	Palleperuwa	94,888
05.	Thanthiriya	72,747
06.	Mirahawaththa	44,281
07.	Abadandegama	24,9471
08.	Puhulpola	42,699
09.	Bidunuwewa	44,281
10.	Dikkapitiya	56,142

Sources: Survey data

The prices of land plots (per perch) for each land category for each village has taken by calculating the average value using the figures given by each individual interviewed.

Results and Discussion

It is obvious that the construction work of the Uma Oya project, already completed one-third including the tunnel, has created social, economical, ecological and geological issues in 10 villages in Bandarawela. Due to the ad hoc development project, people in these villages have faced serious issues. A growing number of complaints on the damages to houses and drying up wells and springs have made the Government cease construction of the Rs.76.3 billion Uma Oya project temporarily time to time. Villagers and environmentalists claim that the present disastrous situation is created due to the ad hoc decisions by the short sighted politicians. Given this background, we investigate the impact of this project on land prices in the affected area.

As shown in the below Table 2, prices of agricultural, commercial and residential land plots in the selected villages before the commencement of UOMDP and after the arise of water scarcity issue due to UOMDP collected.

Table 2 - Prices of land categories before and after the affects

No.	Village Name	Before UOMDP			After the arise of water scarcity issue		
		Agriculture	Commercial	Residential	Agriculture	Commercial	Residential
01.	Makulella	15,000	20,000	15,000	5,000	10,000	10,000
02.	Heeloya	20,000	30,000	25,000	5,000	15,000	10,000
03.	Udaperuwa	10,000	20,000	20,000	2,000	10,000	8,000
04.	Palleperuwa	12,000	15,000	13,000	5,000	10,000	8,000
05.	Thanthiriya	40,000	75,000	55,000	25,000	75,000	55,000
06.	Mirahawaththa	55,000	80,000	40,000	20,000	60,000	30,000
07.	Abadandegama	15,000	15,000	10,000	5,000	10,000	10,000
08.	Puhulpola	45,000	30,000	25,000	20,000	25,000	15,000
09.	Bidunuwewa	50,000	100,000	75,000	25,000	100,000	55,000
10.	Dikkapitiya	30,000	20,000	15,000	10,000	15,000	10,000
	Change as an %				58	18	28

However, it was difficult to find the land area belongs to each land category in each and every village though total land area for each and every village was available. Therefore, calculation was done assuming 80 % land area of every village belongs to all three land categories and 20 % land area has no value in order to find the total economic lose. Accordingly, the average land price for each village was calculated as follows.

$$\text{Average land price} = \frac{\text{Agriculture land price} + \text{Commercial land price} + \text{Residential land price}}{3}$$

Table 3:Estimated total land values before and after the affects

	Total Land Area (Perch)	Land area belongs to 3 categories (80%)	Average Land Price before UOMDP	Total Land value before UMODP	Average Land Price after the affects	Total land value after the affects
Makulella	67,608	54086	16,666	901,440,000	8,333	450,720,000
Heeloya	124,145	99316	25,000	2,482,900,000	10,000	993,160,000
Udaperuwa	48,234	38587	16,666	643,120,000	6,666	257,248,000
Palleperuwa	94,888	75910	13,333	1,012,138,666	7,666	581,979,733
Thanthiriya	72,747	58197	56,666	3,297,864,000	51,666	3,006,876,000
Mirahawaththa	44,281	35424	58,333	2,066,446,666	36,666	1,298,909,333
Abadandegama	249,477	199581	13,333	2,661,088,000	8,333	1,663,180,000
Puhulpola	42,699	34159	33,333	1,138,640,000	20,000	683,184,000
Bidunuwewa	44,281	35424	75,000	2,656,860,000	60,000	2,125,488,000
Dikkapitiya	56,142	44913	21,666	973,128,000	11,666	523,992,000
				17,833,625,333		11,584,737,06

Source: Authors calculation using survey data

Conclusion and Policy Implications

The purpose of this research is to throw light on one problem that is emerging due to unplanned development activities implemented in haphazard manner, damaging environment, especially land resources.

According to the calculation, agricultural, commercial and residential land prices has reduced by 58 %, 18 % and 28 % consecutively. Accordingly, the biggest loss has incurred to the agricultural lands. Yet, falling of the market for residential and commercial lands in the villages would be stop for some extent by providing pipe born water to the villages. However, increase the price for agricultural lands cannot be guaranteed if the solutions to stop water seepages to the tunnel couldn't regenerate and improve the water table in the area as hoping. Providing irrigation water to all the affected areas are also impossible due to the diverse geography and topography of the region. According to approximate calculations, the total land value loss due to the water

loss is Rs. 6,248,888,266.67 (RS 6.24 billion) approximately. Even only from these 10 villages, this loss is a colossal economic loss to the country.

According to the project of UOMDP, the total project cost is Rs. 76,316,307,770 (Rs. 76.31 billion). Thus, this loss is about 8.1% from the total project cost. Therefore, the total loss could go beyond the total project cost if the total land value loss calculated for all the affected areas. Considering that, if all physical, biological and sociological loss of the UOMDP calculated, that total loss can go beyond many times than total project cost. Therefore, further studies need to be conduct using accurate property valuation methods and covering all the affected villages

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The Impact of Cost of Paddy Production on Farmers' Standard of Living: A Case Study to Maritimpattu Divisional Secretariat in Mullaitivu District

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***Keywords**: Cost of production, Standard of living, Fixed effect model*

Introduction

Paddy production has become a main source of standard of living for farmers in Sri Lanka not only by providing them with basic food requirement but also generating income and increasing the number of jobs to rural communities. Demand for paddy production is steadily increasing day by day in all over the world due to rise in population. In this regard, demand for paddy in Sri Lanka increase at rate of 1.1 % per year. To meet this, the rice production should grow at the rate of 2.9 % per year (Department of Agriculture, 2014). However, the increases of cost of production, climate changes, inadequate market opportunities and etc. tend to leads for stagnated yield which has made paddy farming a non-viable enterprise during the last few decades. For example, cost of labor, farm power cost and tradable inputs constitutes 5 5 %, 23 % and 2 3 % respectively in total cost of paddy (Department of Agriculture, 2015). Even though Sri Lanka achieved self-sufficiency in paddy production, due to above reasons the farmers are unable to earn profit from their paddy business. Thus, several farmers leave from farming due to inadequate and/ or uncertainty of income.

The majority of the rural people, i.e. more than 61 %, in Mullaitivu District depend on agriculture as their main source of income (Department of Agriculture in Mullaitivu, 2015). At the same time poverty level of this district was 28.8 % (Central Bank of Sri Lanka, 2015), Since Mullaitivu District was harshly affected by war for a long

period, large amount of lands are not in use due to security reasons yet, high cost of production and lower prices of their product tend to leads to the extreme poverty and low living standard among the farmers. At the same time, society also has faced socio-economic problems. Such situation arises due to lack of research and less attention by government policy makers on this area. Although there are several researches which focus on the economic impact of cost of paddy production on the living standard of farmers (Rahman et al., 2005; Rabu et al., 2013) in the world, Mullaitivu district is not yet adequately explored.

Objectives

The primary objective of this study is to examine the impact of cost of paddy production on the living standard of farmers' of Mullaitivu district. The specific objectives are: (i) To diagnose the main socio-economic factors affecting the cost of paddy cultivation, (ii) To identify and analyze the factors which influence on paddy production (iii) To examine the factors that affecting the income of farmers.

Methodology

This study mainly use primary and secondary data also employed where it necessary. The primary data was collected using percentage random sampling method by issuing the questionnaire for 60 families of study area in two round survey (2012 and 2015). The study area of Martimapattu DS division was selected based on purposive random sampling method. The secondary data were collected from the reports of relevant department. Following the Neo Classical growth theory, we used Fixed Effect Multiple Linear Regression Model (FEMLRM) to identify the determinants of cost of paddy production and farmers' income, which are given by equation (1) and (2) respectively.

$$\ln TC_{it} = \propto_{\circ} + \sum_{j=1}^{7} \alpha_j \ln X_{it} + \delta_1 \ln Y_{it} + \delta_2 \ln FS_{it} + \delta_3 \ln EDU_{it} + \delta_4 \ln EXP_{it} + \delta_5 \ln AG_{it} + \delta_6 \ln HHS_{it} + \delta_7 D_1 + \delta_8 D_2 + \delta_9 D_3 + \delta_9 D_4 + \mu_i + \varepsilon_{it} \quad (1)$$

$$\ln Q_{it} = \alpha_0 + \alpha_1 \ln KC_{it} + \alpha_2 \ln LC_{it} + \alpha_3 INPC_{it} + \alpha_4 \ln TRC_{it} + \alpha_5 \ln FS_{it} + \alpha_6 D_3 + \mu_i + U_{it} \quad (2)$$

Thirdly, we adopted Cobb-Douglas production function to examine the factors that affect the paddy production, which is given by:

$$\begin{aligned}\ln TINC_{it} = {} & \beta_0 + \beta_1 \ln TC_{it} + \beta_2 \ln Y_{it} + \beta_3 \ln FS_{it} + \beta_4 \ln EDU_{it} + \\ & \beta_5 \ln EXP_{it} + \beta_6 \ln NY_{it} + \beta_7 \ln SAV_{it} + \beta_8 \ln LOAN_{it} + \beta_9 D_1 + \\ & \beta_{10} D_2 + \beta_{11} D_3 + \beta_{12} D_4 + \mu_i + \varepsilon_{it} \end{aligned} \quad (3)$$

where, TC: average production cost, Q: average paddy production, TINC: total income of farmers, $X = [KC, LC, SC, FC, WC, PDC, TRC]$ KC: capital cost, LC: labour cost, SC: seed cost, PDC: pesticides cost, WC: weed cost, FC: fertilizers cost, EDU: education level of the farmers, HHS: household size, Y: monthly average income from farm, FS: farm size, EXP: experience of the farmer, NY: monthly average income from non-farm, AG: age of farmers, TRC: transport cost, INPC: inputs cost, SAV: saving, D_1: land ownership, D_2: agriculture training D_3: irrigation system, D_4 : quality of land and μ_i: individual specific fixed effect, u_{it} and ε_{it}: error terms $(0, \sigma^2)$.

Finally, we utilized Logit model to investigate the living standard of farmers, which is takes the form as:

$$\begin{aligned} LS_{it} = {} & \rho_0 + \rho_1 TC_{it} + \rho_2 Q_{it} + \rho_3 \ln Y_{it} + \rho_4 \ln NY_{it} + \rho_5 SAV_{it} + \rho_6 HHS_{it} + \\ & \mu_i + \vartheta_{it} \end{aligned} \quad (4)$$

where, LS is the standard of living of farmers which takes value 1, if the household *i* is the standard of living, is above average level, 0 otherwise; NY: non-farm income, SAV: saving. μ_i is the individual specific fixed effect and ϑ_{it} is the white noise error term. We also used Weighted Least Squared (WLS) Method to compare the results of FEMLRM.

Results and Discussion

Hausman test suggests that fixed effect model is appropriate to this study. The Table 1 below presents the estimated results of cost of paddy production.

Table 1: Cost of Paddy Production Estimates by Fixed Effect

Variables	Coef.	Std. Err	T	P>|t|
lnkc	0.4948	0.0119	41.4	0.000***
lnlc	0.3365	0.0084	39.6	0.000***
lnsc	0.0663	0.0139	4.75	0.000***
lnfc	0.0289	0.0074	3.91	0.000***
lnwc	0.0291	0.0041	7.08	0.000***
lnpdc	0.0489	0.0048	10.0	0.000***
lntrc	-0.0038	0.0041	-0.91	0.363
lny	-0.0048	0.0039	-1.24	0.218
lnfs	0.0031	0.0033	0.94	0.350
lnedu	0.0043	0.0048	0.91	0.365
lnexp	0.0025	0.0017	1.43	0.157
lnag	-0.0044	0.0056	-0.78	0.439
lnhhs	0.0018	0.0033	0.54	0.592
d1	0.0015	0.0027	0.57	0.567
d2	0.0016	0.0023	0.70	0.484
d3	-0.0048	0.0025	-1.87	0.064*
d4	0.0020	0.0034	0.60	0.552
c	1.2780	0.1587	8.05	0.000

Note: *, **, *** represents the 10 %, 5 % and 1 % level of significant respectively.

The above table reveals that as expected to the theory and some of the existing literature (Egbodian and Ahmadu, 2015; Ahmad and Razmy, 2005; Aheer et al., 2005), cost of capital, labour and total input cost (SC, FC, WC, PDC and TRC) have significant and positive impact on cost of paddy production. Further, method of irrigation negatively affects cost of paddy production at 10 % significant level. The estimated result of production function is given by Table 2.

The results in Table 2 indicate that the cost of capital and cost of transportation, farm size and irrigation method have significant and positive impact on quantity of paddy production. This findings is similar to some of the existing empirical findings (e.g., Aung, 2012; Egbodin and Ahmadu, 2015; Gamawelagedara et al., 2011).

Table 2: Paddy Production Estimates by Fixed Effect

Variables	Coef	Std.err	T	P>|t|
lnkc	0.3665	0.1843	1.99	0.049**
lnlc	-0.0245	0.1251	-0.20	0.845
lninpc	-0.0389	0.1339	-0.29	0.772
lntrc	0.1307	0.0576	2.27	0.025**
lnfs	0.8513	0.03866	22.0	0.000***
d3	0.0734	0.0365	2.01	0.047**
cons	3.9543	2.3147	1.71	0.090

Note: *, **, *** represents the 10 %, 5 % and 1 % level of Significant respectively

The Fixed effect income estimates in Table 3 reveal that as expected farm income, non-farm income, saving and irrigation system affect the farmers total income positively at 5 % significant level, while cost of paddy production affect and negatively at 10 % level of significant. Moreover, irrigation system has positive and significant impact on total income of farmers.

Table 3: Income Estimates by Fixed Effect

Variable	Coef.	Std. Err.	t	P>|t|
lnq	0.04574	0.03951	1.16	0.251
lntc	-0.32563	0.17154	-1.90	0.062*
lny	0.45459	0.04120	11.0	0.000***
lnny	0.41265	0.02022	20.4	0.000***
lnedu	-0.02923	0.04131	-0.71	0.481
lnsav	0.07126	0.02149	3.32	0.001***
d1	0.00021	0.03104	0.01	0.995
d2	-0.01762	0.02225	-0.79	0.431
d3	0.05845	0.02389	2.45	0.017**
d4	-0.03946	0.03917	-1.01	0.317
cons	4.48959	1.73822	2.58	0.012

Note: *, **, *** represents the 10 %, 5 % and 1 % level of Significant respectively

The WLS method also reveals the same results as FEMLRM (results are not presented here but available up on request).

The Logit regression results in Table 4 imply that several variables are significantly correlated to the living standard of farmers. First, negative coefficient estimate of LNTC indicates that an increase in total cost of farmers decreases the probability of the farmers being above the average living standard level. Second, an increase in monthly average income of farm increases the probability of the farmers being above the average living standard level as coefficient of LNY variable is statistically significant and positive. This finding is similar to some of the existing empirical findings (Abur, 2014; Labbe, 2014; Makki et al., 2013). Third, a rise in non-farm income appears to increase the probability of the farmers being above the average living standard level. Finally, an increase in saving raises the probability of the farmers being above the average living standard level as coefficient of LNSAV variable is statistically significant and positive. The odd ratio also suggests the same conclusion as the value of odd ratio of LNTC is less than 1 and LNY, LNNY and LNSAV are greater than 1.

Table 4: Logit Estimation of Farmers Living Standard Model

Variables	Coef.	dy/dx	odds ratio	Average
lntc	-9.3414 (0.039**)	-0.09819	0.00008	10.58
lnq	1.8179 (0.274)	0.01911	6.15936	9.760
lny	5.0443 (0.005**)	0.05302	155.138	8.934
lnny	2.7360 (0.014**)	0.02876	15.4253	9.202
lnsav	2.6901 (0.047**)	0.02827	14.7338	7.290
lnhhs	-4.3139 (0.100)	-0.04534	0.01338	1.378
cons	1.7703 (0.962)		5.87361	

Note: *, **, *** represents the 10 %, 5 % and 1 % level of significant respectively. probability values are given in the parenthesis

Conclusion and Policy Implications

The results of FEMLRM reveal that capital, labour and total input costs have significant and positive impact on cost of paddy production. Further, cost of capital, transportation cost and farm size are positively linked with quantity of paddy production. Moreover, total cost is negatively correlated with farmer's total income while farm income, non-farm income and saving have positive impact on monthly average total income of farmers. Logit model suggest that raises in cost of paddy production decreases the probability of farmers being above the average level of living standard, whereas farm income, non-farm income and saving have a positive impact on it. Therefore, the government should take necessary actions to reduce the cost of paddy production in order to increase the living standard of farmers.

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The Rising Demand for Organic Food and Farming in Sri Lanka

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Keywords: *organic food, high yield crops, inorganic fertilizers, pesticides*

Introduction

Throughout the history of Sri Lanka, the islanders have practiced eco-friendly farming. We can trace the history of eco-friendly farming practices from the era of kingship as the farming was the main livelihood and farming related activities embedded to the culture and religious beliefs. The saying "*ගමයි පන්සලයි වැවයි දාගැබයි*" [5] summarizes how much farming, culture and the religion was embedded together.

As an island nation with adequate natural resources Sri Lanka is being able to practice organic farming and sustainable eco-friendly agricultural practices. The farmer friendly weather with tanks, rivers, scattered all over the island with religious belief of optimum use kept farming a peaceful livelihood(Warnakulasooriya and Athukorala, 2016) . With the arrival of the open economy and embracing the green revolution, the farmers found interest in high yield crop varieties which demand inorganic fertilizers, and pesticides.

By focusing only on high yield the farmers have lost some of the key expectations, outcomes, and ethics of environmental friendly agriculture and excess use of fertilizers, pesticides, and technologies created health issues among consumers. Having popular media started

[5] Village, temple, tank, and stupa

to discuss the consequences of inorganic farming there is a rising trend among the consumers that they seek organic food, in order to be healthy and stay away from Non-Communicable Diseases (NCD) like Kidney failures, cancer etc.

Objectives

The objectives of this performance are to, discover the attitude and awareness of the consumer about the organic food and identify the needs of organic farmers to meet the market demand with quality products.

Methodology

This research was performed with the primary data collection from 48 individuals by means of a questionnaire survey among randomly selected 04 farmers[6], from Badulla and Monaraagala districts to get information about the supply and demand, and expectations during the period of June 2017. 04 established organic food sellers were interviewed at their respective outlets and the randomly selected 40 consumers at the same were interviewed on their consent.

The questionnaire for consumers collected the data on awareness on cultivation environment, type of fertilizers use, certification procedure, assurance, and their willingness to pay. The questionnaire for the farmer's collected the data on their education, capacity, revenue, challenges and opportunities and rewards they wish to have. Food seller's questionnaire collected the data of market demand, certification, challenges, strategies and pricing. Finally, the raw data was gathered in a Microsoft Excel spreadsheet and the frequency and percentage was calculated for further analysis.

[6] A farmer from a society which collects small amounts from its members and supply bulk as a society.

Results and Discussion

The awareness on the harmful effects of chemicals present in food is increasing among the consumers. The trend towards purchasing organic food is growing among people. Some of the prominent motivating factors to purchase organic foods include environmental concern, health concern and lifestyle, product quality and subjective norms. Given this background, we first investigate the descriptive statistics of the survey.

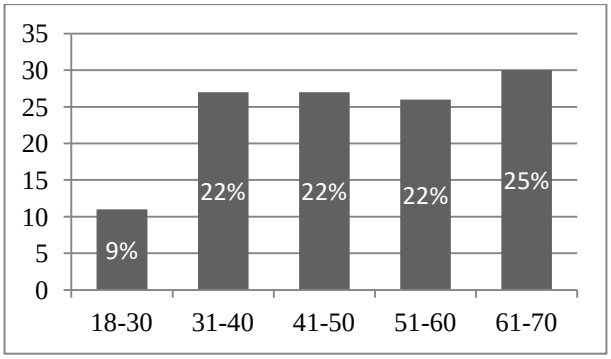

Figure 1: Age categories of consumers and participation to the survey

The age categories of the consumers revels the purchasing power of the consumers as well as their willingness to pay. The consumers below age 30 has less purchasing power compare to other age categories. Also the data analysis shows that those who are above age 31 are having higher income and high profiles. On the other hand above age 31 categories are health conscious compare to below age 30 consumers.

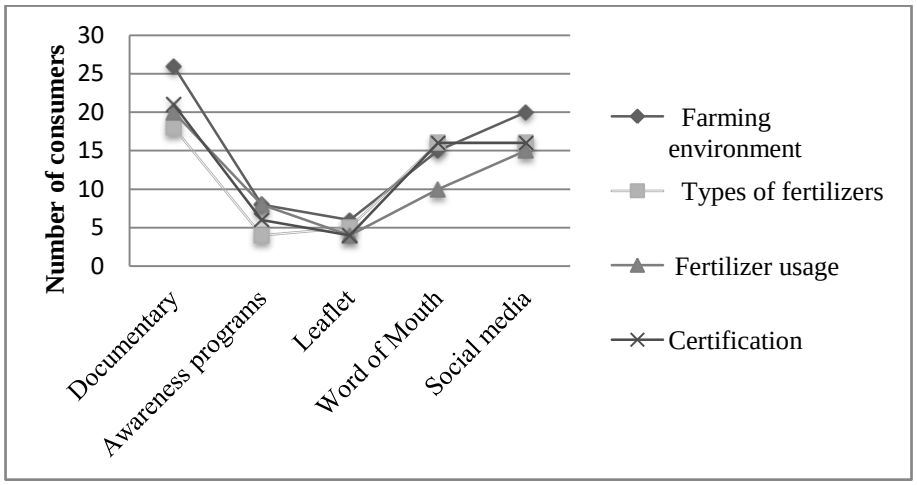

Figure 2: Consumer awareness on the basic ingredients of organic farming and awareness received mediums

The data of consumer's actual awareness on organic food they consumed was collected and analyzed. Hence, the analysis tells that the type of awareness determines the quality of the awareness and right reasons to demand organic food.

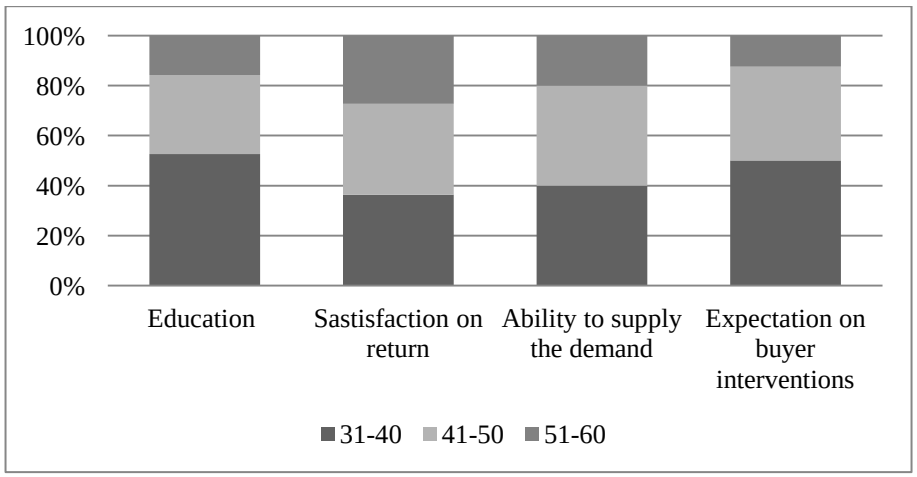

Figure 3: Farmer's age expectations and capacity

The farmers' age and education seems to have a relationship with their level of satisfaction of the return and the interventions done by the organic food selling organizations. Also, the farmer's ability in supply the demand of the organizations also depends on the age and education.

The summary of the survey with individual farmers shows that 13 % of them would like to have training and workshops in organic farming including costing, budgeting, planning with training on leadership, marketing and organic farming. 37 % of them would like the food selling organizations to assist them in organic food certification whereas 50 % of the farmers would like to have all the training, workshops with assistance in getting certification.

Conclusion and Policy Implications

The results reveal that consumers are not well aware of the essential ingredients in organic farming. It is recommended to have detail documentary / short video clips at both outlets and social media to give a better awareness. In order to meet the market demand, produce quality food and maximize the profit it is recommended for organic food selling organizations to capacitate the registered farmers with training and workshop in the area of strategic planning, value chain analysis, and supply chain management through visual media and exposure visits to successful farmlands.

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Tackling Economic Inequality in Pakistan: A Fiscal Approach

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Keywords: Economic inequality, Welfare, Fiscal policy

Introduction

The subject of inequality, more specifically economic inequality has been on the forefronts of election speeches. However, what seems to be evidently missing from such public discourses is a comprehensive solution to it. Society is pillared upon decisions illustrated through policies, laws and economic choices, that either strengthen the welfare of the community or debilitate it. By allowing economic inequality to metastasize rampantly, Pakistan is embarking on a path of socio-economic destruction that may be irreparable if urgent policy measures aren't enacted immediately.

So why does economic inequality matter? Aren't inequalities inherited akin to genes and sometimes good for the functioning of the society? And what could the federal government possibly do in mitigating the inequality in Pakistan? First of all, we begin by defining the crux of our proposition – economic inequality. Economic inequality comprises of three parts - income inequality, wealth inequality and pay inequality, however, we would focus more on the former two in this paper. Income inequalities refer to the disparities in income not limited to the money received through pay, but all money received through employment whereas wealth inequality refers to the disparities in the amount of financial assets, stocks, bonds and property etc. Rampant income and wealth inequalities could very well transform into other inequalities such as education, health, gender, ethnicity in the long-run. This can be corroborated quite explicitly in Balochistan which has the lowest income/capita of the country and where in towns like Dera Bugti,

female literacy rates are hardly 0.06 %. The situation perjorates since future generations are simply unable to break free of this inequality trap. According to a recent report by Oxfam (Burki, Memon and Mir), children born in income-poor families in Pakistan in the year 2010-2011 are less likely than those born in the year 1994-1995 to break their poverty trap and move into the middle-class category. Dr. Hafiz Pasha, a former finance minister suggests that this has primarily been due to the underreporting of income for tax evasion. Gaping inequalities has corrupted politics, thwarted potential, fueled crime, stifled social mobility and hindered economic growth in Pakistan in the last few decades.

Objectives

Given the sheer increase in gaping economic inequalities and their diffused effects on other social indicators in Pakistan, it becomes imperative for the State to become a major player in the fight against inequality. This paper tries to establish this by advocating for a more robust, progressive and inclusive fiscal policy. In order to establish our case, we will first try and understand the reasons behind economic inequality in Pakistan. Then we will examine the current fiscal policy in practice in Pakistan and then suggest an alternative mechanism for achieving the goal of reducing economic inequality in a more efficient way.

Methodology

The methodology undertaken is purely secondary in nature. Papers and statistics taken from government statistics bureaus and research think tanks will form the main crux for our arguments. The Pakistan Economic Survey 2014-2015 was reviewed and thoroughly analyzed. News reports were also studied and analyzed to ensure the accuracy of the data.

Results and Discussion

According to the Pakistan Economic Survey and other reports, the reasons for Pakistan's hitherto situation can be traced back in history. The so-called establishment in Pakistan consisting of the coalition of military and democratic governments has ensured that since independence the country remains a 'security state' rather than a 'developmental state'. Albeit, military tenures were focused on paradigms of rapid growth and the reliance on the 'trickle-down'; nevertheless, they paradoxically remained the ones with the highest inequality. Estimates show that in Pakistan, Rs. 33 goes to the top 1 % for every Rs.100 worth of commodities generated and a mere Rs. 3 goes to the bottom 3%. Clearly the 'trickle down' theory is dubious and it's about time we start thinking about inverting the pyramid.

Examining the fiscal terrain of Pakistan with more scrutiny, we find that the allocation of assets is the most unequal when it comes to agricultural land. About two third of the Pakistani population resides in rural areas, it follows that the primary source of income for such people is through agriculture related activities. However, a recent study revealed that the top 1 % of farmers own as much as 22 % of farmland, 41 % of the tractors and 28 % of the tube wells. Despite agriculture dominating Pakistan's GDP, the sector has remained sufficiently under-taxed amounting up to just Rs. 1 billion for all four provinces combined. As a matter of fact, the maximum punishment for not filing agricultural tax returns is a hefty fine of just Rs. 1000 (Pasha, 2017).

Possessing enormous political power and close ties with the government, the rich have successfully managed to evade taxes to ensure that the beneficiaries of growth hitherto were the ones with the most capital. These groups enjoy wide-ranging exemptions and concessions, low tax rates and can engage in tax evasion with a degree of impunity, frequently in connivance with a corrupt tax administration. This has engendered in a low tax-to-GDP ratio of around 8.5 % (2014) that is extremely low relative to other countries in the region.

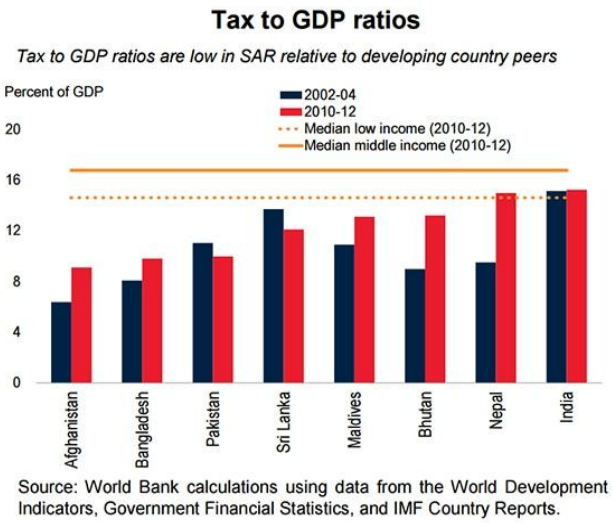

Figure 1 - Tax to GDP Ratios in South Asia

Let's now also understand the composition of tax revenues in the country. Instead of direct taxation, the government has persistently focused on indirect taxes to finance its expenditures. Not only has this failed to circumscribe the exorbitant income sources of the rich but has targeted the poor segments of society via an increase in the general prices of essential commodities, especially food.

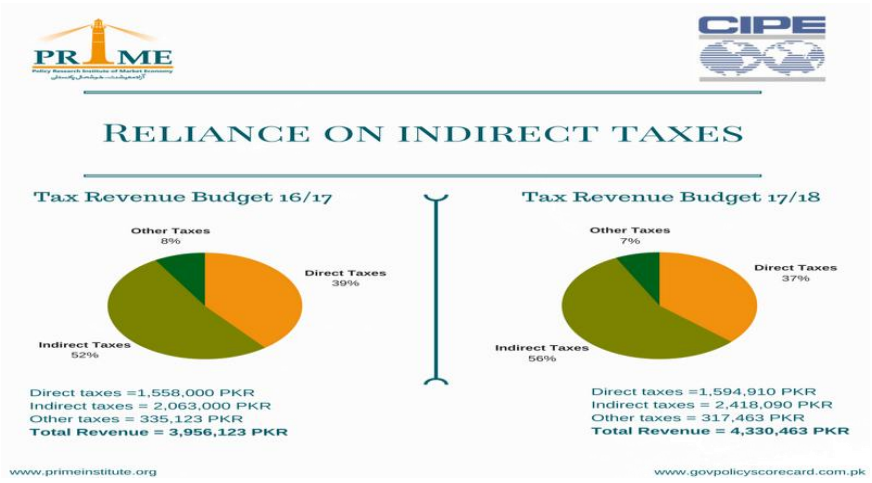

Figure 2 - Reliance on Indirect Taxation in Pakistan

Tax evasion has resulted in forgone revenue of approximately Rs. 500 billion for Pakistan which could otherwise have been utilized for the public good (Oxfam, 2017). When compared with its neighbor India where 1 in 40 people file tax returns, Pakistan's figures are estimated to be around 1 in 260. In fact, only $1/4^{th}$ of the total population actually files returns and the total number of taxpayers has declined over the past 6 years, worsening the fiscal deficit. As Oliver Holmes acclaimed 'taxes are the price we pay for a civilized society', Pakistan's government needs to redesign its taxation policy to further the cause of inclusive growth and reducing the economic inequities in the population.

Given the distorted tax system of Pakistan, a large fiscal deficit could be in theory be acceptable. Unfortunately, the statistics point towards the contrary. Due to inadequate receipts, not only is expenditure on public services abated, but the allocation of spending remains quite skewed. Spending on health and education, one of the cardinal tenets of social capital narrowly make 15 % of the total expenditure, and the expenditure on health is only one-third of the expenditure on education. Combined expenditure on social services approached 3 % of the GDP in 2012-2013. The realization that social expenditure on social services seems to be side lined by the federal government. Equally important is the establishment of a robust mechanism of social protection to safeguard the marginalized from their financial woes. Targeted programmes such as direct cash transfers or unemployment have received little attention in the past. The primary cash transfer programs include but are not limited to the Zakat, Bait-ul-Maal and the Benazir Income Support Programme (through which a monthly stipend of Rs. 1000 is transferred to the families of lower income classes). The system of Zakat transfers seems pretty obsolete given the current demands of this time. Similarly, the Bait-ul-Maal responsible for targeting the poor is constructed at the district level with no independently verifiable criteria for maintaining or updating the list of beneficiaries. Renewed interest in social protection in the form of the Benazir Income Support Programme, the Punjab Food Security Programme and the recently

developed Khushal Fund is also under scrutiny since only one fourth of the beneficiaries actually receive the funds (Gazdar).

Conclusion and Policy Implications

A fiscal policy should be designed in a way such that it is inclusive - that is, it benefits every Pakistani so that each party gets it deserved share of the economic pie and also sustainable so that future generations could benefit from its outcomes. On the taxation side, a number of steps can be possibly undertaken to increase tax revenue in a fair and equitable manner. Many advanced economies such as the Scandinavian countries have achieved their redistributive objectives more efficiently via the progressivity of their tax and transfer systems by augmenting marginal tax rates for higher income groups and exempting taxes for lower income groups.

In order to make the progressivity and inclusiveness of taxes yield results, the funds need to be spent in a way to target economic inequality both in the short and long run. Firstly, the government needs to do away with a myriad of price subsidies and supply it with direct cash transfers to poor households. Funding the development of better educational institutions from progressive taxation for low-income groups needs to be one of the top priorities of the expenditure side, particularly at the primary schooling level. Another proposition is the initiation of a comprehensive package of health insurance to provide adequate healthcare for every citizen of the country at subsidized prices, especially the poor. A recent report emphasizes the importance of a fiscally sustainable, publicly financed basic health package covering essential health care, which would disproportionally benefit the poor since they would do away with unproductive precautionary health saving (Jamison). Finally, analogous to a system of means-tested cash transfers, a system of non-contributory social pensions could be enacted with progressive tax receipts that provide a flat pension to the country's senior citizens.

All in all, despite some of the inherent limitations of fiscal policy in Pakistan, it is the most optimal tool at the government's disposal to achieve redistributive goals. Inequalities reflect the hierarchies of power, and both tend to produce and reproduce their privileged positions regardless of the force of intellectual and ethical arguments against its unacceptable manifestations. Indeed, inequality and economics are a complicated science, we never know whether fiscal policy would help achieve our objectives, however, the longer we wait, the more problems it will yield.

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Information Failure and Poor Health Services in Pakistan: How Information Communication Technology (ICT) Fills the Gap

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Keywords: Information failure, Communication technology, Pakistan

Introduction

It is woeful that in Pakistan the most crucial aspect of well-being is also the most neglected. Discussions around health policy in Pakistan's 70-year history have received little or no space in the agenda of any government – civil or military - that has taken over. While specific health related crises such as the spread of polio and child deaths in the tend to take the media by storm, a meaningful debate around the causes actually spurring such abysmal health services is appallingly absent. The indifference of Pakistan's government to health is reflected in the fact that a measly 0.9 % of the GDP is spent on health with only a third of that being allocated to public sector health services, leaving the public availing these services from the private sector primarily through out-of-pocket payments.

This apathy is evident in health indicators such as to name a few, the infant mortality is sky-rocketing to 66 per 1,000 births as opposed to 38 in India or a mere 8 in Sri Lanka and life expectancy in the nation for women is 67 years as compared to 73 in Bangladesh and 78 in Thailand. However, while these numbers speak volumes about the dismal quality of healthcare provided in Pakistan, they also remind us that behind these facts and figures lie heart-wrenching stories of countless lives that were ruined and cut short due to health facilities lacking the necessary care. Information failure, lack of accountability, miserly and mismanaged government funding and readiness on part of healthcare providers coupled with poor training amongst other deep-rooted

problems are responsible for the dreadful condition of the country's healthcare sector. After extensive research though we have deduced information failure as being the primal cause behind a great proportion of the problems that the healthcare sector faces and therefore our research aims to focus on solutions addressed specifically to overcome it (Malkani, 2016).

A systematic literature review being drawn from various sources has helped us analyze the major themes plaguing the health sector as a result of information failure. Assuming their prominence from the frequency of times they were mentioned in our sources along with the significance of their impact, we have narrowed down these themes and selected two to focus on for the purpose of this paper:

- Mismanaged Data Collection and Record-Keeping
- Staff Absenteeism

Keeping in special consideration the deep-rooted problems common to both the general concerns plaguing the healthcare sector and our specific areas of focus, our paper aims to expand beyond the traditional methods of physical contact with patients to the virtual platforms of e-Health as proposed solutions to correct information failure. E-health systems entail many sub-facilities including telemedicine, tele-education, telematics for improved management of healthcare and research, giving access to improved access and quality of healthcare. Both biblical and new models of healthcare are globally serving the masses side by side, with the latter pulling forward in most developed and developing societies alike, but in Pakistan the concept of e-Health is still relatively alien. Computer based health information systems are becoming the order of the day but their spread in Pakistan is still limited.

Objectives

The main objective of this study is to identify the relationship between information failure and poor health services in Pakistan. It also will investigate whether information communication technology (ICT) can fill the gap in the future.

Methodology

After a stringent evaluation of the sources used based on the credibility of their database (journal/website/newspaper), we compiled and analyzed data from several studies. We evaluated the methods of how ICT could be used to improve the health systems in Pakistan, and how the health system lacks behind in the country and developed policy recommendations based on the literature used in the report.

Results and Discussion

The World Health Organization (WHO) has listed Pakistan as one of the fifty-seven countries with a critical deficiency in its Human resources for health (HRH) (MLHW 102). The problem of health workforce deficiency is two-pronged. Firstly, there is no specific department dedicated to HRH within the ministry of health, and along with the inadequate training programs and unrevised health curriculums, health force that is being produced is simply not competent enough. With an absence of a department whose specific function is to monitor the workforce, 'slackers' take advantage of the information failure resulting from the fact that they have to meet low standards of accountability and do not take their public-sector duties seriously. Secondly, in Sindh alone, 35.7 percent of public-sector doctors are absent from their workplace during normal working hours (Agboatwalla and Niazi, 2010). This proportion is higher amongst rural regions as compared to urban regions.

A cause of inefficiency in itself, absenteeism further abates the efficient delivery of public health services within the country by presenting a dual obstacle- not only does absenteeism translate into leakage in

budgetary allocations as absence of health workers entails that budgetary allocations do not reach the beneficiaries; but absenteeism also leads to poor health service delivery due to unavailability of health personnel (Agboatwalla and Niazi, 2010).

Therefore, without the correction of information failure and a way forward being devised to improve standards of accountability and monitoring, increasing spending on the health sector is futile. Chaudhury et al. (2011) study staff attendance in health facilities in Bangladesh, Ecuador, India, Indonesia, Peru and Uganda to find that some common themes persist across countries such as generally higher absence rates in poorer regions, higher absence rates amongst higher-ranking and more powerful providers (such as the doctors), and higher absenteeism amongst men as compared to women. They also observe low evidence of financial incentives decreasing absenteeism, and instead find greater evidence that infrastructure plays a crucial role in increasing staff attendance.

We have identified the efficient keeping of medical records as a high-threat problem to Pakistan's healthcare institution due to the fact that record-keeping is a government's administration's basic tool. With records that are accurate and up-to-date, viable information is provided and this lays the foundation for future decision making and planning. A structured and effective medium to maintain records is needed such that it coordinates the care the patient receives in every department that they have received treatment in; with this not only serving the purpose of the patient receiving higher quality healthcare due to the staff having access to a complete medical history but also with the records providing evidence for the hospital's accountability for its actions and perhaps also direction for future medical research.

In line with new policies emphasizing better health care services including Millennium Development Goals, the Pakistan Government has introduced a series of federally funded vertical and horizontal programs such as Lady Health Worker Programme, Expanded Programme on Immunization, National Maternal and Child Health

Programme and Tuberculosis and HIV/AIDS Control Programme. Mismanaged record keeping is not only a consequence of information failure but also a cause of it. The purpose of this section is to highlight how important it is to carry out efficient and structured record keeping by ensuring that the information failure it both entails and creates is overcome, so as to not only record medical information of patients during consultation accurately leading to proper diagnosis and treatment but also for the successful execution of any health-related initiative.

Conclusion and Policy Implications

This report has discussed two major problems in the health sector that are caused by poor information which have often been given secondary importance in the literature on health policies. Firstly, ICT could significantly improve the condition of record keeping in Pakistan, which is a high-threat problem to the healthcare institution of Pakistan. An efficient record keeping system could improve the treatment the patient receives and also provide more informed directions for future research. The use of Electronic Health Records (EHRs) would significantly improve the record keeping system and provide quick and accurate medical information. Secondly, poor management and information flow results in stock unavailability in the pharmacies. An investment into an IT based management system could improve the budgeting and forecasts for the future, which would balance the levels of supply of different medicines. A more informed higher-level management would improve the accountability of the corruption and inefficiencies of the lower level workers.

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What factors determine Female Labour Force participation in Pakistan?

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Keywords: Labour force, Gender equality, Economic growth Pakistan

Introduction

Pakistani females have long contributed significantly less than their male counterparts in the labour force. This lack of female labour force participation greatly cuts down the active labour available at Pakistan's disposal and adversely affects its economic growth, gender equality and standards of living as about 58 % of female headed household in Pakistan live below the poverty line compared to 49 % of male headed households. (Encyclopedia of Women and Islamic Cultures: Family, Body, Sexualit, Volume 3). Intuitively, the 77.85 % (Labour Force Survey 2013) of women being out of Pakistan's workforce, can be attributed to the long standing problem of patriarchy which restricts the access of women to productive resources.

Ever since Mincer's pioneering study in 1962 which attempted to reinterpret labour supply by accounting for lifetime variables and the resulting conclusions that family income had no effect on the wife's demand for leisure and that a women's fertility is a major determinant of her labour supply, other researchers took it upon themselves to research in depth into the newly emerging field of female labour force participation which became evident after the suffragette movement. Shah (1976) examined the effects of socio-economic and demographic variables on labour force in all four provinces and concluded a positive relationship between marital status, literacy ratio, and LFP. A negative association was found between LFP and child-women ratio along with an inverse relation with nuclear family type. Shah then in 1986

attempted to observe changes in the role of women against Pakistan's development using Panel data ranging from 1951 to 1981. The study concluded that the strict observance of purdah and the number of durable goods available, along with the level of husband's own education level greatly limited female labour force participation. Kozel and Alderman (1990) made use of the OLS regression and Tobit model to determine the factors which affect labor force participation and supply decisions in urban areas of Pakistan. Rashed,Lodhi and Chisti (1989) examined Female labour supply determinants using a Probit model and only just focusing on Karachi. Both studies concluded a positive relationship between LFP and regressors : education levels and expected increase in wages. Presence of male members in the household found to decrease the likelihood of women working.

Ibraz (1993) studies on factors determining female work force participation based on the Rawalpindi district found religious and cultural views to discourage females from working such as observance of purdah and strict gender segregation, as these hindrances confine women to their private domains whereas Malik (1994) found variables such as age of the women, education and dependency ration to be insignificant in the determination of female labour supply but found there to be a positive relation between predicted male wage and female work force participation rate.

Objectives

This paper will aim to add to the richness of the existing literature by considering women's own characteristics comparing not only the married with the unmarried but considering FLFP for the divorced and the widowed too along with a host of other variables. Our study will also be distinct in that it is using the actual labour force specific data from LFS 2012-13, which most other studies in this area have failed to use instead opting for Integrated household Surveys and PSLM to name a few.

Our first hypothesis is: women's characteristics have no impact on their female labour force participation. Apart from this, we will be taking into account the fact that most women in Pakistan are dependent on the males of their household and face considerable constraints when it comes to them working outside of home. They are allowed to work only when the male is for some reason unable to do so or can't find employment. Hence we will be evaluating the effects of properties related to the head of the household on the work participation rate of women: Second Hypothesis is: head of household's characteristics have no impact on FLFP. Our third hypothesis focuses on whether the fertility of the women along with regional differences resulting from the women's residence being in the urban or rural area has any impact on FLFP and if it makes a difference if the head of the household is a female. Then the third hypothesis is: household characteristics have no effect on FLFP in Pakistan.

For the purpose of testing these hypotheses, we will be using Labour Force Survey 2012-13, the labour participation rate in which is nearly equivalent (32.8 %, 32.9 %) and the gender-area wise rates congruent. Augmented participation rates seem to be curving downwards with most of the employed being classified as employees followed closely by own account workers (Pakistan Bureau of Statistics-LFS12-13).

Methodology

It is often the case that economists are faced with a dichotomous dependent variable which takes the value 1 if it's one part of the binary and 0 otherwise. For such models, OLS and other standard estimators are deemed to be inappropriate due to the limited or qualitative nature of the dependent variable. And because this study inculcates within itself a dependent variable FLFP which takes the value 1 if the women is currently involved in economic activity for profit either on farms, shops, as employee, employer, and other modes of employment and 0 otherwise, we will be turning towards Probit model for estimation of our regressors and their due effect on FLFP.

The Probit model is based on the underlying latent variable FLFP where:

FLFP = *F*(Women own characteristics-WCH; Head of household characteristics-HHHC; Household characteristics-HC)

$$FLFP = \beta_0 + \beta_1 WCH + \beta_2 HHHC + \beta_3\, HC + e$$

Instead of directly observing FLFP, we have assigned it a binary variable which is 1 if the woman in the sample is engaged in any form of economic activity as defined above and 0 otherwise. The residual value given above, **εi,** can be seen to represent any sampling errors that may have occurred and any misrepresentation of information on part of our sampling units. It is assumed to be normally distributed with mean 0 and constant covariance. Accordingly, we will be estimating three probit equations, one with a focus on urban areas of Pakistan, one focusing on the rural areas of Pakistan.

Table 1: Definition of variables used in the models

Variables	Description
Women's own Characteristics	
AGE	Age of the women 15–49 years in completed years
AGEsq	Squared of the ages (AGE) of women being considered in the sample
MARRIED	Dummy variable 1 if the woman is married, 0 otherwise
DIVORCED	=1 if the woman is divorced, 0 otherwise
WIDOWED	=1 if the woman is widowed, 0 otherwise
PRIMARY	=1 if the woman has completed 5 years of primary education, 0 otherwise
SECONDARY	=1 if the womans' highest level of completed education is secondary, 0 otherwise
HIGH	=1 if the highest level of education includes highschool, undergrad, masters or doctorate
Head of Household Properties	
HAGE_hh	Age of the Head of the Household
HAGEsq_hh	Squared of HAGE_hh
HPRIMARY_hh	=1 if H of HH level of education is completed primary,0 otherwise
HSECONDARY_hh	=1 if H of HH level of education is completed secondary, 0 otherwise
HHIGH_hh	=1 if H of HH level of education is completed highschool, undergrad, masters or doctorate, 0 otherwise
HLIT_hh	=1 if the head can read and write in any language, 0 otherwise
HEMPLOYER_hh	=1 if the head's employment status is that of an employer , 0 otherwise
HEMPLOYEE_hh	=1 if the head's employment status is of a paid employee somewhere, 0 otherwise
HSELF_EMPLOYED _hh	=1 if the head's employ.st. is that of having been self-employed in own enterprise, 0 otherwise
HUNPAID_hh	=1 if the head is an unpaid family worker, 0 otherwise
Household Features	
FHEAD_hh	=1 if head of the household is a female, 0 otherwise
CHILDNO_hh	Number of kids in the household under the age of 16

Results and Discussion

Results of the Table 1 provides us with standard probit parameters with their asymptotic t-statistics in parentheses, while Table 2 gives the predicted probabilities. We will be making use of Table 2 (predicted probabilities) for greater accuracy and to account for the fact that other variables are more often than not never null but rather are at levels of which we have taken the average. Established relationships (signs) of all three results are the same. It can be seen that age has a positive impact on Female Labour Force Participation when Pakistan is taken as a whole and when separate regressions are run for rural and urban areas. A one unit or a one-year increase in age of the woman can result in 3.6 %, 2.8 % and 2.6 % increase in labour participation in Pakistan, Urban and Rural areas respectively. On the other hand, AGEsq i-e the squared of ages indicate a negative relationship with FLFP in all three cases intuitively due to the falling mental prowess of humans as they age.

Marital Status is another significant factor which determines whether women are allowed to work in Pakistan or not. The three sub groups of marital status, married, divorced and widowed, are being measured against the base group of unmarried women. We can see that a woman getting married decreases her chances of working by 21 % in Pakistan, rural and urban area following the same trend, however, the chances of a divorcee to work in rural areas increases in contrast to urban area and Pakistan in general. The variable indicating the divorcees is, however, insignificant in relation to FLFP. Widowship follows the same trend as being married, due to the religious obligations of women being confined in their houses for a fixed period of time and the societal stigma attached to widows working. This variable is insignificant too but results in relatively smaller decrease in FLFP as compared to being married, most likely due to the widows having to work to satisfy their basic needs and wants after the passing of their husbands. Education(Primary, Secondary and High) is positively related to FLFP in all three incidence and establishes itself as a strong determinant of

women economic participation for profit as apart from these values being statistically significant, secondary and higher education increase the probability of women working in Pakistan by quiet a lot i-e 30 % and 52.4 % respectively. Primary education, though has a positive effect on FLFP, is deemed insignificant in urban areas where strict competition and the education spiral moves the employers to favour those who are highly educated whereas in Rural areas, primary education is significant at 5 % sig.level but leads to a mere 3.8 % increase in females working. Secondary and higher education statistics in rural areas: 14.5 % and 48.1 % respectively, however, indicate a substantial increase in the probability of women working than those who are not educated up to these levels. We have discussed Women's own characteristics up till now, however, due to the long standing patriarchal mind-set that prevails in Pakistan, a majority of women are made to follow the decisions of their male counterparts who may or may not only allow their female relatives to work, but rather whose own characteristics can have a profound impact on whether the wife, a daughter, a sister or the mother works. Hence, we have included the properties of the men of the households who in Pakistan are considered head of the family.

Unlike the females themselves, higher the age of Head of household (men) , the lesser the incidence of women working in Pakistan(rural and urban) although the parameter for urban area is insignificant. Similarly, higher the education level of a man, higher the probability of a woman not working. This may be due to an illiterate male head having lower prospects of a job and a good one at that and hence the woman working to help with the finances of the house. We can observe decreasing FLFP by a bigger ratio as the head passes the education levels of primary, secondary and high in Pakistan: from a 2 %(insignificant) decrease in FLFP from the male head being primary educated to a 7.3 % decrease in FLFP if the male head gains higher education.

An unusual finding though comes in the form of a positive, significant relationship between FLFP and the employment status of the male head which also clash with the estimates of the probit equation in table one. Predicted probabilities indicate the probability of women working actively in the labour force to increase if either the male head is an employer, an employee and or self-employed by 13.1 %, 51.9 % and 31.3 % in Pakistan while the probability of the woman working decreases if the male head is an unpaid family worker. In contrast to this, the probit coefficients indicate a decrease in women working if the male head is an employer of sorts or self-employed in Pakistan. This in itself is contradictory to the estimates of urban and rural probit coefficients which indicate a positive relation between FLFP and the male head being employed. Marginal Effects follow the path of the predicted probabilities. A deviation from this unusual trend is in urban areas where if the male head is an employer in an enterprise or self-employed, owning his own business, then FLFP decreases. It is difficult to explain this anomaly. The remaining two variables referring to Household Characteristics indicate a higher probability of women working in the workforce if they are the Head of the households by 46.8 %, 22.3 % and 42.5 % in Pakistan, urban and rural areas respectively. As head of the household, they are likely responsible for bringing in the required income to satisfy the basic needs of the house. On the other hand, greater the number of dependent children who the women, as tradition requires them to, have to look after, lower their economic activity for profit in all three instances.

Conclusion and Policy Implications

In order to identify the factors that determine female labour force participation, this paper has made use of the Probit model to account for dependent binary variable and have used Labour Force Survey2012-13 to adequately use data collected with the view of discerning the workforce position of Pakistan. 3 sets of independent variables were used to explain FLFP; Women's own characteristics, Head of

Household Characteristics, and Household characteristics and their results declared. The low participation rate amongst females of Pakistan can be attributed to disruption in their education due to marriage, domestic duties and household discriminatory views. These factors do not only mean that employers offer them lower wages to account for their transient position but due to women's own high reservation wages and lower demand for their labour, a discouraging framework is established for them to work. However, taking into account the evolving state of female labour force participation over the decades, it is clear that female population can now greatly alter the path of development and provide third world countries such as Pakistan much needed human capital which can go on to increase national income. However, the relationship between participation and economic growth is not as straightforward as it seems because a lot goes into the decision-making process of a woman deciding to work. It is these factors that this paper has analysed to better equip development economists on the policies which target women specifically and aim to increase FLFP. Beyond the standard labour force statistics, policy makers should ensure that women are provided equal educational facilities as this one factor can increase the probability of a woman entering the workforce manifold.

An alternative to educational facilities, is providing vocational training pertaining to established industries in Pakistan so that women are not left behind men when it comes to labour force participation. Emphasis should be placed on the education of young girls so that they don't drop out, rather complete higher levels of education and make use of better employment opportunities. Apart from education, a change in mind set is needed such that the males of the household, along with the females, are made aware of women's rights and their ability to work and work effectively. The stigma around any female working needs to be removed and wider options of fields should be made available to them for equal dispersion of gender across occupations. With about half of Pakistan's population consisting of females, obstacles on their path to work will hinder the country's development. In order to ease the burden

of domestic responsibilities, government can establish care centres to look after children while mothers work.

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Table 1: Results of the initial run of the Probit Model

VARIABLES	Probit Coeff :Urban	Probit Coeff :Rural	Probit Coeff
AGE	0.098(0.014)***	0.082(0.007)***	0.094(0.006)***
AGEsq	-0.0011(0.00018)***	-0.001(9.49e-05)***	-0.0011(8.23e-05)***
MARRIED	-0.607(0.0992)***	-0.451(0.0593)***	-0.548(0.0494)***
DIVORCED	-0.140(0.336)	0.0926(0.212)	-0.0462(0.177)
WIDOWED	-0.0278(0.198)	-0.109(0.113)	-0.119(0.0955)
PRIMARY	0.126(0.0951)	0.119(0.0552)**	0.173(0.0462)***
SECONDARY	0.294(0.0910)***	0.449(0.0856)***	0.597(0.0591)***
HIGH	0.771(0.0903)***	1.490(0.0978)***	1.366(0.0604)***
HAGE_hh	-0.0183(0.0135)	-0.044(0.0067)***	-0.0432(0.00595)***
HAGEsq_hh	0.00014(0.00013)	0.0005(66e-05)***	0.0005(5.86e-05)***
HPRIMARY_hh	-0.0886(0.112)	-0.0357(0.0577)	-0.0671(0.0497)
HSECONDA_hh	-0.189(0.111)*	-0.161(0.0722)**	-0.0914(0.0578)
HHIGH_hh	-0.271(0.111)**	-0.225(0.0917)**	-0.191(0.0651)***
HLIT_hh	-0.168(0.0957)*	0.0297(0.0485)	-0.0210(0.0418)
HEMPLOYE_hh	-0.627(0.148)***	0.489(0.235)**	0.340(0.120)***
HEMPLOYEE_hh	0.275(0.0821)***	1.425(0.0394)***	1.352(0.0335)***
HSELF_EMPLD.hh	-0.114(0.0840)	0.836(0.0405)***	0.817(0.0346)***
HUNPAID_hh	-1.806(0.284)***	-0.551(0.148)***	-0.760(0.132)***
FHEAD_hh	0.779(0.129)***	1.318(0.0653)***	1.220(0.0573)***
CHILDNO_hh	-0.0165(0.0139)	-0.0226(0.0072)***	-0.0272(0.00630)***
Constant	-0.166(0.411)	-1.466(0.199)***	-1.394(0.175)***
Observations	2,829	9,123	11,952

Note: Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 2: Predicted probabilities based on Probit regression

VARIABLES	**Predicted prob.**	**Predicted prob. Urban**	**Predicted prob. Rural**
AGE	0.0361(0.0025)***	0.0281(0.0042)***	0.0266(0.0024)***
AGEsq	-0.0004(3.16e-05)***	-0.0003(5.31e-05)***	-0.0003(3.06e-05)***
MARRIED	-0.210(0.019)***	-0.174(0.028)***	-0.146(0.0191)***
DIVORCED	-0.0177(0.0678)	-0.0401(0.0961)	0.0299(0.0684)
WIDOWED	-0.0458(0.0366)	-0.00797(0.0568)	-0.0352(0.0365)
PRIMARY	0.0664(0.0177)***	0.0360(0.0273)	0.0383(0.0178)**
SECONDARY	0.229(0.0227)***	0.0842(0.0261)***	0.145(0.0276)***
HIGH	0.524(0.0235)***	0.221(0.0255)***	0.481(0.0321)***
HAGE_hh	-0.0166(0.0022)***	-0.00525(0.00387)	-0.0143(0.0021)***
HAGEsq_hh	0.0001(2.25e-05)***	4.13e-05(3.84e-05)	0.00016(2.14e-05)***
HPRIMARY_hh	-0.0258(0.0191)	-0.0254(0.0321)	-0.0115(0.0186)
HSECONDA_hh	-0.0351(0.0222)	-0.0540(0.0318)*	-0.0519(0.0233)**
HHIGH_hh	-0.0733(0.0250)***	-0.0777(0.0318)**	-0.0728(0.0296)**
HLIT_hh	-0.00807(0.0161)	-0.0480(0.0274)*	0.00959(0.0156)
HEMPLOYE_hh	0.131(0.0461)***	-0.180(0.0425)***	0.158(0.0757)**
HEMPLOYEE_hh	0.519(0.0128)***	0.0787(0.0236)***	0.460(0.0127)***
HSELF_EMPLD.hh	0.313(0.0132)***	-0.0326(0.0241)	0.270***(0.0129)
HUNPAID_hh	-0.292(0.0507)***	-0.517(0.0806)***	-0.178(0.0478)***
FHEAD_hh	0.468(0.0222)***	0.223(0.0360)***	0.425(0.0216)***
CHILDNO_hh	-0.0104(0.00242)***	-0.00473(0.00397)	-0.00729(0.00235)***
Observations	11,952	2,829	9,123

Note: Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Daily Wage Determinants of Informal Sector Workers in Sri Lanka

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Keywords: *Informal sector, Daily wage, Employees*

Introduction

The employees of every country can be identified as formal sector and informal sector employees[7]. In most of the developing countries' the predominant sector is the informal sector. Sri Lankan national definition of the informal sector states that an institute is informal if there is no registration of the institute under the employees' provident fund and/or Inland Revenue Department, no formal accounts maintained and the number of regular employees less than 10 (DCS, 2017). Employees of the informal sector have to face many difficulties. Currently, there is no formal mechanism established for the informal sector pay and benefits schemes in Sri Lanka.

Aruntilaka (2004) states that the market forces decide that wages of the informal sector of Sri Lanka. A study by Gunatilaka (2008) shows that the ability to earn in this sector can change according to the area of employment. These statements confirm the research by Saget in 2006 on wage in the informal economy in Brazil, India, Indonesia and South

[7] International Conference of Labor Statisticians (2003) define informal employment as own account workers and employers employed in their own informal sector enterprises, family workers, members of informal producers' cooperatives, and employees holding informal jobs.

Africa for Sri Lanka as well. According to Banerjee (2014) the wages of the informal sector should be decided through the trade liberalization policies. Cho and Cho (2011) deduce that the gender wage gap of the informal sector as the worst.

Objectives

This research examines the functionality of the existing informal structures used in determining informal sector wages in Sri Lanka and compares the available structures with the existing systems in other countries. Based on the above country comparison results, this study proposes essential factors to be incorporated in determining a methodology for a fair wage for daily informal sector workers, acceptable for Sri Lanka.

Methodology

This study is based on primary data and secondary data. A total sample of 108 employees and employers were selected from the informal sector from Anuradhapura and Mullaitivu districts by using multistage sampling in 2016. Sample consisted of 54 employers and 54 employees with a representation from agricultural (36), industry (36) and service (36) sectors. Two separate questionnaires were administered among employers and employees to collect the primary data and the secondary data were collected from publish documents from several institutions. For the data analysis, descriptive method and multiple regression estimation were used.

Results and Discussion

According to the National Minimum Wages Act No. 3 of 2016, for the first time in the country, a mandatory national minimum daily wage of Rs. 400 was fixed payable to all workers by all employers in the country. The daily wages between the two districts differ by sector and gender (given in figure 1.1). In the agricultural sector the daily wage in Anuradhapura is 49 % higher than Mullaitivu. The average overall

daily wage is 191 % higher than national minimum daily wage of 2016. Lowest average female daily wage (Rs. 833) is also 9 7% higher. There is a considerable variation by district compared to the national minimum daily wage.

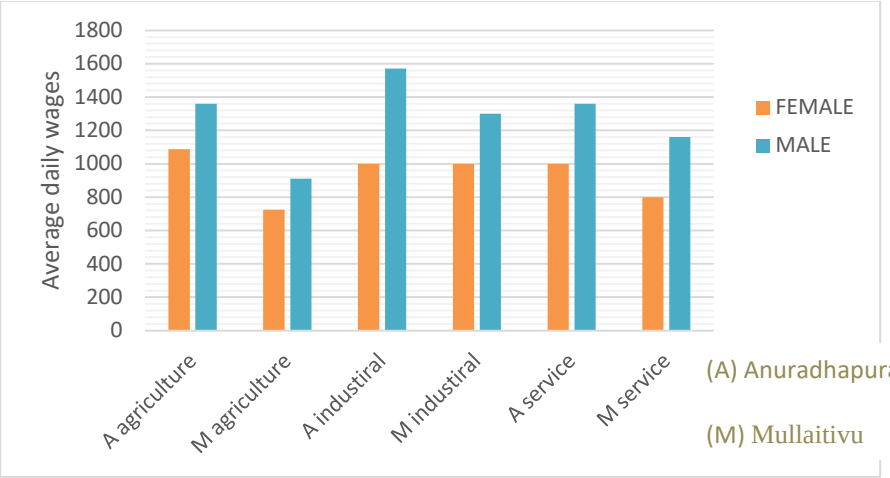

Figure 1: Gender Daily Wage Differential by District and Sector -2016

A multiple regression model was used to determine the factors that affect the daily wage of the employee. Five separate regression models were estimated for the surveyed data (One for each district, Employees, Employers and overall sample- given in Table 1). According to overall sample regression results, districts, gender, labor supply demand, wage of nearby areas, hours of work, experience, service sector and agriculture sector had a statistically significant impact in determining informal sector wages. Besides that, for Anuradhapura district number of working hours, experience, wage of nearby areas, labor supply and demand, gender and additional benefits determine the wages of the informal sector. For Mullaitivu, wage of the nearby areas, labor supply and demand, gender and service sector had an impact on a workers' daily payment. Among the variables significant for Mullaitivu, only service sector variable was not among the significant variables for Anuradhapura district. According to regression results of this study, different factors influence the daily wage levels in each district. The

level of education and age of the employee had no impact on wage in the informal sector employment.

This research studied informal sector wage determination structures of several countries in the world (Brazil, India, Indonesia and South Africa). The study found that the countries use different criteria to determine the level of informal sector daily wage. These countries had used criteria such as occupation, power to form groups, collective agreements and social security benefits. In most of the countries, the informal sector wage is determined based on various characteristics of the locality such as the districts and states. Furthermore, some labor regulations, such as the minimum wage in Sri Lanka are applicable to formal as well as the informal sector jobs. However, since there is no contractual binding (This can have positive impact on the salary and the other benefits of informal sector worker.) between the employers and employees in the informal sector, there is no mechanism to go for litigation. And also this study found informal sector employees can be divided mainly into two categories as casual workers and seasonal workers. The employers and employees lack knowledge on the wages and other benefits.

Conclusion and Policy Implications

This study identifies a set of essential factors to be considered in determining the informal sector minimum daily wage for informal sector worker in Sri Lanka. Policy makers must take into account the following factors such as district/state of the employment, industry of employment, wage of nearby areas, labor supply and demand and gender in determining the informal sector wage. Based on these identified, influencing factors, the government can introduce a mechanism to determine the informal sector wage, new saving systems, insurances, pension systems for informal sector. The employers and employees must be well-informed about their expected daily wage and other benefits. There are some labor regulations that are formally constituted, equally for both the formal and informal sector jobs.

However, when implemented there are areas that require policy makers' attention to rectify possible short-comings that can impede the benefits to the informal sector workers.

Table 1: Informal Sector Wage Determinants - 2016

Variable (Dependent Variable –Daily Wages)	Anuradhapura District	Mullaitivu District	Employees	Employers	Overall Sample
Hours of work	.0055	.00339	.00469	.00392	.0043
	(0.002**)	(0.191)	(0.066***)	(0.129)	(0.012**)
Age	.00049	-.00080	.00042	.0003	.00036
	(0.347)	(0.136)	(0.479)	(0.617)	(0.364)
Experience	4.64e-06	-3.94e-06	-3.92e-06	-2.11e-06	-3.06e-06
	(0.003**)	(0.208)	(0.072***)	(0.346)	(0.037**)
Extra benefits	-.0001	.00008	.00007	-.00006	-.00006
	(0.09***)	(0.370)	(0.426)	(0.510)	(0.270)
Wage of nearby areas	.00017	.00034	.00029	.0027	.00028
	(0.000*)	(0.000*)	(0.000*)	(0.000*)	(0.000*)
Labor supply and demand	.0045	.01135	.00695	.0073	.00714
	(0.001*)	(0.000*)	(0.004**)	(0.003**)	(0.000*)
Level of education	.00066	.00223	.00123	.0322	.00154
	(0.578)	(0.210)	(0.450)	(0.020**)	(0.162)
Gender	.0434	.02144	.04152	.0018	.0367
	(0.000*)	(0.074**)	(0.003**)	(0.277)	(0.000*)
District	(not use for regression)	(not use for regression)	-.04496	-.037	-.0409
			(0.001*)	(0.004**)	(0.000*)
Agriculture sector	.0117	-.02045	-.01929	-.0146	-.0168
	(0.214)	(0.205)	(0.153)	(0.283)	(0.06***)
Service sector	-.0178	-.04940	-.03627	-.0257	-.03095
	(0.105)	(0.023**)	(0.048**)	(0.160)	(0.011**)
R-squared	0.9503	0.9511	0.9383	0.9272	0.9318
Adj R-squared	0.9387	0.9398	0.9222	0.9081	0.92404

Note: the P-value is given in the brackets. * denotes 1 % significant, ** denotes 5 % significant and *** denotes 10 % significant levels.

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කුඩා පරිමාණ කර්මාන්තයන්හි බැංකු ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපාන ආයතනයේ අභ්‍යන්තර සාධක

එම්. එම්. ඒ. එන්. තිලකවර්ධන සහ එම්. බී. රණතිලක

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තමේන්තුව, පේරාදෙණිය විශ්වවිද්‍යාලය

මූල පද:*ඉල්ලුම, ණය, අභ්‍යන්තර සාධක*

හැඳින්වීම

කුඩා පරිමාණ කර්මාන්ත ආර්ථික සංවර්ධනය කරා ගමන් කිරීමේ දී ප්‍රබල දායකත්වයක් ලබා දේ. කුඩා හා මධ්‍ය පරිමාණ කර්මාන්ත අංශය ශ්‍රී ලංකා රජයේ සමස්ත අරමුණු තුළ වැදගත් අංශයක් ලෙස හඳුනාගත හැක්කේ සියලු අංශ ඇතුලත්වන ආර්ථික වර්ධනය, ප්‍රාදේශීය සංවර්ධනය, රැකියා උත්පාදනය හා දිළිඳුකම පහත හෙළීම සඳහා වූ වෙනස්කම්වල ගාමක බලවේගය බැවිනි (කුඩා හා මධ්‍ය පරිමාණ ව්‍යවසාය සංවර්ධන ජාතික ප්‍රතිපත්ති රාමුව, 2015). කුඩා පරිමාණ කර්මාන්ත ආර්ථික සංවර්ධන ක්‍රියාවලියට සක්‍රීය වශයෙන් දායක වන බවට මෑත කාලයේ විශාල වශයෙන් නව සාහිත්‍යයක් ගොඩ නැගෙමින් පවතී.

ශ්‍රී ලංකාව වැනි රටක පවතින විභවතාව මත කුඩා පරිමාණ කර්මාන්ත ආරම්භ කිරීම ඉතා පහසු හා සුලබ වී තිබේ. නමුත් තත්ත්වය එසේ වුව ද ශ්‍රී ලංකාව ඇතුළු සංවර්ධනය වෙමින් පවත්නා රටවල කුඩා පරිමාණ කර්මාන්තයන් හා ව්‍යාපාර විශාල අර්බුධකාරී මෙන්ම අපහසුතාවන්ට මුහුණ පා ඇති බව පැහැදිලි වේ. බොහොමයක් කුඩා පරිමාණ කර්මාන්ත අරම්භ කර ටික කාලයකින්ම වැසී යන්නේය. එයට විවිධ හේතූන් බලපෑ හැකිය. එනම් ප්‍රාග්ධන හිඟකම, මූල්‍ය පහසුකම් ලබා ගැනීමට ඇති අපහසුතා, විවෘත ආර්ථික ප්‍රතිපත්ති සමඟ තරඟ කිරීමට නොහැකි වීම ආදියයි. ප්‍රත්‍යක්ෂමූල සාක්ෂි පෙන්වන්නේ ව්‍යවසායකයා ඔවුන්ගේ මූල්‍ය අවශ්‍යතා තෘප්ත කර ගැනීමේදී අසීරුතාවලට මුහුණ දෙන බවයි (විජේතුංග 2008). මූල්‍ය ප්‍රාග්ධන හිඟකම තෘප්තකර ගැනීමේදී කුඩා පරිමාණ කර්මාන්ත විධිමත් හෝ අවිධිමත් අංශයන් ගෙන් ණය ගැනීමට පෙළඹේ. එසේ බාහිර ණය ගැනීමේ දී විශේෂයෙන්ම බැංකු ණය කෙරෙහි යොමු වීම දක්නට ලැබේ. කුඩා හා මධ්‍ය පරිමාණ ව්‍යවසායන් හි වර්ධනයට හා සඵල වීමට මෙන්ම ආර්ථික පරිසරයක් නිර්මාණය කිරීමට බැංකු මූල්‍යනය සඳහා ප්‍රවේශය අත්‍යවශ්‍ය වෙතත් ශ්‍රී ලංකාවේ කුඩා හා මධ්‍ය පරිමාණ ව්‍යවසායන් බැංකු මූල්‍යයනයට

ප්‍රවේශ වීමේදී සැළකිය යුතු බාධාවන්ට මුහුණ දීමට සිදුවේ (පණ්ඩුල 2015). බැංකු ණය ඉල්ලුම් කිරීමේ දී සාර්ව ආර්ථික සාධක, ප්‍රාදේශීය සාධක, ආයතනයේ අභ්‍යන්තර තත්ත්වය ආදිය බලපායි. නමුදු කුඩා පරිමාණ කර්මාන්තවල බැංකු ණය සඳහා ප්‍රවේශයේ ගැටළුකාරී තත්ත්වයන් හා කුඩා පරිමාණ කර්මාන්තවල බැංකු ණය කෙරෙහි බලපාන සාධක පිළිබඳ හඳුනා ගැනීමට වැදගත් වේ.

කුඩා පරිමාණ කර්මාන්තවල මූල්‍ය ගැටළු පිළිබඳව විවිධ පර්යේෂණ සිදුව තිබුණ ද කුඩා පරිමාණ කර්මාන්තවල ඇති බැංකු ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපාන ආයතනයේ අභ්‍යන්තර සාධක පිළිබඳ අධ්‍යයන ඉතා විරලය. ඒ තුළ ද ණය ඉල්ලුම සඳහා බලපාන ආයතනයේ අභ්‍යන්තර සාධක පිළිබඳ ශ්‍රී ලංකාවට අදාළව එක් පර්යේෂණයක් හෝ සිදුවී නොමැත. නමුත් ආයතනයේ අභ්‍යන්තර සාධක ණය ඉල්ලුම කෙරෙහි බලපාන ආකාරය අධ්‍යයනය කිරීම වැදගත් වේ. එහිදී කුඩා පරිමාණ කර්මාන්තවල ණය ඉල්ලුම් ප්‍රමාණය තීරණය කරන අභ්‍යන්තර සාධක හඳුනා ගැනීම මෙන්ම ඒවා ණය ඉල්ලුම කෙරෙහි කොපමණ ප්‍රමාණයෙන් බලපෑම් කරන්නේ ද? හා එය කුමන ආකාරයේ බලපෑමක් ද? යන්න පිළිබඳව මෙහි අධ්‍යයන ගැටළුව ලෙස වැඩිදුර විශ්ලේෂණය හා පැහැදිලි කිරීම සිදු කරයි.

මෙම අධ්‍යයනයේ අරමුණ කුඩා පරිමාණ කර්මාන්තවල බැංකු ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපාන ආයතනයේ අභ්‍යන්තර සාධක හඳුනා ගැනීම හා එම සාධකයන් ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපෑම පරීක්ෂා කිරීමයි. එහිදී ව්‍යවසායකයාගේ වයස, ව්‍යවසායකයාගේ අධ්‍යාපන මට්ටම, ව්‍යවසායකයාගේ ස්ත්‍රී/පුරුෂ භාවය, පවුලේ විශාලත්වය, ආයතනයේ වත්කම් ප්‍රමාණය, ආයතනයේ ආරම්භක ප්‍රාග්ධනය, ණයක් ලබා ගැනීමට ගතවන කාලය, බැංකුවට ඇති දුර ආදි සාධක ණය ඉල්ලුම් ප්‍රමාණයට බලපාන ආකාරය හඳුනා ගැනීමට කටයුතු කරයි.

අධ්‍යයනයේ සංගහනය ලෙස නොච්චියාගම ප්‍රාදේශිය ලේකම් කොට්ඨාසයේ සියලු කුඩා පරිමාණ නිමවුම් කර්මාන්තයන් (ආයතන 324) ද නියදිය ලෙස සරල සසම්භාවීව ආයතන 60ක් ද තෝරා ගෙන තිබේ. ප්‍රශ්නාවලී හා සම්මුඛ සාකච්ඡාවන් මඟින් දත්ත රැස් කිරීම සිදු කෙරේ. නොච්චියාගම ප්‍රාදේශිය ලේකම් කොට්ඨාසයේ කුඩා පරිමාණ නිමවුම් කර්මාන්ත ආයතන 60කින් ලබා ගන්නා ප්‍රාථමික දත්ත ඇසුරින් ප්‍රතිපායන ආදර්ශයක් ගොඩනගමින් දත්ත විශ්ලේෂණය සිදුකර තිබේ.

අධ්‍යයන අරමුණු

කුඩා පරිමාණ කර්මාන්තයන්හි බැංකු ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපාන ආයතනයේ අභ්‍යන්තර සාධක පිළිබඳ නොච්චියාගම ප්‍රාදේශීය ලේකම් කොට්ඨාසය ඇසුරින් අධ්‍යයනය මෙහි ප්‍රධාන අරමුණ වේ.

ක්‍රමවේදය

මෙහිදී ණය ඉල්ලුම් ප්‍රමාණය පරායත්ත විචල්‍යය ලෙසත්, එසේම ණය ඉල්ලුම් ප්‍රමාණය සඳහා බලපාන අනෙකුත් ස්වායත්ත විචල්‍යයන් ලෙස ව්‍යවසායකයාගේ වයස, ව්‍යවසායකයාගේ අධ්‍යාපන මට්ටම, ව්‍යවසායකයාගේ ස්ත්‍රී/පුරුෂ බාවය, පවුලේ විශාලත්වය, ආයතනයේ වත්කම් ප්‍රමාණය, ආයතනයේ ආරම්භක ප්‍රාග්ධනය, ණයක් ලබා ගැනීමට ගතවන කාලය, බැංකුවට ඇති දුර යොදාගෙන ඇත. දත්ත විශ්ලේෂණයේ දී විචල්‍යයන්ගේ වෙසෙසි බලපෑම හඳුනාගැනීම බහුගුණ ප්‍රතිපායන ආදර්ශයක් පදනම් කරගෙන සිදු කෙරේ.

$$y_i = \alpha_0 + \propto_1 AG_i + \propto_2 ED_i + \propto_3 SX_i + \propto_4 FS_i + \propto_6 IC_i + \propto_7 PC_i + \propto_8 DS_i + u_i$$

y_i - ණය ඉල්ලුම් ප්‍රමාණය

AG_i - ව්‍යවසායකයාගේ වයස

ED_i - ව්‍යවසායකයාගේ අධ්‍යාපන මට්ටම

SX_i - ව්‍යවසායකයාගේ ස්ත්‍රී / පුරුෂ සමාජභාවය

FS_i - පවුලේ විශාලත්වය

AS_i - ආයතනයේ වත්කම් ප්‍රමාණය

IC_i - ආයතනයේ ආරම්භක ප්‍රාග්ධනය

PC_i - ණයක් ලබා ගැනිමට ගතවන කාලය

DS_i - බැංකුවට ඇති දුර

u_i - දෝෂ පදය

i - නියදි නිරීක්ෂණ

ප්‍රතිඵල හා සාකච්ඡාව

මෙහි ප්‍රතිඵල ලෙස ආයතනයේ ආරම්භක ප්‍රාග්ධනය, ආයතනයේ වත්කම් ප්‍රමාණය, බැංකුවට ඇති දුර ණය ඉල්ලුම් ප්‍රමාණය සඳහා වෙසෙසි බලපෑමක් ඇති කරයි. එනම් ආයතනයේ වත්කම් ප්‍රමාණය ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි ඇති කරන බලපෑම 5% වෙසෙසි මට්ටම යටතේ සංඛ්‍යාත්මකව වෙසෙසි වේ. ආයතනයේ වත්කම් ප්‍රමාණය ඉහළ යන විට තව දුරටත් විශාල ආයෝජන සිදු කිරීමට පෙළඹීමත්, විශාල වත්කම් ප්‍රමාණයක් පවතින හේතුවෙන් ඔවුන්ගේ ආපසු ණය ගෙවීමේ හැකියාව ඉහළ වීමත් ඔවුන්ට ණය ලබා ගැනීමට පවතින බාධාකාරී තත්ත්වයන් අවම වේ. එසේම වත්කම් ප්‍රමාණය ඉහළ තත්ත්වයක පවතින ආයතනයක වත්කම් ඉහළ වුවත් ආයතනයේ මුල්‍ය තත්ත්වය යහපත් මට්ටමක නොපවතී නම් එවිට ද ණය ඉල්ලුම සඳහා යොමුවිය හැකිය. කෙසේ වෙතත් ආයතනයක වත්කම් ප්‍රමාණය ඉහළයන විට ආයතනයේ ව්‍යාපාරික තත්ත්වය ද ඉහළ යාම ණය ලැබීමේ හැකියාව වර්ධනය වී ඇත. එවිට ණය ඉල්ලුම් ප්‍රමාණය සමඟ ආයතනයේ වත්කම් ප්‍රමාණය ධනාත්මකව සම්බන්ධ වේ.

ආර්ථිකමිතික විශ්ලේෂණයේ ප්‍රතිඵල පහත පරිදිය.

වගුව 1: ණය ඉල්ලුම් ප්‍රමාණය සඳහා බලපාන සාධක

ස්වායත්ත විචල්‍යයන්	**Coef.**	**Std.Err.**	**t value**	**P>|t|**
ව්‍යවසායකයාගේ වයස (AG)	12161	11232.88	1.08	0.285
ව්‍යවසායකයාගේ අධ්‍යාපන මට්ටම (ED)	42550	148022.6	0.29	0.775
ව්‍යවසායකයාගේ ස්ත්‍රී / පුරුෂ සමාජභාවය (SX)	-302297	212822.3	-1.42	0.163
පවුලේ විශාලත්වය (FS)	73542	100957.6	0.73	0.470
ආයතනයේ වත්කම් ප්‍රමාණය (AS)	.0074**	.0033003	2.25	0.030
ආයතනයේ ආරම්භක ප්‍රාග්ධනය (IC)	.3437*	.0483045	7.12	0.000
ණයක් ලබා ගැනීමට ගතවන කාලය (PC)	-28719***	15564.13	-1.85	0.072
බැංකුවට ඇති දුර (DS)	123102**	44530.9	2.76	0.008

Note: *1 % significant, ** 5 % significant, *** 10 % significant

මීට අමතරව ආයතනයේ ආරම්භක ප්‍රාග්ධනය 5%ක් වූ වෙසෙසි මට්ටම යටතේ ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි සාධනීය බලපෑමක් ඇති කරයි.

ආයතනයේ ආරම්භක ප්‍රාග්ධනය යහපත් මට්ටමක පවතින විට එම ව්‍යාපාරවලට ණය ගෙවීම් අවදානම අඩුවන බැවින් ද ව්‍යාපාරය බිඳ වැටීමට ඇති සම්භාවිතාවය අඩු වී ව්‍යාපාරික හැකියාව වර්ධනය වන බැවින් ද ඔවුන්ට ණය ලබා ගැනීමට ඇති සංරෝධකයන් අවම වී බැංකු විසින් ණය ලබා දීමට පෙළඹීම හේතුවෙන් ණය ඉල්ලුම් ප්‍රමාණය සමඟ ධනාත්මක සම්බන්ධයක් මෙම විචල්‍යය පෙන්නුම් කරයි.

ණයක් ලබා ගැනීමට ගතවන කාලය ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපෑම් කරන අතර 10%ක වෙසෙසි මට්ටමක් යටෙත් එම බලපෑම වෙසෙසි වේ. ණයක් ලබා ගැනීමට ගතවන කාලය සතියකින් වෙනස් වන විට ණය ඉල්ලුම් ප්‍රමාණය -28719.85 කින් වෙනස් වේ. එනම් සෘණාත්මක සම්බන්ධතාවයකි. ණය ලබා ගැනීමට ගතවන කාලය වැඩිවන විට ව්‍යාපාරයේ කටයුතු ඉදිරියට ගෙන යාමට අපහසුතා ඇති වීම මෙන්ම ව්‍යාපාරිකයාගේ ව්‍යාපාරික කාලය බොහෝ සෙයින් අපතේ යාම සිදු වේ. මුල්‍ය අවශ්‍යතාවය සැපිරෙන තුරු ආයතනයේ කටයුතු එකතැන රඳවා ගැනීමට ඔවුන්ට සිදු වේ. මෙය ව්‍යාපාරික ආයතනයන්ට ගැටළු මතු කරයි. එමනිසා ණයක් ලබා ගැනීමට ගතවන කාලය වැඩිවන විට ව්‍යාපාරිකයන් බැංකු ණය ඉල්ලුම් ප්‍රමාණය අඩු කරයි. 5% ක වෙසෙසි මට්ටමක් යටතේ බැංකුවට ඇති දුර ප්‍රමාණය ණය ඉල්ලුම් ප්‍රමාණය කෙරෙහි බලපෑම් ඇති කරයි. එය ධන සම්බන්ධයකි. එනම් බැංකුවට ඇති දුර වැඩි වුවත් ණය ඉල්ලුම් කිරීම සිදු කරන බවයි. එහිදී බැංකුවට ඇති දුර වැඩි වුව ද ව්‍යාපාරික පහසුකම් හා කර්මාන්ත ඉලක්ක කරගත් ණය පහසුකම් නාගරික බැංකු මඟින් සැපයීම ව්‍යාපාරිකයින් ආසන්න බැංකුවලට වඩා නාගරික බැංකුවලට ප්‍රවේශය වැඩි වේ. මේ අනුව ණය ඉල්ලුම් ප්‍රමාණය සමඟ ධනාත්මක සම්බන්ධයක් බැංකුවට ඇති දුර ප්‍රමාණය යන සාධකය මඟින් ඇති කරයි.

මෙම අධ්‍යයනය සඳහා යොදාගත් අනෙක් ස්වායත්ත විචල්‍යයන් වන ව්‍යවසායකයාගේ වයස, ව්‍යවසායකයාගේ අධ්‍යාපන මට්ටම, ව්‍යවසායකයාගේ ස්ත්‍රී /පුරුෂ සමාජභාවය, පවුලේ විශාලත්වය, ණය ඉල්ලුම් ප්‍රමාණය වන පරායත්ත විචල්‍යය කෙරෙහි වෙසෙසි බලපෑමක් සිදු නොකිරීම විශේෂ කරුණකි. ඒ සඳහා යොදාගත් නියදි තරම විශාල නොවීම ඊට හේතු විය හැකිය.

නිගමන හා යෝජනා

අධ්‍යයනය තුළ ලබා ගත් ප්‍රතිඵල හා නිගමන මත ඉදිරිපත් කළ හැකි ප්‍රතිපත්තිමය ගම්‍යතාවයන් ලෙස, කුඩා පරිමාණ කර්මාන්තයන් ඉල්ලුම් කරන ණය ප්‍රමාණ සහනදායී තත්ත්වයන් හා කොන්දේසි යටතේ ලබා දීමට කටයුතු කිරීම, බැංකු ණය සැපයීමේ දී අනවශ්‍ය ප්‍රමාදයන්ගෙන් තොරව ලබා දීමට කටයුතු කිරීම, සීමිත ණය ප්‍රමාණයන් ඉල්ලුම් කරන විට ප්‍රමාදයන් සිදු

වීම වැළැක්වීම සඳහා කණ්ඩායම් ණය යෝජනා ක්‍රම හඳුන්වා දීම, ග්‍රාමීය මට්ටමින් බැංකු ශාඛා පිහිටුවීම හා ඒවාට ව්‍යාපාරික පහසුකම් මෙන්ම ව්‍යාපාරික සැලසුම් හඳුන්වා දීම ආදී ක්‍රියාමාර්ග හඳුනාගත හැක.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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RESEARCH IN PROGRESS EXTENDED ABSTRACTS

ශ්‍රී ලංකාවේ දේශීය සහල් මිල තීරණය වීමට බලපාන සාධක

එච්. එම්. අයි. සඳමාලි සහ එම්. බී. රණතිලක

ආර්ථික විද්‍යාව හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙණිය විශ්ව විද්‍යාලය

මූල පද: *දේශීය සහල් මිල, උච්චාවචනය, බලපෑම් සාධක*

හැඳින්වීම

පොදුවේ ගත්කල සහල් ගෝලීය වශයෙන් මෙන්ම ආසියාතික වශයෙන් ද ප්‍රධාන ආහාර ද්‍රව්‍යයකි. ලෝක ජනගහනයෙන් බිලියන 2.4 ක් ම තම පෝෂණ අවශ්‍යතාව වෙනුවෙන් සහල් පරිභෝජනය කරති. සහල් තුළින් ඔවුන්ගේ දෛනික කැලරි අවශ්‍යතාවයෙන් සියයට 20 කට වඩා වැඩි ප්‍රමාණයක් සපුරාගනු ලබයි (Lampe 1995). එසේම IRRI (2013) වාර්තාවට අනුව ගෝලීය ඒක පුද්ගල ශක්ති පරිභෝජනයෙන් 1/4ක් පමණ සහල් පරිභෝජනයෙන් සපයාගත හැකි වේ. Peterson & Warren (1989) සිදුකළ අධ්‍යනයකට අනුව ශ්‍රී ලංකාව ද ඇතුළුව සහල් මූලික ආහාරය කොටගත් ආසියාතික රටවල් 14ක් හඳුනාගෙන තිබේ. ඒ බංගලාදේශය, බුරුමය, චීනය, ඉන්දියාව, ඉන්දුනීසියාව, ජපානය, දකුණු කොරියාව, මැලේසියාව, නේපාලය, පිලිපීනය, සිංගප්පූරුව, ශ්‍රී ලංකාව, තායිලන්තය සහ තායිවානය යනාදිය යි. ආසියාතික රටවල් විසින් ලෝක සහල් නිෂ්පාදනයෙන් සියයට 90 ක් නිෂ්පාදනය සහ පරිභෝජනය කරනු ලබයි (ලොකුපතිරගේ 2012).

ලෝක ජනගහනය වර්ධනය වීමට සමාන්තරව හරිත විප්ලවය තුළින් නව වී වර්ග හඳුන්වාදීම සහ පොහොර තාක්ෂණය වැඩිදියුණු වීම හේතුකොට ගෙන සහල් නිෂ්පාදන අංශයේ සුවිශේෂී වර්ධනයක් දක්නට ලැබුණි (ලෝක ආහාර සහ කෘෂිකාර්මික සංවිධානය 2012). පසුගිය දශක දෙකක කාලය තුළ චීනය, මැලේසියාව හා තායිලන්තය වැනි මැදි ආදායම් ලබන රටවල මස් සහ එළවළු වැඩිපුර පරිභෝජනය කර තිබෙන අතර ධාන්‍ය වර්ග අඩුවෙන් පරිභෝජනය කර තිබේ. එසේම බංගලාදේශය, කාම්බෝජය, ලාඕසය, මියන්මාරය සහ පිලිපීනය වැනි මධ්‍යම අඩු ආදායම් ලබන ආසියාතික රටවල් බොහොමයක ඒක පුද්ගල සහල් පරිභෝජනය කාලයත් සමඟ ඉහළ යන තත්වයක් දක්නට ලැබේ. නමුත් මෑතකාලීනව ඉන්දියාව, ඉන්දුනීසියාව, වියට්නාමය හා ශ්‍රී ලංකාව වැනි අනෙකුත් සංවර්ධනය වෙමින් පවතින ආසියාතික රටවල ආදායම ඉහළයාමත් සමඟ ඒක පුද්ගල සහල් පරිභෝජනය සෙමින් පහළ බසින තත්වයක් දක්නට ලැබේ (IRRI 2013). මෙලෙස තම ආදායම ඉහළයාමත් සමඟ මිනිසුන් තම භෝජන රටාව වෙනස් කිරීමක් දක්නට ලැබෙන බැවින් ඒක පුද්ගල සහල් පරිභෝජනයේ

වෙනස්වීමක් පවතී. නමුත් අඩු ආදායම්ලාභී රටවල්වල සමස්ත සහල් ඉල්ලුමේ ඉහළයාමක් පවතී. ඒ තම ශක්ති අවශ්‍යතාවයෙන් වැඩි ප්‍රමාණයක් උකහාගැනීම සඳහා තම ආදායමෙන් වැඩි ප්‍රතිශතයක් සහල් පරිභෝජනය වෙනුවෙන් වැය කිරීමෙනි. FAPRI (2013) වාර්තාවට අනුව 2010 වර්ෂයේදී මිලියන ටොන් 388ක් වූ ආසියාතික සහල් ඉල්ලුම 2035 වසර වනවිට මිලියන ටොන් 465ක් ලෙස වර්ධනය වන බව ප්‍රක්ෂේපනය කර තිබේ. ඒක පුද්ගල ආදායම් වර්ධනය වේගවත් වීම හා ජනගහන වර්ධන වේගය ඉහළයාමත් සමඟ මෙලෙස ගෝලීය වශයෙන් පවතින සහල් ඉල්ලුම් හා සැපයුම් ප්‍රවණතාවයන් මත ලෝක සහල් මිල නිරන්තරයෙන් උච්චාවචනය වන තත්වයක් හඳුනාගත හැකිය.

ලෝක සහල් මිල අස්ථාවර ස්වභාවයෙන් පැවතීම එම රටවල සහල් නිෂ්පාදකයන්ගේ සහ අතරමැදිකරුවන්ගේ ආදායම් කෙරෙහි මෙන්ම ඉල්ලුම් කරුවන්ගේ පැහැදම කෙරෙහි ද නොයෙක් බලපෑම් සිදුකළ හැකියි. ප්‍රධාන ආහාර ද්‍රව්‍යයක් ලෙස පමණක් නොව රසකැවිලි නිෂ්පාදනය, මත්ද්‍රව්‍ය පාන වර්ග සැකසීම, සබන් සහ සේදුම් කාරකයන් නිෂ්පාදනය මෙන්ම පශු සම්පත් නිෂ්පාදනය සඳහා ද බොහෝ රටවල් සහල් ඉල්ලුම් කරති (IRRI 2013). එබැවින් සහල් මිල ඉහළයාම ගෝලීය වශයෙන් විවිධ පාර්ශවයන් කෙරෙහි බලපෑම් එල්ල කළ හැකි සාධකයකි. එනම් ඉහළයන සහල් මිල පාරිභෝගික ක්‍රයශක්තිය සහ ජීවන තත්වය කෙරෙහි බලපෑම් ඇතිකළ හැකි අතරම නිෂ්පාදන කර්මාන්තවල පිරිවැය ඉහළ ගොස් කර්මාන්ත බිඳවැටීමට මෙන්ම ජාත්‍යන්තර වශයෙන් උද්ධමනකාරී ස්වභාවයන් සහ සේවා වියුක්ති තත්වයන් පවා ඇතිකරන අර්බුධකාරී වාතාවරණයක් ද ඇතිකිරීමේ හැකියාවක් පවතියි.

ආසියාතික රටක් වශයෙන් ශ්‍රී ලංකාව තුළ ද සහල් සඳහා සමාජ, ආර්ථික, දේශපාලනික හා සංස්කෘතික වැදගත්කමක් පවතී. ශ්‍රී ලාංකිකයන් අතිබහුතරයක් තම ප්‍රධාන ආහාරය වශයෙන් සහල් පරිභෝජනය කරති. ඔවුන් තම කැලරි අවශ්‍යතාවයෙන් සියයට 45 ක් ද ප්‍රෝටීන් අවශ්‍යතාවයෙන් සියයට 40ක් ද සහල් පරිභෝජනයෙන් සපුරාගනු ලබයි (IRRI 2013). ඒ සඳහා එක් පුද්ගලයකු වර්ෂයකදී සහල් කිලෝග්‍රෑම් 100ක් පරිභෝජනය කරයි (ජන ලේඛන හා සංඛ්‍යා ලේඛන දෙපාර්තමේන්තුව 2013). සහල් සඳහා වන ඉල්ලුම වර්ෂයකට සියයට 1.1 බැගින් ඉහළ යන බව ඇතැම් පුරෝකතන තුළින් හෙළිකරන අතර එම ඉල්ලුම සපුරාලීම සඳහා සහල් නිෂ්පාදනය වර්ෂයකට සියයට 2.9ක අනුපාතයකින් ඉහළ යා යුතුයැයි ගණන් බලා තිබේ (ශ්‍රී ලංකා මහ බැංකුව 2011). එපමණක් නොව පාරිභෝගිකයාගේ ප්‍රධාන ආහාර භෝගය සහ නිෂ්පාදකයාගේ හෝ අතරමැදිකරුගේ ප්‍රධාන ඉපයීම් මාර්ගය ලෙස ද සේවා නියුක්තිය ඇතිකරන රැකියා මූලාශ්‍රයක් ලෙස ද සහල් නිෂ්පාදන අංශය වැදගත් වේ. ලොකුපතිරගේ (2012) පර්යේෂණයට

අනුව මුළු ශ්‍රම බලකායෙන් සියයට 30කට වඩා වැඩි ප්‍රමාණයක් ඍජුවම හෝ වක්‍රවම සහල් හා වී නිෂ්පාදන අංශය හා සම්බන්ධ වේ. එමෙන්ම ශ්‍රී ලාංකිකයන් මිලියන 1.8කට වැඩි ප්‍රමාණයක් තම ජීවන උපාය වශයෙන් මෙම අංශයේ නියලෙන බව හඳුනාගනී.

දේශීය සන්දර්භය තුළ ද සහල් මිල නිරන්තරයෙන් උච්ඡාවචනය වන ස්වභාවයක් හඳුනාගත හැකි වේ. කාලගුණික හා දේශගුණික වෙනස්වීම්වලට අනුව සහ අස්වනු නෙළන වාරයන්හි විවිධත්වය අනුව සිදුවන අපේක්ෂිත විචලනයන් මෙන්ම අනපේක්ෂිත මිල කම්පනයන් ද ඒ අතර විය හැකියි. ශ්‍රී ලංකා මහ බැංකු වාර්ෂික වාර්තාවන්ට අනුව 2008 වර්ෂයේදී අසාමාන්‍ය ලෙස ඉහළ ගිය වාර්ෂික සාමාන්‍ය සහල් මිල 2011 වසර වනවිට ක්‍රමයෙන් පහළ බැස තිබෙන අතර ප්‍රතිපත්තිමය වෙනස්කම් හා වෙළඳපොළ තත්වයන්ට ප්‍රතිචාර දක්වමින් 2012-2016 කාලය තුළ සහල් මිල ක්‍රමයෙන් ඉහළ යාමක් දක්නට ලැබුණි. සහල් මිල අර්බුදය ප්‍රබල වීමක් 2017 වසර ආරම්භයේදී හඳුනා ගැනීමට හැකිවුණි. 2016 වර්ෂයේ නොවැම්බර් මාසය වනවිට රුපියල් 86.20ක පැවති නාඩු සහල් කිලෝග්‍රෑමයක මිල 2017 වර්ෂයේ ජනවාරි මාසය වනවිට 96.26ක් ලෙස ඉහළ යාමෙන් එය තහවුරු වේ (ජන ලේඛන හා සංඛ්‍යා ලේඛන දෙපාර්තමේනතුව 2017). මෙය රටතුළ සහල් හිඟයක් නිර්මාණය කිරීමට පවා හේතු විය.

මෙලෙස නිරන්තරයෙන් සහල් මිල උච්ඡාවචනය වීම දේශීය ආර්ථික කාරකයන් කෙරෙහි නොයෙක් අයුරින් බලපෑම් කරයි. මිල ඉහළයාම පාරිභෝගික ක්‍රයශක්තිය, ජීවන තත්වය හා දරිද්‍රතාවය මත මෙන්ම කාර්මික නිෂ්පාදන අංශයේ වැටුප් පිරිවැය හා නිෂ්පාදන ඵලදායිතාවය කෙරෙහිද බලපෑම් ඇතිකළ හැකියි. එමෙන්ම ඉතුරුම් හා ආයෝජන කෙරෙහිද බලපෑම් ඇතිකළ හැකියි. ඉහළ සහල් මිල ග්‍රාමීය ප්‍රදේශවල අඩු අධ්‍යාපනලාභී ශ්‍රමිකයන් උත්තේජනය කරයි. එය දීර්ඝකාලීනව ග්‍රාමීය අංශයේ ශ්‍රමික වැටුප් ඉහළ යාමට හේතුවිය හැකියි. ඒ තුළින් වැටුප් ශ්‍රමික කුටුම්බ සහ ස්වයං රැකියාවල නියුතු ගොවීන් ප්‍රතිලාභ ලබති. සහල් මිල නිරන්තරයෙන් ඉහළයාම ආහාර මිල උද්ධමනයකට ද මගපාදයි. එය පොදු මිල මට්ටම ඉහළගොස් උද්ධමනකාරී තත්වයන් පවා ඇතිවීමට හේතුවිය හැකි අතරම ඒ හේතුවෙන් පසුකාලීනව සේවා වියුක්තිය වැනි සාර්ව ආර්ථික අස්ථායිතාවයන් ඇතිකිරීමට පවා හේතුවිය හැකියි. ඉහළ සහල් මිල ජාත්‍යන්තර ආර්ථික තරඟකාරිත්වය සීමා කිරීමට හේතුවිය හැකි අතරම ආහාර මිල අනපේක්ෂිත සහ අවිනිශ්චිත ලෙස උච්ඡාවචනය වන තරමට රටක දේශපාලනික ස්ථාවරත්වය ද අනපේක්ෂිත වේ.

එමෙන්ම සහල් නිෂ්පාදකයාගේ ආදායම තීරණය කරන ප්‍රධාන සාධකය ලෙස ද වැදගත්වන "ශ්‍රී ලංකාවේ දේශීය සහල් මිල" තීරණය වීම කෙරෙහි බලපාන සාධක විමර්ශනය කිරීම කාලීන වශයෙන් වැදගත්කමක් උසුලයි.

එමෙන්ම සහල් මිල තීරණය වීමට බලපාන සාධක සහල් මිල සමඟ පවත්නා කෙටිකාලීන හා දිගුකාලීන සබඳතාව සංඛ්‍යාත්මකව විශ්ලේෂණය කිරීම සහ මෙම සාධක අතුරින් බලාත්මක සාධක හඳුනාගැනීම මේ තුළින් අධ්‍යනය කිරීමට අපේක්ෂා කරයි.

සාහිත්‍ය විමර්ශනය

ලොව විවිධ පර්යේෂකයන් විසින් සහල් මිල හා සම්බන්ධිත නොයෙක් මාතෘකා ඔස්සේ විවිධ අයුරින් අධ්‍යනයන් සිදුකර ඇත. දයාරත්න ඇතුළු පිරිස (Dayarathne et al. 2008) විසින් ශ්‍රී ලංකාවේ සහල් මිල පාලනයේ අර්ථ හා නිරර්ථ පිළිබඳ අධ්‍යනය කිරීම සඳහා ද්විතියික දත්ත මූලාශ්‍ර භාවිතයෙන් දත්ත රැස්කර තිබේ. එහිදී සහල් මිල ඉහළයාම හා රජයේ ප්‍රතිපත්ති භාවිතය පිළිබඳව සාකච්ඡා කරයි. නොමඟ යවන ආනයනික ප්‍රතිපත්ති සහ තරඟකාරී නොවන සහල් වෙළඳපොළ ක්‍රියාකාරකම් ඉහළයන සහල් මිල කෙරෙහි මූලිකවම බලපාන බව හඳුනාගෙන තිබෙන අතර මිල සීමාවන් පැනවීම මඟින් ශ්‍රී ලංකාවේ සහල් මිල අර්බුදය ඵලදායිව විසඳිය නොහැකි බව පෙන්වා දී තිබේ. සහල් හා තිරිඟු ආනයනය කිරීම මිල සීමාවන් පැනවීමට සාපේක්ෂව කෙටිකාලීනව තාවකාලික සහල් හිඟය ඉවත් කළහැකි ක්‍රමයක් වන බව පෙන්වා දෙයි. එසේම කුමාර් සහ ශර්මා (Kumar & Sharma 2006) යන අය විසින් මිල විචලතාවය හා එහි නිර්ණායක අධ්‍යනය කිරීම උදෙසා 1980 - 2000 කාලවකවානුවේ ඉන්දියාවේ තිරිඟු, සහල් සහ රළු ධාන්‍යවල මිලගණන් පිළිබඳ කාලශ්‍රේණි දත්ත ලබාගනිමින්, සංඛ්‍යානමය විශ්ලේෂණ ක්‍රමවේදය ඔස්සේ සිදුකරන ලද අධ්‍යනයට අනුව රජයේ මැදිහත්වීම් හා අනපේක්ෂිත සැපයුම සහල් සහ තිරිඟුවල මිල ඉහළයාම කෙරෙහි ඍණ බලපෑමක් ඇතිකරන බව හඳුනාගෙන ඇත. එමෙන්ම තිරිඟු හා සසඳන කල රජය විසින් සහල් මිලදී ගැනීම හා මිල සීමාවන් පැනවීම සඳහා මැදිහත්වීම තොග මිල පරාසය සඳහා වැඩි බලපෑමක් එල්ලකරන ආකාරය පෙන්වා දෙයි. ඒ අනුව මෙම අධ්‍යන දෙක තුළින්ම සහල් මිල පාලනය කෙරෙහි රාජ්‍ය මැදිහත්වීමෙහි ඍණ බලපෑම් පිළිබඳව සාකච්ඡා කර තිබේ.

සුෂිල් ඇතුළු පිරිස (Sushil et al. 2008) විසින් ද්විතීයික මූලාශ්‍ර ඔස්සේ රැස්කරන ලද දත්ත භාවිතකර සහල් මිල අර්බුදයේ හේතු, බලපෑම් සහ විසඳුම් පිළිබඳව අධ්‍යනයට ලක්කර ඇත. එහිදී ඔවුන් විසින් විස්තරාත්මක ක්‍රමවේදය භාවිත කරමින් දත්ත විශ්ලේෂණය කිරීම තුළින් සහල් සඳහා පවතින දීර්ඝකාලීන ඉල්ලුම් සැපයුම් අසමබරතාවය වර්තමාන සහල් අර්බුදයට බලපාන මූලිකම හේතුව බව පෙන්වා දෙයි. තවදුරටත් සහල් ඵලදා වර්ධන අනුපාතිකය, සහල් තොග මට්ටම, සහල් ඉල්ලුම, කෘෂිකාර්මික පර්යේෂණ හා සංවර්ධනය සඳහා වන රාජ්‍ය ආයෝජන සහ තෙල් මිල ඉහළයාමත් සමඟ සහල් නිෂ්පාදනයේ ශක්ති පිරිවැය ආදී සාධක සහල් මිල

කෙරෙහි මූලිකවම බලපෑම් ඇතිකරන බව හඳුනා ගනියි. එමෙන්ම පර්යේෂණ හා සංවර්ධන කටයුතු ඉහළ නැංවීම තුළින් සහල් ඵලදායිතාවය ඉහළ නැංවීම සහල් මිල අර්බුදයට මූලික විසඳුමක් බව දක්වන අතරම ආහාර මිල ඉහළයාම අඩුමතරමින් මිලියන 32ක් පමණ මිනිසුන් නැවත දරිද්‍රතාවය දෙසට ඇදමීමට සමත්වන බව ද හඳුනාගෙන තිබේ.

ඇමරිකාවේ සහල් ඉල්ලුම, සැපයුම හා සහල් මිල තීරණය වීමට බලපාන සාධක පිළිබඳ විශ්ලේෂණය කිරීම පිළිබඳ අවධානය යොමු කරමින් ග්‍රාන්ට් සහ ලීත් (Grant & Leath, 1979) විසින් සිදුකළ අධ්‍යනය සඳහා අඩුතම වර්ග නිමානිත ක්‍රමය භාවිතයෙන් දත්ත විශ්ලේෂණයක් සිදුකර තිබේ. අධ්‍යනයට අනුව, වාර්ෂික දේශගුණික වෙනස්වීම්, තාක්ෂණික වෙනස්වීම්, සහල් වගාකරන භූමි ප්‍රදේශය, පසුගිය වර්ෂයේ ගොවිපළ මිල, රජයේ වැඩසටහන් ආදී සාධක සහල් සැපයුම කෙරෙහි දැඩිලෙස බලපාන අතර ම සහල්වල සිල්ලර මිල වෙනස්වීම සහල් ඉල්ලුම කෙරෙහි එතරම් බලපෑමක් නොමැති බව පෙන්වා දේ. එමෙන්ම වර්තමාන සහල් බීජ (බිත්තර වී) ඉල්ලුම ඊළඟ වසරේ වී වගාකරන අක්කර ප්‍රමාණය කෙරෙහි විශාල බලපෑමක් ඇතිකරන බව ද හඳුනා ගනී.

සච්චමර්ගා සහ විලියම්ස් (Sachchamarga & Williams, 2004) විසින් ද්විතීයික දත්ත මූලාශ්‍ර භාවිත කරමින් ආර්ථික මිථික විශ්ලේෂණ ක්‍රමවේදය ඔස්සේ සහල් නිෂ්පාදනය සඳහා බලපාන ආර්ථික සාධක හඳුනාගැනීම හා මිනුම් කිරීම පිළිබඳව තායිලන්තය ඇසුරින් සිදුකළ අධ්‍යයනයට අනුව පෙර වර්ෂවල වී වගාකළ භූමි ප්‍රමාණය මෙම වර්ෂයේ වගාකරන භූමි ප්‍රමාණය කෙරෙහි බලපාන බව පෙන්වා දෙයි. එමෙන්ම වර්ෂාපතනයේ ප්‍රමාණය, වී හෝ සහල් මිල ගණන්, ආදේශන භාණ්ඩ මිල ගණන් හා යෙදවුම් මිල ගණන් ආදී සාධක සහල් නිෂ්පාදනය සඳහා මූලිකවම බලපාන බව හඳුනා ගනියි.

පර්යේෂණ පරතරය

සහල් මිල ප්‍රතිපත්ති සහ ඒවායේ සමාජ ආර්ථික ප්‍රතිවිපාක, එමෙන්ම සහල් මිල උච්ඡාවචනය වීම හා එය ආර්ථික, සමාජ හා දේශපාලනික අංශයන් වෙත ඇතිකරන බලපෑම, සහල් ඉල්ලුම හා සැපයුම තීරණය කරන සාධක යනාදී ක්ෂේත්‍රයන් පිළිබඳ දේශීය වශයෙන් මෙන්ම ජාත්‍යන්තර වශයෙන් ද අධ්‍යනයන් රැසක් සිදුකර ඇති මුත් සෘජුවම සහල් මිල තීරණය වීමට බලපාන සාධක හඳුනාගැනීම සඳහා මෑතකාලීනව ශ්‍රී ලංකාව තුළ සිදුකර ඇති අධ්‍යනයන් සීමිත වේ. එබැවින් දේශීය සහල් මිල තීරණය වීමට බලපාන සාධක විශ්ලේෂණය කිරීම මෙම අධ්‍යනයේ පර්යේෂණ පරතරය වේ.

අධ්‍යයන අරමුණු

අධ්‍යනයේ ප්‍රධාන අරමුණ වන්නේ ශ්‍රී ලංකාවේ දේශීය සහල් මිල තීරණය වීම කෙරෙහි බලපාන සාධක හඳුනා ගැනීමයි. එහිදී පොදුවේ සහල් ඉල්ලුම හා සැපයුම වෙනස්වීම ඔස්සේ සහල් මිල වෙනස්වීම සඳහා බලපාන සාධක මොනවා ද යන්න හඳුනාගැනීම සිදුකෙරේ. සහල් මිල තීරක (Factors) සහල් මිල සමඟ පවත්නා කෙටිකාලීන හා දිගුකාලීන සබඳතාව සංඛ්‍යාත්මකව විශ්ලේෂණය කිරීම මෙම අධ්‍යනයේ උප අරමුණක් ලෙස ගැනේ. එමෙන්ම හඳුනාගත් සහල් මිල තීරණය වීමට බලපාන සාධක අතුරින් බලාත්මක සාධක කවරේ ද යන්න පිළිබඳ විග්‍රහ කිරීමට ද මේ ඔස්සේ අපේක්ෂා කෙරේ.

පර්යේෂණ ක්‍රමවේදය

මෙම අධ්‍යනය සඳහා විස්තරාත්මක විශ්ලේෂණය මෙන්ම ආර්ථිකමිතික විශ්ලේෂණ ක්‍රමවේදය ද යොදා ගනියි. සහල් මිල තීරණය වීමට බලපාන සාධක සහල් මිල සමඟ පවත්නා සබඳතාවයේ ස්වරූපය අධ්‍යනය කිරීම සඳහා ආර්ථිකමිතික විශ්ලේෂණ ක්‍රමවේදය යොදාගනු ලැබේ. එහිදී කාලශ්‍රේණි ප්‍රතිපායන ආදර්ශයක් භාවිත කරමින් එම සාධක සහල් මිල සමඟ පවත්නා කෙටිකාලීන හා දිගුකාලීන සබඳතාවය පරීක්ෂා කරයි. ඒ සඳහා පහත ප්‍රතිපායන ආදර්ශය යොදා ගනියි.

$$\boldsymbol{ln(RP_t) = \beta_o + \beta_1 \ln(GP_t) + \beta_2 \ln(pp_t) + \beta_3 \ln(pw_t) + \beta_4 \ln(iR_t) + \beta_5 \ln(EP_t) + \beta_6 \ln(AP_t) + \beta_7 \ln(RA_t) + \varepsilon_t}$$

R = ශ්‍රී ලංකාවේ දේශීය සහල් මිල (සහල් කිලෝග්‍රෑමයක වාර්ෂික සාමාන්‍ය මිල)

G = වී කිලෝග්‍රෑමයකට පනවා ඇති සහතික මිල

P = වාර්ෂික වී නිෂ්පාදන ප්‍රමාණය

Pw = තිරිඟු පිටි කිලෝග්‍රෑමයක වාර්ෂික සාමාන්‍ය මිල

iR = වාර්ෂික සහල් ආනයනික ප්‍රමාණය

E = වාර්ෂික සාමාන්‍ය විදුලි ගාස්තුව

A = මධ්‍ය වාර්ෂික ජනගහනය

RA = වාර්ෂික වර්ෂාපතනය (mm)

ε_t = දෝෂ පදය

t = කාල උපනතිය (1977 - 2016)

මෙහිදී සහල් කිලෝග්‍රෑමයක වාර්ෂික සාමාන්‍ය මිල සඳහා නාඩු සහල් කිලෝග්‍රෑමයක වාර්ෂික සාමාන්‍ය මිල යොදා ගැනේ. මෙහි ඇති වී කිලෝග්‍රෑමයකට පනවා ඇති සහතික මිල නැමැති ස්වායත්ත විචල්‍යය මඟින්

වී මිල තීරණය කිරීම සඳහා වන රාජ්‍ය මැදිහත්වීම නිරූපණය කරයි. වාර්ෂික වී නිෂ්පාදන ප්‍රමාණය තුළින් දේශීය සහල් සැපයුම තීරණය වන අතර තිරිඟුපිටි මිල තුළින් සහල් මිල කෙරෙහි ආදේශන භාණ්ඩ මඟින් ඇතිකරන බලපෑම නිරූපණය කරයි. එමෙන්ම සහල් ආනයනික ප්‍රමාණය රටේ සමස්ත සහල් සැපයුම කෙරෙහි බලපාන විචල්‍යකි. වාර්ෂික සාමාන්‍ය විදුලි ගාස්තුව ඇසුරින් සහල් නිෂ්පාදනයේ බලශක්ති පිරිවැය නිරූපණය කරයි. මධ්‍ය වාර්ෂික ජනගහනය සහල් ඉල්ලුම කෙරෙහි බලපෑම් කරන අතර වාර්ෂික වර්ෂාපතනය සහල් නිෂ්පාදනය කෙරෙහි බලපාන විචල්‍යකි.

දත්ත විශ්ලේෂණය කිරීම සඳහා E-views 7 පරිගණක මෘදුකාංගය භාවිත කෙරේ. ද්විතීයික දත්ත මත පදනම් වන මෙම අධ්‍යනය සඳහා ශ්‍රී ලංකා මහ බැංකු වාර්ෂික වාර්තා, ජන හා සංඛ්‍යා ලේඛන දෙපාර්තමේන්තු වාර්තා, පර්යේෂණ ලිපි, ප්‍රකාශිත පොත්පත්, සඟරා සහ අන්තර්ජාලය යනාදියෙන් දත්ත රැස්කිරීමට අපේක්ෂා කෙරේ.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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සාම්ප්‍රදායික සහ නූතන ආහාර අතර තරඟය : සහල්වලට එදිරිව තිරිඟුපිටි පිළිබඳව සංසන්ධනාත්මක අධ්‍යයනයක්

පී.එල්.සී.ජේ. ගමගේ සහ එම්.බී. රණතිලක

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙනිය විශ්වවිද්‍යාලය

මූල පද: *දේශීය ආහාර, විදේශීය ආහාර, තිරිඟු පිටි පරිභෝජනය*

හැඳින්වීම

වර්තමානයේ ආහාර පරිභෝජන රටාව, ආහාර ඉල්ලුම හා එහි ප්‍රවණතාවයන් පිළිබඳව අධ්‍යයනය කිරීමේදී ඒ හා සම්බන්ධ ඓතිහාසික තත්ත්වයන්ද වැදගත් වේ. වර්ෂ 1505 සිට සිදු වූ විදේශීය ආක්‍රමණයන්ගෙන් පසු කෘෂිකර්මාන්තය කෙරෙහි පැවති රාජ්‍ය අවධානය අවම වූ අතර ආහාර නිෂ්පාදනය පහත වැටීම නිසා සහල් ප්‍රමුඛ ආනයන ද්‍රව්‍යයක් බවට පත් විය (සෝමරත්න, 1991). නමුත් ක්‍රමක්‍රමයෙන් සහල් ආනයනය පහළ ගොස් වර්තමානය වන විට තිරිඟු ආනයනය ඉහළ අගයක්ව පවතින බව ආහාර ශේෂ පත්‍ර පිරික්සීමෙන් පැහැදිළි වේ. 1961 දී සහල් ආනයනය තිරිඟු ආනයනය අභිබවා පැවති අතර එහි පරතරය මෙට්‍රික් ටොන් 816,990 කි. 2013 වන විට සහල් මෙට්‍රික් ටොන් 22,930ක් හා තිරිඟු මෙට්‍රික් ටොන් 494,400ක් ලෙස මෙට්‍රික් ටොන් 471,470ක විශාල පරතරයක් සහිතව තිරිඟු ආනයනිත ප්‍රමාණය ඉහළ ගොස් ඇත (ආහාර ශේෂ පත්‍රය 1961, 2013). එය ශ්‍රී ලංකාවේ වර්තමාන පරිභෝජන රටාව පිළිබිඹු කරන කැඩපතකි.

වර්තමානය වන විට තිරිඟු පිටි, සහල් පරිභෝජනය සඳහා බලපෑම් කිරීමට තරම් සමත් වීම කාගේත් අවධානයට පාත්‍ර වූ කරුණකි. මේ ආකාරයට තිරිඟු පිටි ධාන්‍යමය ආහාර ද්‍රව්‍ය අතරින් ඉතා වැදගත් හා ජනප්‍රිය ද්‍රව්‍යක් බවට පත්වෙමින් පවතී. සහල් සමඟ සංසන්දනාත්මකව දක්වන විට තිරිඟු ආශ්‍රිත ආහාර පිළියෙල කර ගැනීමේ පහසුව මෙම ජනප්‍රියත්වයට හේතු වී ඇති අතර තිරිඟු පිටි මිලෙන් අඩු ද්‍රව්‍යක් වීමද එහි පරිභෝජනය වැඩි වීමට හේතු වේ (ආරියවර්ධන, 2003). නාගරීකරණය හේතුවෙන් ආසියාතික රටවල සහල් මත ඍණ බලපෑමකුත් තිරිඟු පරිභෝජනය මත ධන බලපෑමකුත් සිදු කරන බව ආසියාතික රටවල් ආශ්‍රයෙන් සිදු කර ඇති අධ්‍යයන මඟින් තහවුරු කර ඇත. එසේම කාන්තා සේවා නියුක්තිය නිසා ගෘහණියට ආහාර පිසීම සඳහා විවේකයක් නොමැති වීම, ආදායම් මට්ටම් ඉහළ යාම, නාගරීකරණය යන සාධක හේතුවෙන් ක්ෂණික හා විදේශීය ආහාර සපයන අවන්හල් වෙතින් තම පරිභෝජන අවශ්‍යතා තෘප්තිමත් කර ගැනීමට යොමු වේ.

මෙම සන්දර්භය තුළ වර්තමානයේ විදේශීය පිසූ ආහාර අවන්හල් ද ව්‍යාප්ත වෙමින් පවතියි. එම ආයතන අවශ්‍ය අමුද්‍රව්‍ය ආනයන මඟින් සපයා ගන්නා

අතර එහිදී තිරිඟුපිටි ප්‍රධාන අමුද්‍රව්‍යක් වේ. විදේශීය අවන්හල් ලබන ලාභය මව් රට වෙතට රැගෙන යාම නිසා ඒවා රට තුළ ප්‍රාග්ධන සම්පාදනයට යෙදවීමට අවස්ථාවක් හිමි නොවේ. විදේශීය ධාන්‍ය ආනයනය හේතුවෙන් දේශීය කෘෂි බෝග සඳහා වෙළඳපළ අහිමි වන අතර එම බෝග වගා කිරීම සඳහා පවතින අභිප්‍රේරණයද හීන වෙමින් පවතියි. ආහාර ද්‍රව්‍ය ආනයනය කිරීම මඟින් ගෙවුම්ශේෂ හිඟය තව දුරටත් පුළුල් වන බව පොදු පිළිගැනීමයි. මහබැංකු වාර්තාව (2015) දක්වන පරිදි ශ්‍රී ලංකාවේ ආහාර ආනයන වියදම ඩොලර් මිලියන 1627.8 ක් වන අතර ආහාර අපනයන ආදායම ඩොලර් මිලියන 112.6 කි. ගෙවුම්ශේෂ හිඟයට ආහාර ආනයන වියදම හා ආහාර අපනයන ආදායම අතර පරතරය සෘණාත්මක බලපෑම් කර ඇති බව මෙහිදී පැහැදිලිය. වර්තමානය වන විට ශ්‍රී ලංකාව තුළ දේශීය පිසූ ආහාර අවන්හල්ද ව්‍යාප්ත වෙමින් පවතියි. එම අවන්හල් මඟින් දේශීය ආහාර පිසින ක්‍රමවේද, දේශීය ආහාර පිළිගන්වන ක්‍රමවේද භාවිත කරමින් දේශීය ආහාරවල ගුණය, රසය වෙතට නැවත වතාවක් සමාජීය අවධානය යොමු කර වීමට උත්සාහයක යෙදී සිටියි. ඉහළ ප්‍රචාරණ කටයුතු සිදු කරන, විශාල ශාඛා ප්‍රමාණයක් පවතින, වඩාත් සුදුසු අලෙවි උපක්‍රම භාවිත කරන විදේශීය පිසූ ආහාර සපයන අවන්හල් සමඟ දේශීය පිසූ ආහාර සපයන ආයතනවලට තරඟ කිරීමට ඇති හැකියාව අවම බව විද්වත් මතයයි. එම නිසා එම බාධක අභිබවා යමින් දේශීය ආහාර වෙළඳපල සකස් වීම අවශ්‍ය වේ. මෙවන් තත්ත්වයක් තුළ දේශීය ආහාර වෙළෙඳපොළක අවශ්‍යතාවය ඉස්මතු වෙමින් පවතියි. දේශීය ආහාර වෙළෙඳපොළක ඉදිරි ගමන සඳහා අවැසි වන අවස්ථාවන් හා එයට එරෙහි වන බාධාවන් අධ්‍යයනය කර ඒ සඳහා ක්‍රියාමාර්ග ගැනීම තුළින් දේශීය ආහාර වෙළෙඳපොළත්, දේශීය කෘෂිකර්මාන්තයත්, දේශීය ආර්ථිකයත් ශක්තිමත් කළ හැකිය.

සාහිත්‍යය විමර්ශනය

වෙනස් වන පරිභෝජන රටාවන්, විවිධ ආහාර වර්ග සඳහා පවතින ඉල්ලුම, ආහාර ඉල්ලුම සඳහා බලපාන සාධක, ආහාර අලෙවිසැල් භාවිත කරන අලෙවිකරණ උපක්‍රම යන කරුණු පිළිබඳව දේශීයව මෙන්ම විදේශීයවද අධ්‍යයන රාශියක් සිදු කර ඇත. එහිදී ඇන්ඩ්‍රසන් හා සියාඕහොන් (Androson and xiaohon, 2009) විසින් චීන මහජන සමූහ ආණ්ඩුව හා ඇමෙරිකා එක්සත් ජනපදය යන රටවල සංස්කෘතිය හා ක්ෂණික ආහාර වෙළෙඳපොළ මිශ්‍රණය පිළිබඳව බහුගුණ ප්‍රතිපායන ආදර්ශ යොදා ගනිමින් අධ්‍යයනයක් සිදු කර ඇත. ඇමෙරිකාවේ හා චීනයේ විශාල ප්‍රතිචාර දක්වන්නන් පිරිසක් තම කාලය හා අරමුදල් ඉතිරි කර ගැනීමට ක්ෂණික ආහාර පරිභෝජනය සිදු කරන බවට නිගමනය කර තිබේ. අවන්හල්වලට ළඟා වීමට ඇති පහසුව කෙරෙහි ඇමෙරිකා ජාතිකයින් සලකා බලන අතර චීන ජාතිකයින් පෝෂණය පිළිබඳව සිතා බලයි. අනෙක් කරුණ නම් චීනයේ වයස අවුරුදු තිස්පහට අඩු විශාල සේවා නියුක්ත පිරිසක් ක්ෂණික ආහාර ලබා ගැනීමට යොමුවීමය. පරිභෝජනය කරන ආහාර වර්ගය, ආහාර අලෙවිසැලේ නාමය, අලෙවිසැළ වෙත ළඟා වීමට බලපාන සාධක, මිල, පෝෂණය, රසය, සංස්කෘතික පරිසරය, වයස, ස්ත්‍රී-පුරුෂ සමාජභාවය, රුකියා තත්ත්වය, පවුලේ සාමාජිකයින් ගණන යන කරුණු ඔස්සේ දත්ත රැස් කර ඇත. මීට සමානම අධ්‍යයනයක් ඉස්ලාම් හා උල්ලාහ් (Islam and

Ullah, 2010) විසින් සිදු කර තිබේ. බංගලාදේශයේ ක්ෂණික ආහාර වර්ග මත පරිභෝගික රුචියේ බලපෑම යන අධ්‍යයන මාතෘකාව යටතේ විශ්වවිද්‍යාල සිසුන් 250කින් යුක්ත නියදියක් ගෙන ව්‍යුහාත්මක ප්‍රශ්නාවලියක් භාවිතයෙන් දත්ත රැස් කර ඇති අතර SPSS ක්‍රමවේදය මඟින් දත්ත විශ්ලේෂණය කර ඇත. එහිදී සන්නම්නාමයේ කීර්තිය, රසයේ සමානාත්මතාවය, ආහාරවල ගුණත්වය හා පිරිවැය, ලබා දෙන වට්ටම් හා රසය, පරිසිදු බව, සැරසිලි හා අලෙවි හැකියාව යන සාධක කෙරෙහි පරිභෝගිකයින් වැඩි රුචිකත්වයක් දක්වන බව අවසන් නිගමනය වේ. ඇන්ඩ්‍රසන් හා සියාඕහොන් (Androson and xiaohon, 2009) විසින් සිදු කරන ලද අධ්‍යයනයේදී අවන්හලට ළඟා වීමට ඇති පහසුව, කාලය හා මුදල් ඉතිරි කර ගැනීමට ඇති අවශ්‍යතාවය මත ක්ෂණික ආහාර ලබා ගන්නා බව නිගමනය කර ඇති අතර ඉස්ලාම් හා උල්ලාහ් (Islam and Ullah, 2010) විසින් සිදු කළ අධ්‍යයනයේදී ඊට ප්‍රධානම හේතුව වී ඇත්තේ සන්නම්නාමයේ කීර්තියයි. චීන හා ඇමෙරිකා ජාතිකයින් අතර සන්නම්නාමය යන සාධකය ආහාර අළෙවිසැල් වෙත ළඟා වීම සඳහා විශාල බලපෑමක් සිදු නොකරයි.

පර්යේෂණ ගැටලුව

ශ්‍රී ලංකාවේ පරිභෝගිකයින් විදේශීය හා දේශීය ආහාර පරිභෝජනය වෙත යොමු වීමට බලපාන සාධක මොනවාද? යන්න කුරුණෑගල නගරය ආශ්‍රයෙන් සලකා බැලීම පර්යේෂණ ගැටලුව වේ.

පර්යේෂණ අරමුණු

ප්‍රධාන අරමුණ

- විදේශීය හා දේශීය ආහාර ඉල්ලුමට බලපාන සාධක සන්සන්දනය කිරීම. විදේශීය හා දේශීය ආහාර ඉල්ලුමට බලපාන ආදායම, වැටුප, රැකියාවේ ස්භාවය ආදී විචල්‍යයන්ගේ බලපෑම මෙන්ම රසය, පෝෂ්‍යදායී බව හා මිල ගණන් යන සාධක සම්බන්ධව සංසන්දනයක් සිදු කිරීමට මෙහිදී බලාපොරොත්තු වේ.

උප අරමුණු

- පුද්ගලයින්ගේ වයස් ව්‍යුහය ආහාර ඉල්ලුමට කරන බලපෑම අධ්‍යයනය කිරීම. පාරිභෝගිකයන්ගේ වයස් කාණ්ඩ හා දේශීය, විදේශීය ආහාරවලට ඇති රුචිකත්වය අතර සම්බන්ධතාවය අධ්‍යයනය කිරීම මේ මඟින් අදහස් කෙරේ.

- පුද්ගලයින්ගේ ආදායම් මට්ටම් විදේශීය හා දේශීය ආහාර ඉල්ලුමට කරන බලපෑම හඳුනා ගැනීම.

- කුටුම්භ ව්‍යුහයේ ස්වාභාවය හා ආහාර වියදම අතර සම්බන්ධය හඳුනා ගැනීම.කුටුම්භ ව්‍යුයේ ස්වාභාවය ලෙස මෙහිදී ඔහුගේ හෝ ඇයගේ රැකියාව, සේවයේ යෙදෙන පැය ගණන හා නිවසේ

ගෘහණියගේ වෘත්තීය තත්ත්වය යන සාධක යොදා ගනී. එම සාධක සමඟ දේශීය හා විදේශීය ආහාර ඉල්ලුම අතර පවතින සම්බන්ධතාවය මෙහිදී හඳුනා ගැනේ.

පර්යේෂණ ක්‍රමවේදය

නියදිය තෝරා ගැනීම - කුරුණෑගල නගරය පදනම් කර ගනිමින් එහි පවතින දේශීය හා විදේශීය අවන්හල් වෙතට පැමිණෙන සසම්භාවී ලෙස තෝරා ගත් පාරිභෝගිකයින් 60 බැගින් පුද්ගලයින් 120 ක් නියදිය ලෙස තෝරා ගැනීම සිදු වේ. දේශීය ආහාර සපයන අවන්හල් ලෙස හෙළ බොජුන් අවන්හල්ද, විදේශීය ආහාර සපයන අවන්හල් ලෙස Dominos Pizza, Dine Hut, Pizza Hut, MyBurger අවන්හල්ද මෙහිදී යොදා ගනී. එම අවන්හල් තිරිඟු පිටි පදනම් කර ගත් අළෙවිසැල් වීම අත්‍යවශ්‍ය සාධකයක් වේ.

දත්ත රැස් කිරීම - තෝරාගත් නියදිය සඳහා ප්‍රශ්නාවලියක් යොමු කිරීම මඟින් පාරිභෝගිකයින් මෙම අවන්හල් වෙත පැමිණීමට හේතු සාධක හා එසේ පැමිණන පාරිභෝගිකයින්ගේ ජීවන රටාවන් සම්බන්ධව දත්ත රැස් කිරීම සිදු වේ. ඊට අමතරව ද්විතික දත්ත මූලාශ්‍ර ලෙස සංඛ්‍යාන නිබන්ධන, මහබැංකු වාර්තා, එක්සත් ජනපද කෘෂිකර්ම දෙපාර්තමේන්තු වාර්තා ආදී දත්ත මූලාශ්‍ර භාවිත කර ඇත.

ප්‍රතිපායන ආදර්ශ විශ්ලේෂණය

$$Y_i = \alpha_0 + \alpha_1 I_i + \alpha_2 F_i + \beta_1 D_{pi} + \beta_2 D_{ti} + \mu_1 D_{oi} + \lambda_1 D_{mi} + U_i$$

Y_i = දේශීය/විදේශීය ආහාර සපයන අවන්හලකින් එක් පුද්ගලයකුට ආහාර ගැනීම සඳහා සතියකට වැය වන වියදම

I_i = පාරිභෝගිකයාගේ මාසික ආදායම

F_i = නිවසේ/රැකියා ස්ථානයේ සිට අවන්හලට ඇති දුර

D_{pi} = පාරිභෝගිකයාගේ වයස අවුරුදු 20-30 අතර නම් = 1

D_{ti} = පාරිභෝගිකයාගේ වයස අවුරුදු 40ට වැඩි නම් = 1
(මෙහිදී අත්හරින ලද කාණ්ඩය අවුරුදු 31-40 අතර වයස් කාණ්ඩය වේ.

D_{oi} = විධිමත් රැකියාවක නිරත වන (පැය 8ක සේවා කාලයේ නිරත වන්නේ නම්=1, විධිමත් රැකියාවක නිරත නොවන්නේ නම් 0)

D_{mi} = මව/ගෘහණිය රැකියාවක නිරත වන්නේ නම් = 1, රැකියාවක නිරත නොවන්නේ නම් = 0

U_i = දෝෂ පදය

මෙම ප්‍රතිපායන ආදර්ශය විශ්ලේෂණය මඟින් ඒ ඒ අවන්හල් වෙත පැමිණෙන පාරිභෝගිකයින් සිදු කරන වියදම වයස, ආදායම, සේවාවේ නිරත වන පැය ගණන, අවන්හලට ඇති දුර යන සාධක සමඟ ඇති සම්බන්ධතාවය මිනුම් කරනු ලබයි.

විස්තරාත්මක දත්ත විශ්ලේෂණය

SPSS හා Excel මෘදුකාංගගතවිත කරමින් වගු හා ප්‍රස්තාර මඟින් පාරිභෝගිකයින් මෙම අවන්හල් වෙත පිවිසීමට බලපාන සාධක විශ්ලේෂණය කිරීමක් තව දුරටත් සිදු වේ. එහිදී පෝෂණය, රසය, සන්නම් නාමය, ප්‍රචාරණය, ආහාර මිල ගණන් යන සාධක කෙරෙහි අවධානය යොමු කරයි.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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කාබනික සහ කාබනික නොවන කෘෂි නිෂ්පාදන: ගොවීන්ගේ ආදායම් සහ වියදම් පිළිබඳව විශ්ලේෂණයක්

ඒ. එම්. එස් සංජීවනි සහ එම්. බී. රණතිලක

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙනිය විශ්වවිද්‍යාලය

මූල පද: *කාබනික, කෘෂි නිෂ්පාදන, ගොවිතැන*

හැඳින්වීම

ලෝකය පුරා වැසියන්ගේ විශේෂ අවධානය පරිසරික ගැටලු කෙරෙහි යොමුවෙමින් තිබේ. මේ සන්ධර්භය තුළ පාරිසරික හානිය අවම කරගනිමින් ආර්ථික සංවර්ධනය රටට ළඟා කර ගත යුත්තේ කෙසේද යන ගැටලුවට බොහෝ දෙනා පිළිතුරු සොයමින් සිටියි. මෙම ගැටලුවට විසඳුම් සෙවීමේදී එක්සත් ජාතීන්ගේ සංවිධානය විසින් අවධානය යොමු කළ කරුණක් ලෙස" තිරසාර සංවර්ධනය" හැඳින්විය හැක. එක්සත් ජාතින්ගේ සංවිධානය මඟින් 1980 දී පැවති සම්මේලනයෙන් ලබාගත් තොරතුරු මඟින් ලෝක සංරක්ෂණ ක්‍රමෝපාය (World Conservation Strategy) යන ප්‍රකාශනයෙන් නිෂ්පාදනය හා සංරක්ෂණය තුලිත වන චිරස්ථායි සංවර්ධනයක් ගැන පළමු වරට පැහැදිලි කර තිබේ. 1992 මිහිකත සමුළුවේදී "අපේ පොදු අනාගතය" නමින් වාර්තාවක් ඉදිරිපත් කරමින් ලෝකය හමුවට මෙම කරුණ නැවත ගෙන එන ලදී (වීරකෝන් 1996). තිරසාර යන වචනය සඳහා අර්ථ ඉදිරිපත් කරන විද්වතුන් චිරස්ථායි, කල්පවතින හා සාධාරණ යනාදි තේරුම් රැසක් එයට ඉදිරිපත් කරයි. කෙසේ වුවත් තිරසාර සංවර්ධනය යන්නෙන් ඉදිරිපත් කරනුයේ පරිසර හිතකාමී, ආර්ථිකමය වශයෙන් දැරිය හැකි, දේශපාලනික වශයෙන් සාධාරණ හා සමාජීය වශයෙන් පිළිගත හැකි සංවර්ධනයක් ලෙස සඳහන් කෙරේ. ආර්ථික සමාජීය යන අංශ දෙකටම අලුතින්ම එක්වූ අංශය ලෙස පරිසරය දැක්විය හැක.

පාරිසරික විශ්ලේශකයන්ට අනුව රටක් සංවර්ධනය කළ යුත්තේ පරිසරයට වන හානිය අවම වන ලෙසය. මෙම අවශ්‍යතාවය මත තිරසාර කෘෂිකර්මය යන සංකල්පය නිර්මාණය වී තිබේ. තිරසාර කෘෂිකර්මය යන සංකල්පයේ පදනම ලෙස කාබනික භාවිතය දැක්විය හැක. එනම් රසායනික පොහොර, පළිබෝධක නාශක හා වල්නාශක අවම මට්ටමක පවත්වා ගනිමින් කරනු ලබන කෘෂිකාර්මික නිෂ්පාදනයන්ය. මෙසේ අඩු රසායනික ද්‍රව්‍ය ප්‍රමාණයක් භාවිත කරමින් සිදුකරන නිෂ්පාදනය පරිසර හිතකාමී මෙන්ම පිරිවැයද අවම වන නිෂ්පාදන ක්‍රමයකි. කාබනික නිෂ්පාදන ක්‍රමවේදය ලෝකය පුරා ව්‍යාප්ත කිරීම සඳහා ගොවීන් උනන්දු කිරීමට රාජ්‍ය මෙන්ම රාජ්‍ය නොවන සංවිධානයන්ගේ අවධානය යොමු වීම අවශ්‍යය කරුණක් වී ඇත (ඇපාකන්ද 2002). කාබනික නිෂ්පාදන පරිසර හිතකාමී මෙන්ම සාපේක්ෂව ලාභදායි වේ. බටහිර රටවල් තුළ මෙම කාබනික නිෂ්පාදන සඳහා

වන ඉල්ලුම ක්ෂණයෙන් වර්ධනය වන අතරම බෝග සඳහා ඉහළ මිලක් ලබා ගැනීමේ හැකියාව පවති (ඈපාකන්ද 2002). මෙලෙස කාබනික නිෂ්පාදන සඳහා අවධානයක් යොමුවීමට බලපෑ හේතූන් අතර හරිත විප්ලවය ද ප්‍රධාන වේ. හරිත විප්ලවය මඟින් ඇති වූ විපර්යාසය තත්ත්කාලීනව නොව යථාකාලීනව භුක්ති විඳිමින් සිටියි. කෘෂිකර්මාන්තය සඳහා භාවිත කරනු ලබන කෘෂි රසායනික ද්‍රව්‍ය හේතුවෙන් ශාරීරික අභ්‍යන්තර රෝග වැළඳීමේ ප්‍රවණතාවය ඉහළ ගොස් ඇති බවට ලෝක සෞඛ්‍ය සංවිධානය ප්‍රකාශයට පත්කොට ඇත.

ආහාර නිෂ්පාදනය සඳහා කෘෂි රසායන ද්‍රව්‍ය භාවිතය 18 සහ 19 වන සියවස්වල ආරම්භ වී ඇත. එම අවධිය වන විට ලෝක ජනගහනය සීඝ්‍ර ලෙස වර්ධනය වීම සිදුවිය. මෙම වැඩිවන ජනගහනය සමඟ 18 වන සියවස අග භාගයේදී එංගලන්තය පුරාවට ආහාර අර්බුදයක් නිර්මාණය වූ අතර එම ආහාර අරබුදය හේතු කරගෙන ආහාර මිල ගණන්හි විශාල ලෙස ඉහළ යාමක් සිදුවිය. 1960දී ආරම්භ වන හරිත විප්ලවය මෙම ආහාර අර්බුදයේ එක් ප්‍රතිඵලයකි. ඇති වූ ආහාර අර්බුදය මර්දනය කිරීම සඳහා හරිත විප්ලවය විසදුම් ඉදිරිපත් කරන ලද්දේ වැඩි දියුණු කරන ලද බෝග, අස්වනු වැඩිකරන ලද පොහොර, කෘමි උවදුරු සහ වල් බිහිවීම මර්දනය කරන රසායනික ද්‍රව්‍ය භාවිත කරමිනි. මෙය තත්කාලීනව පැවති අර්බුදයට හොඳ විසඳුමක් වූ අතර වර්තමානය වන විට එය පාරිසරික ගැටලු නිර්මාණය කරන ප්‍රධාන හේතුවක් වේ (රත්නසිරි 2005). හරිත විප්ලවයේ අනිසි ප්‍රතිඵල පළමු වරට ලෝකය හමුවට ගෙනෙනු ලබන්නේ 1962 දී ලියැවුණු රැචෙල් කාසන්ගේ Silent Spring නම් ග්‍රන්ථය මඟින්ය. මෙම ග්‍රන්ථ සමඟින් ලොව දෘෂ්ඨී කෝණය වෙනස් විය. ශ්‍රී ලංකාව තුළ ද මෙම දෘෂ්ඨී කෝණය වෙනස් වෙමින් පවති. එසේම වර්තමානය ලෝකය පුරා ජනතාව සෞඛ්‍යයමත් ජීවිතයක අවශ්‍යතාවය අගය කොට සළකන බැවින් කාබනික නිෂ්පාදන සඳහා විශේෂ වෙළෙඳපොළක් බිහිවෙමින් පවති. මෙම අවස්ථාව මඟින් ශ්‍රී ලාංකීය ගොවියාට ජාත්‍යන්තර වෙළෙඳපොළට පිවිසීමේ මාර්ගය විවෘත වේ. පිරිවැය අවම වන නිෂ්පාදන රටාවක් තුළ එනම් කාබනික නිෂ්පාදන ක්‍රමවේදයක් තුළ බෝග සඳහා ඉහළ ඉල්ලුමක් හා ඉහළ මිලක් සමඟින් ගොවියාගේ ආදායමේ වෙනසක් සිදුවනවා ද යන්න අධ්‍යයනය කිරීම කාලීන අවශ්‍යතාවයක් වේ. එම අධ්‍යයනය තුළින් කාලානුරූපීව වෙළෙඳපොළ සමඟ තරඟ කිරීමටත් එකම ස්ථානයක රැඳී සිටින අපනයන ආර්ථිකය වෙනස් කිරීමේ හැකියාවක්ද පවති.

සාහිත්‍ය විමර්ශනය

ලෝක අවධානය කාබනික නිෂ්පාදන සඳහා යොමු වීම තුළ පාරිභෝගික ඉල්ලුම මෙන්ම නිෂ්පාදන දායකත්වය ඉහළ මට්ටමක පවතී. ඒ අතර යුරෝපයේ ස්වීඩනය ඇසුරු කරගනිමින් ලෝහර් සහ සලොමොන්ස්සොන් (Lohr and Salomoìson, 1999) යන දෙපළ විසින් කාබනික නිෂ්පාදන සඳහා සහනාධාර ලබාදීම පිළිබඳව සිදුකළ අධ්‍යයනය සඳහා ස්වීඩනය තුළ කාබනික ක්‍රමවේදය යටතේ වගා කරන ගෝවින් 147 දෙනෙකු තෝරා ගනිමින් ප්‍රශ්නාවලියක් මඟින් ප්‍රාථමික දත්ත රැස් කොට Probit ආදර්ශයක් යොදාගෙන පරීක්ෂා කර තිබේ. එහිදී ප්‍රධාන සාධක ලෙස පෙර

ගෙවන ලද සහනාධාරයේ ප්‍රමාණය, ගොවිතැනට යෝග්‍ය අක්කර ගණන, ගෙවත්තේ ගොවිපළ සතුන්ගේ ප්‍රමාණය, කාබනික නිෂ්පාදන සඳහා උපදෙස් ලබා ගන්නා මූලාශ්‍ර, කාබනික නිෂ්පාදන සඳහා ප්‍රමාණවත් තාක්ෂණික මූලාශ්‍ර, කාබනික නිෂ්පාදන අළෙවි ප්‍රමාණය, අධීක්ෂණයේ ප්‍රමාණවත් බව, කාබනික නිෂ්පාදන සඳහා යොමු වීමට බලපෑ ආර්ථික නොවන සාධක ආදිය සැළකිල්ලට ගෙන ඇත. සියයට දහය වෙසෙසියා මට්ටම යටතේ පරීක්ෂා කර බලපෑම් නොකරන සාධක ලෙස ප්‍රමාණවත් තාක්ෂණික මූලාශ්‍ර, අධීක්ෂණයේ ප්‍රමාණවත් බව සහ කාබනික නිෂ්පාදන අළෙවි ප්‍රමාණය හඳුනාගෙන තිබේ. මෙම සාධක හැර අනෙකුත් සාධක කාබනික නිෂ්පාදන සඳහා සහනාධාර ලබාදීමට බලපෑම් කරන බව හඳුනාගෙන ඇත.

කොඑස්ලිනග් ඇතුළු පිරිස (Koesling at al. 2002) විසින් නෝර්වේ ගොවීන් කාබනික නිෂ්පාදනය සඳහා පරිවර්තයන වීම සම්බන්ධව සිදු කළ පර්යේෂණයේදී මොවුන් ද්වි විචල්‍ය විශ්ලේෂණයක් සහ බහුපද තාර්කික ආදර්ශයක් යොදාගෙන ඇත. මොවුන්ගේ අධ්‍යයනය ප්‍රාථමික දත්ත මත පදනම් වූවකි. නෝර්වේ ගොවීන් 1018ක් සමීක්ෂණය කරමින් සිදුකළ මෙම පර්යේෂණයේ නිගමනය තුළ සමස්ත ගොවීන්ගෙන් සියයට 4ක් කාබනික නිෂ්පාදනය සඳහා යොමුවීම දැක ගත හැක. එසේම සාපේක්ෂ වශයෙන් විශාල ඉඩම් හිමියන් කාබනික නිෂ්පාදනය සඳහා යොමුවීමට ප්‍රියතාවයක් දක්වන අතර ඔවුන් තිරසාර හා පාරිසරික හිතකාමී පිරිසක් වේ. නිගමනය තුළින් අනාවරණය කරගත් කරුණක් නම් විශාල ඉඩම් හිමියන් වඩා අධ්‍යාපනය ලද පිරිසකි. කාබනික නිෂ්පාදනය සඳහා යොමුවන ගොවීන් ලාභය නොව එනම් ව්‍යාපාරික පදනමට එහා ගිය අරමුණකින් වගාකරයි. ප්‍රතිපත්ති සම්පාදනයේ දී කාබනික නිෂ්පාදනය ප්‍රවර්ධනය කිරීම සඳහා පරිසරයක් ගොඩනැගිය යුතු බව දක්වයි.

අධ්‍යයන ගැටලුව

කාබනික කෘෂි නිෂ්පාදන ගොවීන් හා කාබනික නොවන කෘෂි ගොවීන්ගේ කෘෂි ආදායම් සහ වියදම් අතර කොපමණ වෙනසක් පවතීද?

අධ්‍යයනයේ අරමුණු

ප්‍රධාන අරමුණ

- ශ්‍රී ලංකාවේ කාබනික කෘෂි නිෂ්පාදන හා අකාබනික කෘෂි නිෂ්පාදන ගොවීන්ගේ කෘෂි ආදායම් සහ වියදම් පිළිබඳව විශ්ලේෂණය කිරීම.

උප අරමුණු

- කාබනික හා අකාබනික කෘෂි නිෂ්පාදකයින්ගේ කෘෂි ආදායමට සහ වියදමට බලපාන සාධක හඳුනා ගැනීම.
- කාබනික හා අකාබනික කෘෂි නිෂ්පාදකයින්ගේ නිමැවුම් ප්‍රමාණය සහ වෙළෙඳපොළ සමඟ සම්බන්ධ වීම අධ්‍යයනය කිරීම.

- කාබනික හා අකාබනික කෘෂි නිෂ්පාදකයින්ගේ භෞතික ජීවන තත්වයේ වෙනස් වීම් අධ්‍යයනය කිරීම.

පර්යේෂණ ක්‍රමවේදය

පුත්තලම් දිස්ත්‍රික්කය පදනම් කරගනිමින් එම කලාපය ආවරණය වන පරිදි කාබනික කරවිල නිෂ්පාදනය කරනු ලබන හා අකාබනික කරවිල නිෂ්පාදනය කරනු ලබන ගොවීන්ගෙන් 60ක නියැදියක් තෝරාගනිමින් අධ්‍යයනය සිදු කරනු ලැබේ. මෙහිදී කාබනික ගොවීන්ගේ නියැදිය තෝරගනු ලබන්නේ GAP ගොවීන් පදනම් කර ගනිමිනි. එනම් කෘෂිකර්ම දෙපාර්තමේන්තුවේ අනුමැතිය ලත් නිවැරදි කෘෂිකාර්මික ක්‍රමවේදය යටතේ වගාකරනු ලබන ගොවීන්ගෙනි. එහිදී කල්පිටිය, ආණමඩුව, මහකුඹුක්කඩවල යන ප්‍රදේශ සඳහා විශේෂ අවධානය යොමු කෙරේ. නියැදියට අනුව කාබනික කරවිල නිෂ්පාදනය කරනු ලබන හා අකාබනික කරවිල නිෂ්පාදනය කරනු ලබන ගොවීන් සමඟින් සම්මුඛ සාකච්ඡා පවත්වමින් ප්‍රශ්නාවලියකට පිළිතුරු ලබාගැනීම තුළින් ඔවුන්ගේ ආදායම් සහ වියදම් වෙනස් වීම් හදුනා ගැනීම සිදු කෙරේ. ගොවියාගේ කෘෂි ආදායම සහ වියදම සඳහා බලපාන සාධක අධ්‍යයනය කිරීම සඳහා ආර්ථිකමිතික ආදර්ශයන් දෙකක් භාවිත කරයි. පළමු ආදර්ශය තුළ කරවිල නිෂ්පාදකයාගේ එක් නිෂ්පාදන චක්‍රයක් සඳහා අක්කර භාගයකට ලබාගන්නා ආදායම පරායත්ත විචල්‍යය ලෙසත් එම පරායත්ත විචල්‍යයේ විචලනයට බලපෑම් කරන ස්වායත්ත විචල්‍යයය ලෙස වගාකරන ඉඩම් ප්‍රමාණය, පළපුරුද්ද (වසර ගණන), කෘෂි උපදේශන ලබා ගැනීම, අධ්‍යාපන මට්ටම සහ කාබනික ගොවියෙකු වීම යන සාධක යොදා ගැනේ. මෙම හරස්කඩ දත්ත මත පදනම් බහුගුණ රේඛීප්‍රතිපායන ආදර්ශය SPSS මෘදූකාංගය භාවිතා කරනු ලැබේ.

කරවිල නිෂ්පාදකයාගේ කෘෂි ආදායම සඳහා බලපාන සාධක

$$y_i = \beta_0 + \beta_1 L_i + \beta_2 E_i + \beta_3 T_i + \alpha_1 D_{Ai} + \alpha_2 D_{Ei} + \alpha_3 D_{oi} + U_i$$

y_i = කරවිල නිෂ්පාදකයාගේ එක් නිෂ්පාදන චක්‍රයක් සඳහා අක්කර භාගයකට ලබාගන්නා ආදායම

L_i = වගාකරන ඉඩම් ප්‍රමාණය

E_i = පළපුරුද්ද (වසර ගණන)

T_i =වගාව සඳහා යොදවන කාලය (මසකට දින ගණන)

D_{Ai} = කෘෂි උපදේශන ලබා ගැනීම = 1 (නොගන්නේ නම් = 0)

D_{Ei} = ප්‍රාථමික සහ තෘතීක අධ්‍යාපනය ලබන අය =1 (අතහරින ලද කාණ්ඩය = 0)

D_{oi} = කාබනික ගොවියෙකු වීම = 1 (අකාබනික ගොවියෙකු වීම = 0)

U_i = දෝෂ පදය

කරවිල ගොවියාගේ එක් නිෂ්පාදන චක්‍රයක් සඳහා අක්කරයකට වියදම සඳහා බලපාන සාධක ලෙස ශ්‍රමය සඳහා වියදම, බීජ සඳහා වියදම,

කෘමිනාශක සහ වල්නාශක සඳහා වියදම, පොහොර සඳහා වියදම, ප්‍රවාහන සඳහා වියදම සහ කාබනික ගොවියෙක් වීම ආදිය යොදාගනු ලැබේ.

කරවිල නිෂ්පාදකයාගේ කෘෂි වියදම සඳහා බලපාන සාධක

$$C_i = \beta_0 + \beta_1 P_i + \beta_2 S_i + \beta_3 Cw_i + \beta_4 F_i + \beta_5 T_i + \alpha_1 D_{oi} + U_i$$

C_i = කරවිල නිෂ්පාදකයාගේ එක් නිෂ්පාදන චක්‍රයක් සඳහා වියදම
p_i = ශ්‍රමය සඳහා වියදම
s_i = බීජ සඳහා වියදම
Cw_i = කෘමිනාශක සහ වල්නාශක සඳහා වියදම
F_i = පොහොර සඳහා වියදම
T_i = ප්‍රවාහන සඳහා වියදම
D_{oi} = කාබනික ගොවියෙක් වීම = 1 (අකාබනික ගොවියෙකු වීම = 0)
u_i = දෝෂ පදය

කාබනික සහ අකාබනික නිෂ්පාදකයින් අතර සාමාන්‍යය ආදායමේ වෙනස් වීම = $\left\lfloor \frac{\sum_{i=1}^{n} y(o)_i}{n} \right\rfloor - \left\lfloor \frac{\sum_{i=1}^{n} y(non)_i}{n} \right\rfloor$

කාබනික සහ අකාබනික නිෂ්පාදකයින් අතර සාමාන්‍යය වියදමේ වෙනස් වීම = $\left\lfloor \frac{\sum_{i=1}^{n} E(o)_i}{n} \right\rfloor - \left\lfloor \frac{\sum_{i=1}^{n} E(non)_i}{n} \right\rfloor$

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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කෙසෙල් නිෂ්පාදනය හා වෙළඳාම පිළිබඳ ලාභ පිරිවැය විශ්ලේෂණයක්

පී. පී. එන්. ලක්ෂ්මි සහ එම්. බී. රණතිලක

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙණිය විශ්ව විද්‍යාලය

මූල පදඃ *ලාභ පිරිවැය විශ්ලේෂණය, කෙසෙල් වගාව, අලෙවිකරණය*

හැඳින්වීම

ශ්‍රී ලංකාවේ සිදු කරනු ලබන පළතුරු වගාවන් අතුරින් වැදගත් හා ආකර්ෂණීය කෘෂිකාර්මික නිෂ්පාදන විශේෂය 'කෙසෙල්' වාර්ෂික බෝග වගාවයි (Vidanagama & Priyathilake, 2010). මෑත කාලීනව ශ්‍රී ලංකාවේ කෙසෙල් නිෂ්පාදන ව්‍යාප්තිමය ඉහළ යාමක් වාර්තා වුවද ඒ හා සම්බන්ධ ලාභ පිරිවැය අනුපාතයේ ක්‍රමික අඩුවීමක් වාර්තා වේ (Kudagamage et al 2002). කෙසෙල් අලෙවිකරණය සබඳතා රාශියක් දක්වන සංකීර්ණ දාමයක් වන අතර ඒ සඳහා සම්බන්ධවන්නන් එකිනෙකාට අසමාන ප්‍රතිලාභයන් භුක්ති විඳිනු ලබයි (Deshmukh et al. 2003, Mukul and Rahaman, 2013). අතරමැදිකරණ දාමයක් යනුවෙන් මෙහිදී අදහස් වන්නේ 'කෙසෙල් ගොවියාගේ සිට පාරිභෝගිකයා දක්වා නිෂ්පාදනයන් සහ වටිනාකම් හුවමාරු වීම සඳහා නිර්මාණය වී පවත්නා සබඳතා ජාලයයි' (Kudagamage et al. 2002). එහි තීව්‍රතාව අතරමැදිකරණ ජාලය හා සම්බන්ධ වන්නන් ප්‍රමාණය හා ගණුදෙනු වාර ගණන මත තීරණය වේ. එහි ලාභය භූමිය, ශ්‍රමය ඇතුළු අනෙකුත් යෙදවුම් මූලාශ්‍රයන්ගේ පිරිවැය උච්චාවචනය, පූර්ව හා පසු අස්වනු නාස්තීන් ඇතුළු කෙසෙල් නිෂ්පාදන පාර්ශවීය සාධක මත තීරණය වේ (Ambio, 2013, Perming, 2013, Joel, 2005). වෙළඳපල අර්ථයෙන් සැළකූ විට ප්‍රවාහනය, ගබඩාකරණය, පසු අස්වනු නාස්තිය, වෙළඳපල අවිනිශ්චිතතා, විවිධ අතරමැදිකරණ ස්වරූපයන් යන වෙළඳපල සාධක මත ලාභය තීරණය වේ (Singgih & Woods, 2003,Osman et al 2015, Nzioka, 2009). ශ්‍රී ලංකාවේ කෙසෙල් වෙළඳපල අතරමැදිකරණය මාධ්‍යයන් රාශියක් ඔස්සේ සම්බන්ධීකරණය වන අතර (Gray, 1997) අතරමැදිකරණ ජාලය මූලික වශයෙන්ම ග්‍රාමීය වශයෙන් නිර්මාණය වී ඇති පොළ (Fair) ක්‍රමවේදය ඔස්සේ විකාශනය වේ. මෙහිදී 'පොල' වශයෙන් මූලිකව හඳුනා ගැනෙන්නේ කුඩා පරිමාණයේ ව්‍යාපාරික ක්‍රියාකාරකම් ගණනාවකින් සමන්විත අංගනයකි (Jayathilaka, 2007).

ශ්‍රී ලංකාවේ කෙසෙල් පළතුරු වගාව සම්බන්ධ මූලික තත්ත්වයන් විමසීමේදී එම අංශය මුහුණ දෙන වර්ධන ව්‍යාප්තිමය ප්‍රවණතාව සමඟ නිෂ්පාදන හා ඵලදායිත්වය අතර පරතරය පුළුල් වීම, නිෂ්පාදනය සහ ඵලදායිත්වය පහළ මට්ටමක සාපේක්ෂ ස්ථාවර හැසිරීමක් පෙන්නුම් කිරීම, කෙසෙල් නිෂ්පාදනය හා ඒ සඳහා දරන ලද පිරිවැය අතර පරතරය උච්චාවචනය වීම හා ඉහළ යාම, ලාභදායිත්වය ක්‍රමයෙන් පටු වීම, කෙසෙල් නිෂ්පාදකයන්ගේ ගොවිපල

මිල කාලීනව ඉහළ යාමක් හඳුනා ගතහැකි වුවද පිරිවැය ඉහළ යාම මත ශුද්ධ ආදායම්හි අඩුවීමක් පැවතීම වෙසෙසි ලාක්ෂණිකයන් වේ (කුඩාගමගේ සහ චන්දසිරි 2002). මෙම තත්වයන් අවම කරගනිමින් ලාභදායිත්වය ඉහළ නැංවීම සඳහා ප්‍රතිපත්තිමය නව්‍යතාවන් සඳහා නිෂ්පාදන හා වෙළඳපල ලාභ-පිරිවැය අනුපාතයේ හැසිරීම විස්තර කිරීමට ප්‍රමාණවත් සාක්ෂි සහිත අධ්‍යයන අවශ්‍යතාව පවතී. ලාභදායිත්වය කෙරෙහි බලපෑම් කරන සුවිශේෂී සාධකය වන අතරමැදිකරණ දමයේ ව්‍යුහමය සබඳතාව හඳුනා ගනිමින් කෙසෙල් නිෂ්පාදනය හා වෙළඳපල සඳහා ලාභ-පිරිවැය විශ්ලේෂණයක් සිදු කිරීම යෝජිත පර්යේෂණය තුළින් අපේක්ෂිතය. ශ්‍රී ලාංකික පාරිභෝගික හා නිෂ්පාදක ජනතාවගේ කෙසෙල් නිෂ්පාදන හා පාරිභෝජන විභවතා පුළුල් කිරීමට අදාල හඳුන්වාදීම් හා කාලීන ප්‍රතිපත්තිමය අවශ්‍යතා අරමුණු කරගනිමින් යෝජිත මෙම අධ්‍යයනය කිරීමට බලාපොරොත්තු වේ.

සාහිත්‍ය විමර්ශනය

කෙසෙල් නිෂ්පාදනයේ වර්ධනය සඳහා ලාභදායිත්වය උපරිමකරණයට සාධක හැසිරීම් හා බලාත්මක තීරකයන් මොනවාද යන්න කෙසෙල් නිෂ්පාදනය හා බෙහෙවින් වැදගත් කරුණකි. කෙසෙල් පළතුරු භෝග වගාව පිළිබඳ අන්තර්ජාතික හා දේශීය අධ්‍යයනයන් මූලික වශයෙන් නිෂ්පාදන පාර්ශවීය සාධක, වෙළඳපල පාර්ශවීය සාධක හා එම අංශයන් ඒකාබද්ධ කරගත් සාධක මූලික කරගනිමින් සිදුකර ඇත.

මුකුල් සහ රහමන් (Mukul & Rahaman, 2013) විසින් බංගලාදේශයේ වාණිජ මට්ටමේ කෙසෙල් කර්මාන්තයේ වර්ධනය කිරීම සඳහා හේතු වී ඇති අලෙවිකරණ පද්ධතිය වඩා වර්ධනය කිරීම සඳහා කොබ්-ඩග්ලස් නිෂ්පාදන ශ්‍රිත හා ශ්‍රිතාත්මක විශ්ලේෂණ ක්‍රමවේද භාවිතයෙන් ඊට අදාල ප්‍රතිපත්ති හා යෝජනා ඉදිරිපත් කිරීම සඳහා කෙසෙල් නිෂ්පාදනය හා ලාභදායිත්වය පිළිබඳ අධ්‍යයනයක් සිදුකර ඇත. කෙසෙල් පාරිභෝගික මිලෙන් ගොවියාගේ ආංශික ලැබීම් 42%-62% අතර පවතින බවත්, අතරමැදිකරණ විවිධත්වය මත ලාභදායිත්වය වෙනස්වන බවත්, එහිදී සිල්ලර වෙළඳුන් සාපේක්ෂව ඉහළම ලාභදායිත්වයක් හිමිකරගන්නා බවත් පෙන්වාදේ. ව්‍යාපාරිකයන්ගේ ව්‍යාජ මිල අය කිරීම් යෙදවුම් නිමවුම් විචලනයට දැඩි බලපෑමක් ඇති වන බව හා කෙසෙල් නිෂ්පාදනය ශුද්ධ ප්‍රතිලාභ ලබා දෙන්නක් වුවද නිෂ්පාදන හා පාරිභෝගික මිල අතර සැළකිය යුතු තරම් විශාල පරතරයක් පවතින බව පෙන්වා දේ.

1990 සිට රුවන්ඩාවේ කෙසෙල් නිෂ්පාදනය අඩු වීම සඳහා වූ සමාජ ආර්ථික සාධක පිළිබඳව කැනමා දිස්ත්‍රික්කය ආශ්‍රිත සිද්ධි අධ්‍යයනයක් හරහා විස්තරාත්මක ක්‍රමවේදය භාවිත කරමින් ජෝල් (Joel, 2005) විසින් අධ්‍යයනයක් සිදු කර ඇත. භූමිය, භෞතික ප්‍රාග්ධනය,මිල, නිමවුම වැනි සාධක නිමවුම තීරණය කිරීම සඳහා හේතු වන බවත් කෙසෙල් නිෂ්පාදනය භූමිය, ප්‍රාග්ධනය, පොහොර, මිල, සමඟ ධනාත්මක සම්බන්ධතාවයක් පවතින බවත් එහිදී හඳුනා ගෙන ඇත. නිෂ්පාදනය සඳහා පවතින ඉඩම් ස්ථාවර බැවින් රජය පොහොර වැනි දීමනා සැපයීම තුළින් ගොවීන්

ධෛර්යයමත් කිරීම සිදු කිරීම හා කෙසෙල් නිෂ්පාදනයට අවශ්‍ය අරමුදල් සැපයීම සඳහා කුඩා පරිමාණයේ බැංකු හා මූල්‍ය පහසුකම් වර්ධනය කිරීමට පෞද්ගලික අංශය දිරි ගැන්වීමේ අවශ්‍යතාව ද එහිදී හඳුනාගෙන තිබේ.

ශ්‍රී ලංකාවේ කෙසෙල් නිෂ්පාදන ලාභදායීත්වයේ දිගුකාලීන නව්‍යතා හඳුනා ගැනීම සඳහා කුඩාගමගේ ඇතුළු පිරිස (Kudagmage et al 2002) විසින් 1998 සිට 2000 දක්වා ද්විතියික දත්ත හා ප්‍රතිපායන සංඛ්‍යාත්මක ක්‍රමවේදය භාවිතයෙන් කළ අධ්‍යයන සොයා ගැනීම්වලට අනුව (1973-2002) දක්වා කාලය තුළ නිෂ්පාදන ව්‍යාප්තිය සැළකිය යුතු ප්‍රමාණයකින් ඉහළ යාමක් හඳුනා ගත්ත ද කෙසෙල් නිෂ්පාදන ලාභ-පිරිවැය අනුපාත වසරක් පාසාම අඩු වීමක් පවත්නා බව හඳුනා ගනී. එනිසා එහි සංවර්ධනය සඳහා සැලසුම්හි අවශ්‍යතාව අධ්‍යයනය මඟින් පෙන්වා දේ.

පර්යේෂණ පරතරය

කෙසෙල් වගාවේ ලාභදායීත්වය ප්‍රවර්ධනය කිරීම සඳහා කෙසෙල් නිෂ්පාදනය හා කෙසෙල් වෙළඳපොල අංශයන් පිළිබඳ වෙන් වෙන්ව සිදුකර ඇති විදේශීය හා දේශීය අධ්‍යයනයන් සපයා ගත හැකි වුවද එම අංශයන් ඒකාබද්ධ කරමින් සිදු කර ඇති දේශීය අධ්‍යයනයන් සීමා සහිතය. ඒ අනුව ශ්‍රී ලංකාව සඳහා උක්ත ද්වී අංශයන් ඒකාබද්ධ කරමින් ලාභදායීත්වය විශ්ලේෂණය කිරීමේ අවශ්‍යතාවය සපුරාලීම සඳහා මෙම අධ්‍යයනය සිදු කිරීමට අපේක්ෂා කෙරේ.

පර්යේෂණ ගැටළුව

ශ්‍රී ලංකාවේ කෙසෙල් නිෂ්පාදනයේ ලාභදායීත්වය තීරණය කිරීම සඳහා අතරමැදිකරණ දාමය විසින් කුමන මිල බලපෑමක් ඇතිකරන්නේද? යන්න ආනුභවිකව අධ්‍යනය කිරීම මෙම අධ්‍යනයේ පර්යේෂණ ගැටලුව වේ.

පර්යේෂණ අරමුණ

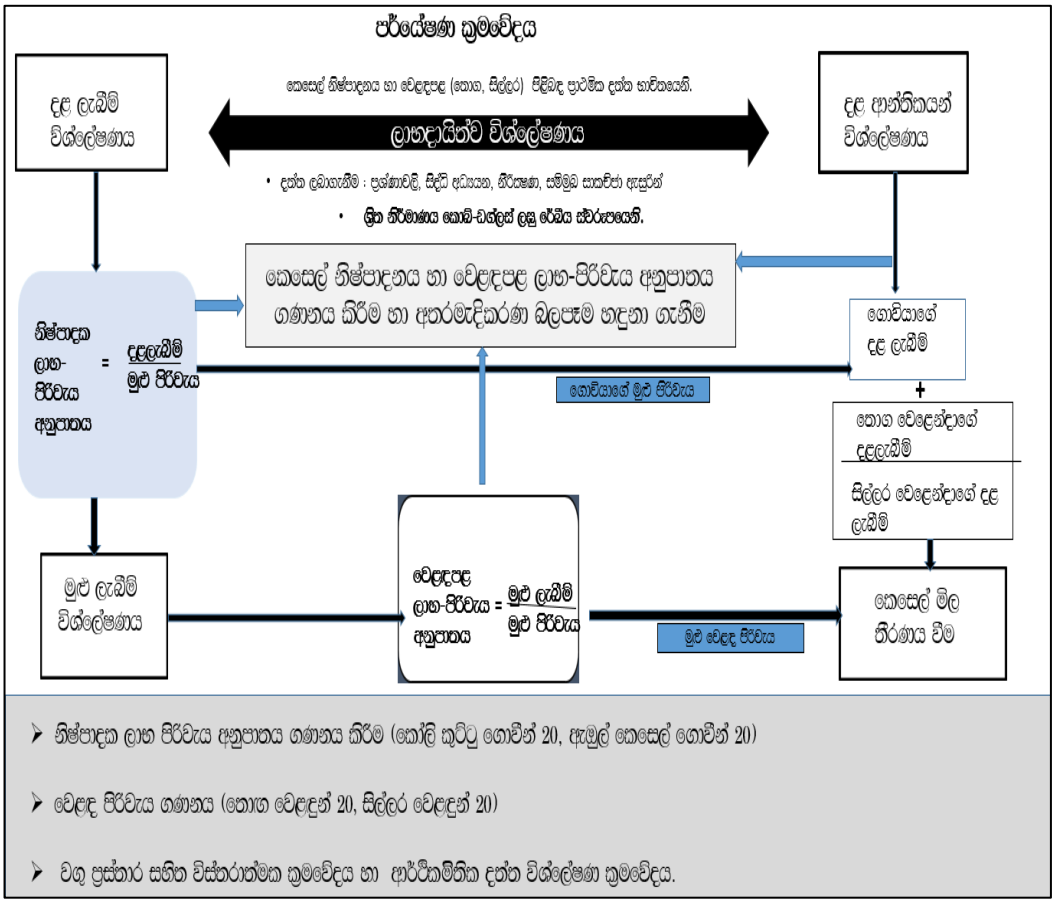
කෙසෙල් නිෂ්පාදනයේ හා වෙළඳාමේ ලාභදායීත්වය තීරණය කරන සාධක කවරේද යන්න හඳුනාගැනීමට ලාභ-පිරිවැය විශ්ලේෂණයක් සිදු කිරීම.

අධ්‍යයන ක්‍රමවේදය

යෝජිත අධ්‍යයන අරමුණු ඉටුකර ගැනීම සඳහා ප්‍රාථමික දත්ත උපයෝගී කරගනු ලැබේ. නිෂ්පාදන හා වෙළඳපල පාර්ශවයන් නියෝජනය වන පරිදි සරල සසම්භාවී ක්‍රමය යටතේ 40 බැගින් 80 ක නියදියක් හා අතරමැදිකරණ දමය හඳුනා ගැනීමට වලව කලාපයේ පොළ මධ්‍යස්ථාන 3ක් තෝරා ගැනේ. නිෂ්පාදන හා වෙළඳ අංශයන්හි අතරමැදිකරණ දම බලපෑම හඳුනා ගැනීමට කෙසෙල් මිල ඇගයුම් කිරීම මත දළ ආන්තිකයන් සරල සමීකරණ මඟින් ගණනය කරනු ලැබේ.

කෙසෙල් නිෂ්පාදක දළ ලැබීම් මත පිරිවැය විචල්‍යයන්හි බලපෑම විශ්ලේෂණයට කොබ්-ඩග්ලස් ස්වරූපයේ දළ ලැබීම් ශ්‍රිතයක් භාවිතා කෙරේ.

ඒ සඳහා සාහිත්‍ය විමර්ශනයේදී හඳුනාගත් මුකුල් සහ රහමන් (Mukul & Rahaman, 2013) විසින් බංගලාදේශයේ කෙසෙල් නිෂ්පාදනය පිළිබඳ සිදු කරන ලද අධ්‍යයනයේදී යොදාගත් **කොබ්-ඩග්ලස් ස්වරූපයේ දළ ලැබීම් ශ්‍රිතය භාවිතා කෙරේ.**



කොබ්-ඩග්ලස් ස්වරූපයේ දළ ලැබීම් ශ්‍රිතය:

$$\ln Y_i = \beta_0 + \beta_1 \ln LPC_i + \beta_2 \ln SKC_i + \beta_3 \ln FZC_i + \beta_4 \ln PSC_i + \beta_5 \ln WSC_i + \beta_6 \ln LBC_i + u_i \qquad (2)$$

කෙසෙල් නිෂ්පාදකයාගේ දළ ලැබීම් (Y) පරායත්ත විචල්‍යය ලෙස ආදර්ශය තුළ යොදා ගැනේ. LPC වගාව ආරම්භයේ භූමි සකස් කිරීම සඳහා භූමි සැකසුම් පිරිවැය, SKC වගාව ආරම්භයේ මොටි (පැළ) සඳහා පිරිවැය, FZC වගාව ආරම්භයේ සිට පොහොර සඳහා පිරිවැය, PSC වගාව ආරම්භයේ සිට කෘමිනාශක සඳහා පිරිවැය, WSC වගාව ආරම්භයේ සිට ජල

සම්පාදන පිරිවැය, LBC වගාව ආරම්භයේ සිට ශ්‍රම පිරිවැය දැක්වේ. ආදර්ශයේ දෝෂ පදය U_i මඟින් නිරූපණය වේ (සියළු පිරිවැය අක්කරයක් සඳහා ගණනය කෙරේ).

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාව හා එහි ප්‍රතිඵල වර්තමාන කෘෂිකාර්මික ගැටලුවලට විසඳුම් ලෙස යොදා ගතහැකි ආකාරය

ඒ. ජී. ටී. අබේසේකර සහ කේ. එම්. ආර්. කරුණාරත්න

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙණිය විශ්ව විද්‍යාලය

මූල පද: *තාක්ෂණික කාර්යක්ෂමතාව, වී නිෂ්පාදනය,* එලදායිතාවය

හැඳින්වීම

කෘෂිකාර්මික අංශය වනාහි ශ්‍රී ලංකා ආර්ථිකය තුළ ප්‍රමුඛත්වයක් ගෙන ක්‍රියාකරන අංශයකි. අතීතයේ සහලින් ස්වයංපෝෂිත රටක් වූ ශ්‍රී ලංකාව තුළ වර්තමානය වනවිට වී නිෂ්පාදනයේ පහළ යාමක් දක්නට ලැබේ. 2015 වර්ෂයේදී දළ දේශීය නිෂ්පාදිතයට වී නිෂ්පාදනය දක්වූ දායකත්වය 0.9%වූ අතර 2016 වනවිට එය 0.6 % දක්වා අඩු වී තිබේ (Athukorala and Wilson, 2016). එසේ ම වී නිෂ්පාදනය දළ දේශීය නිෂ්පාදනයේ වර්ධනයට දක්වූ දයකත්වය ද 2015 වර්ෂයේ දී සියයට 3.8 ක් වූ අතර 2016 වන විට සියයට -6.3 දක්වා අඩු වී තිබේ (ශ්‍රී ලංකා මහ බැංකුව 2015-2016).

එපමණක් නොව වර්තමානය වන විට සමස්ත කෘෂිකාර්මික අංශයේ සේවා නියුක්තියේ අඩු වීමක් ද දක්නට ලැබේ. එය 2013 දී 29.7%ක් ද, 2014 දී 28.5%ක් ද, 2015 දී 28.2%ක් ද, 2016 වනවිට 27.1% දක්වා අඩු වී තිබේ. මීට අමතරව වී නිෂ්පාදනයේ එලදායිතාවය ද අඩු වී තිබේ. එය අනාගතය වන විට තව තවත් අඩුවීම සිදු වුවහොත් අප රටට එය විශාල ගැටලුවක් වනු ඇත. එමනිසා දිනෙන් දින වර්ධනය වන ජනගහනය අනුව වී නිෂ්පාදනය වැඩි කිරීමටත්, පරිසර හිතකාමී පළිබෝධ නාශක හඳුන්වාදීම, ජල කළමණාකරණය, වාරි පද්ධති වැඩි දියුණු කිරීම, වැඩි අස්වැන්නක් ලබා ගැනීම වැනි අංශ හරහා කෘෂිකාර්මාන්තය සංවර්ධනය කෙරෙහි අවධානය යොමු කිරීම ඉතා වැදගත් වේ (ශ්‍රී ලංකා මහ බැංකුව 2015-2016).

මෙම පර්යේෂණය අනුව සාකච්ඡා කරන වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය පිළිබඳව අධ්‍යයනය කිරීමේදී කාර්යක්ෂමතාවය හා තාක්ෂණික කාර්යක්ෂමතාවය යන්න හඳුනා ගැනීම ඉතා වැදගත් වේ. සාම්ප්‍රදායික සංකල්පයට අනුව කාර්යක්ෂමතාවය යන්න M. J. Farrell විසින් තාක්ෂණය, විභේදනය හා ආර්ථිකය යන සංරචක තුන යටතේ හඳුන්වා දී තිබේ. එමෙන් ම තාක්ෂණික කාර්යක්ෂමතාවය යනු නිෂ්පාදනයේ ඉහළ මට්ටමක් ළඟා කර ගැනීම සඳහා ඒකාකාර යෙදවුම් මට්ටමක්

යොදාගැනීමයි (Abdulai & Huffman, 2000). තාක්ෂණික කාර්යක්ෂමතාවය මඟින් අඩු යෙදවුම් මට්ටමක් තුළින් ඉහළ මට්ටමේ භෞතික නිමැවුම් මට්ටමක් ලබා ගැනීමක් සිදු වේ. එහිදී තිබෙන යෙදවුම් වැඩි නොකර පවතින යෙදවුම්වල ඵලදායිතාවය වැඩි කරගත හැකි ආකාරය අධ්‍යයනය කරයි. එමනිසා වී ගොවියාගේ තාක්ෂණික කාර්යක්ෂමතායේ අධ්‍යයන වපසරිය හරහා වර්තමානයේ ප්‍රාදේශීය වශයෙන් වී නිෂ්පාදනයේ කාර්යක්ෂමතාවය පිළිබඳව තහවුරු කර ගැනීමටත්, ඒ හරහා වී නිෂ්පාදනයේ අස්වැන්න වර්ධනය කිරීම සඳහා අවශ්‍ය ප්‍රතිපත්ති හා නිර්දේශයන් සකස් කිරීමටත්, එමඟින් වර්තමානයේ පවතින ගැටලු වලට විසඳුම් ඉදිරිපත් කිරීමටත් හැකියාව ලැබේ.

සාහිත්‍ය විමර්ශනය

උරේටා ඇතුළු පිරිස විසින් (Bravo-Ureta et al. 1997) විසින් ගොවිජන පරිසරයේ තාක්ෂණික කාර්යක්ෂමතාවය (TE), ආර්ථික කාර්යක්ෂමතාවය (EE) හා ප්‍රතිසන්ධාන කාර්යක්ෂමතාවය (AE) පිළිබඳව ඩොමිනිකන් ජනරජයේ සාක්ෂි පදනම් කරගෙන මෙම අධ්‍යයනය සිදුකර තිබේ. එහිදී එම රාජ්‍යයට අයත් ඩජබාන් කලාපයේ ගොවීන් 60 දෙනෙකුගේ නියදියක් සඳහා තාක්ෂණික කාර්යක්ෂමතාවය හා ප්‍රතිසන්ධාන කාර්යක්ෂමතාවය පිළිබඳව අධ්‍යයනය කර තිබේ. මෙහිදී කොබ් ඩග්ලස් නිෂ්පාදන ශ්‍රිතය ගණනය කිරීමේදී උපරිම සම්භාවිතා තාක්ෂණික ක්‍රම භාවිතාකර තිබේ. මෙහිදී ප්‍රතිඵල ලෙස තාක්ෂණික කාර්යක්ෂමතාවය 70 %, ආර්ථික කාර්යක්ෂමතාවය 31 % හා ප්‍රතිසන්ධාන කාර්යක්ෂමතාවය 44 % ක් බව හඳුනා ගන්නා ලදී.

ගුණරත්න හා තිරුච්චෙල්වම් (Gunaratne and Thiruchelvam, 2002) විසින් අනුරාධපුර දිස්ත්‍රික්කයේ සුළු හා මහා පරිමාණ වාරිමාර්ග යෝජනා ක්‍රම යටතේ වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය ගණනය කර තිබේ. එහිදී අනුමානිත ප්‍රත්‍යයන්ත නිෂ්පාදන ශ්‍රිතය යටතේ රාජාංගනය ප්‍රධාන වාරිමාර්ගය හා ඉලයාපත්තුව සුළු වාරිමාර්ග පද්ධතිය පදනම් කරගෙන ගොවීන් 97 දෙනෙකු යටත් සිදු කරමින් සුළු වාරිමාර්ග ක්‍රම යටතේ වී නිෂ්පාදනය 3599 kg ha^{-1} ලෙස පමණක් වර්ධනය වී තිබෙන බවත්, රාජාංගනය වාරි ක්‍රමය යටතේ 4204 kg ha^{-1} ලෙස 14%ක නිෂ්පාදන මට්ටමක් ලෙස ඉහළගොස් තිබෙන බවත් තහවුරු කරගෙන තිබේ.

රහ්මන් (Rahman, 2003) විසින් වී නිෂ්පාදනයේ යෙදෙන ගොවීන් අතර ලාභ කාර්යක්ෂමතාවය පිළිබඳව අධ්‍යයනයක් කර ඇත. මෙහිදී අනුමානිත ප්‍රත්‍යයන්ත ලාභ ශ්‍රිතය භාවිතා කර තිබේ. බංගලාදේශයේ පාරසරික කලාප 03 ක ගම්මාන 21ක් නියදිය සඳහා පසුබිම් කර ගනිමින්

මෙම අධ්‍යයනය සිදුකර තිබේ. මෙම පර්යේෂණයේ ප්‍රතිඵල ලෙස නවීන වී ගොවිතැන තුළ ඉතා ඉහළ තාක්ෂණික අකාර්යක්ෂමතාවයක් පවතින බව අනාවරණය කර ඇත. එසේ ම කාර්යක්ෂමතාවයේ මධ්‍යන්‍යය 77%ක් ද, තාක්ෂණික අකාර්යක්ෂමතාවය 23%ක් ලෙස ද හඳුනා ගන්නා ලදී.

තිරුච්චෙල්වම් (Thiruchelam, 2005) අනුරාධපුර හා පොළොන්නරුව දිස්ත්‍රික්කයන් පදනම් කරගනිමින් නිෂ්පාදන පිරිවැය සාධක සහ වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය පිළිබඳව අධ්‍යයනයක් සිදු කර තිබේ. එහිදී මෙම දිස්ත්‍රික්කයන් දෙකෙහි 1995-2000 කාල පරිච්ඡේදය තුළ FROTIER මෘදුකාංගය යටතේ උපරිම භව්‍යතා නිමානය (Maximum Likelihood Estimation) හා අඩුතම වර්ග ක්‍රමය (OLS) පදනම් කරගෙන අධ්‍යයනය සිදුකර ඇත. ප්‍රතිඵල ලෙසතාක්ෂණික කාර්යක්ෂමතාවයේ 90%ක් ඉක්මවා සිටින්නේ අනුරාධපුර දිස්ත්‍රික්කයේ ගොවීන්ගෙන් 16%ක් හා පොළොන්නරුව දිස්ත්‍රික්කයේ ගොවීන්ගෙන් 21%ක් පමණක් බව දක්වා තිබේ.

අබේදුලාහ් ඇතුළු පිරිස විසින් (Abedullah et al. 2007) පකිස්ථානයේ පන්ජාබ් හි වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය පිළිබඳව පැහැදිලි කිරීම පිළිබඳව අධ්‍යයනයක් සිදුකර තිබේ. අනුමානිත ප්‍රත්‍යන්ත නිෂ්පාදන ශ්‍රිතය යටතේ 2005 වර්ෂයේ පන්ජාබ්හි ෂෙයිකුපුරා (Sheikhupura) හි ගොවීන් 200කගෙන් දත්ත ලබා ගෙන තිබේ. ප්‍රධාන නිෂ්පාදන ක්‍රියාවලියේ ප්‍රතිඵල මඟින් පෙන්නුම් කරනුයේ පළිබෝධනාශක වල සංගුණක බොහෝවිට කෘෂි උවදුරුවලට හේතු වී ඇති බවක් පෙනෙන්නට තිබෙන නිසා පොහොර, සහල් නිෂ්පාදනය කෙරෙහි අහිතකර ලෙස බලපෑම් ඇතිකරන බවයි.

පර්යේෂණ ගැටලුව

වර්තමානයේ වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය කෙරෙහි බලපාන සාධක මොනවාද?

අධ්‍යයනයේ අරමුණු

ප්‍රධාන අරමුණ

වර්තමානයේ වී නිෂ්පාදනයේ පවතින තාක්ෂණික කාර්යක්ෂමතාව නිමානය කිරීම

උප අරමුණු

මෙම පර්යේෂණයේ උප අරමුණු අතර වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය කෙරෙහි බලපාන සාධක හඳුනා ගැනීම, නිමානිත ප්‍රතිඵල වර්තමානයේ පවතින වී නිෂ්පාදනය ආශ්‍රිත කෘෂිකාර්මික ගැටලුවලට ඇති කරන බලපෑම අධ්‍යයනය කිරීම, එසේ හඳුනා ගත් ගැටලුවල කාලෝචිත බව පිළිබඳව අධ්‍යයනය කිරීම හා ගැටලු මඟ හරවා ගනිමින් අනුරාධපුර දිස්ත්‍රික්කයේ වී නිෂ්පාදනය සංවර්ධනය කිරීම හා ඵලදායිතාවය ඉහළ නංවා ගැනීම සඳහා ප්‍රතිපත්ති ඉදිරිපත් කිරීම වැදගත් වේ.

පර්යේෂණ ක්‍රමවේදය

ආර්ථිකමිතික ක්‍රමවේදය

මෙම පර්යේෂණයේ තාක්ෂණික කාර්යක්ෂමතාවය ගණනය කිරීමේදී අනුමානිත ප්‍රත්‍යන්ත නිෂ්පාදන ශ්‍රිතය භාවිතා කරනු ලැබේ. 1995 දී බැටස් හා සොයිලි (Battese & Coelli, 1995) විසින් මෙම ආදර්ශය හඳුන්වා දී තිබේ. එහිදී කොබ් ඩග්ලස් නිෂ්පාදන ශ්‍රිතය, අනුමානිත ප්‍රත්‍යන්ත නිෂ්පාදන ශ්‍රිතය සමඟ අර්ථ දැක්වීමක් සිදු කරනු ලබයි (Warnakulasooriya and Athukorala, 2015).

$Y_i=\int(x_i\ ,\beta)\exp(V_i-U_i)\quad i=1,2\ldots N\quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$

i යන ගොවීන් ප්‍රමාණයක් යටතේ නිෂ්පාදන කරන වී නිෂ්පාදනය Y_i ද, x_i මඟින් විවිධ යෙදවුම්වල දෛශිකයන් ද, β මඟින් ඇස්තමේන්තු කරන ලද පරාමිතීන්ගේ දෛශිකයන් ද නිරූපණය වේ. අනුමානිත ප්‍රමාණය යටතේ වී නිෂ්පාදනය කළහැකි ප්‍රමාණය $\int(x_i\ ,\beta)\exp(i)$ වේ. දෝෂ සංරචක විසින් V_i ස්වාධීනව සහ සර්ව සාමාන්‍යයෙන් ව්‍යාප්ත වීම $N(0,\sigma^2)$ වේ. U_i තුළින් සෘණාත්මක ලොප් කිරීමක් යටතේ $N(0,\ \sigma^{\ 2}_u)$ ව්‍යාප්තිය පෙන්නුම් කරන ලැබේ.

$\ln Y_i=\ln\beta_0+\sum_{i=1}^{n}\beta_i\ln X_i+V_i-U_i\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$

$\ln Y_i=\ln\beta_0+\sum_{i=1}^{n}\beta_i\ln X_i+\epsilon_i$

$\ln Y_i=\ln\beta_0+\beta_1\ln X_{1i}+\beta_2\ln X_{2i}+\beta_3\ln X_{3i}+\beta_4\ln X_{4i}+\epsilon_i$

මෙහිදී,

X = ගොවියා නිෂ්පාදනය සඳහා භාවිතා කරන යෙදවුම්

$\in$= පරාමිතික දෛශිකය ($\in_i = V_i + U_i$ වේ. එහිදී V_i මඟින් එක් දෝෂ පදයක් හා U_i මඟින් තවත් දෝෂ පදයක් දැක් වේ)

X_1 = භූමි ප්‍රමාණය අක්කර

X_2 = ශ්‍රමිකයන් ගණන

X_3 = පොහොර ප්‍රමාණය

X_4 = කෘමිනාශක ද්‍රව්‍ය ප්‍රමාණය

$$U_i = \propto_0 + \propto_1 Z_{1i} + \propto_2 Z_{2i} + \propto_3 Z_{3i} + \propto_4 Z_{4i} + \propto_5 Z_{5i} + \propto_6 Z_{6i} + \propto_7 Z_{7i} + g_i \text{.....(3)}$$

Z_{1i} = ගොවියාගේ වයස

Z_{2i} = ඉගෙනුම ලබා ඇති වසර ගණන

Z_{3i} = ගොවිකම සම්බන්ධව අත්දැකීම් ලබා ඇති වසර ගණන

Z_{4i} = ගොවි සංවිධානයට සහභාගි වූ වාර ගණන (Yes =1,Other = 0)

Z_{5i} = ණය ප්‍රවේශය (Yes =1, Other = 0)

Z_{6i} = ගොවි සංවිධන සාමාජිකත්වය දැරීම (Yes =1,Otherwise =0)

Z_{7i} = ඉඩම් හිමිකම (Own =1, Otherwise = 0)

g_i = දෝෂ පදය

විස්තරාත්මක ක්‍රමවේදය

ඉහත ගණනය කිරීම් මත ලබාගත් ප්‍රතිඵල මත වී නිෂ්පාදනයේ තාක්ෂණික කාර්යක්ෂමතාවය කෙරෙහි බලපාන සමාජ-ආර්ථික සාධක හඳුනා ගැනීම, නිමානිත ප්‍රතිඵල වර්තමානයේ පවතින වී නිෂ්පාදනය ආශ්‍රිත කෘෂිකාර්මික ගැටලුවලට ඇති කරන බලපෑම අධ්‍යයනය කිරීම, ඒ සඳහා ප්‍රතිපත්ති ඉදිරිපත් කිරීම යනාදී උප අරමුණු සඳහා පිළිතුරු සෙවීම සිදු කරනු ලැබේ.

මෙම පර්යේෂණය සඳහා ප්‍රාථමික දත්ත යටතේ ඍජු සම්මුඛ සාකච්ඡා හා ප්‍රශ්නාවලියක් භාවිතයෙන් තොරතුරු රැස් කර ගැනීම සිදු කරනු ලැබේ. ද්විතීයික දත්ත යටතේ මහ බැංකු වාර්තා, කෘෂිකර්ම අමාත්‍යයංශයේ කාර්යසාධන වාර්තාව, පුවත්පත්, ලිපි හා සඟරා ආශ්‍රය කරගැනීම සිදු කරනු ලැබේ.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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ශ්‍රී ලංකාවේ කුඩා තේ වතු අංශයේ ඵලදායීතාව කෙරෙහි බලපාන සාධක

කේ. ආර්. අප්සරා චතුරංගනී සහ කේ. එම්. ආර්. කරුණාරත්න

ආර්ථික විද්‍යා හා සංඛ්‍යාන දෙපාර්තමේන්තුව, පේරාදෙනිය විශ්වවිද්‍යාලය

මූල පද: *ඵලදායීතාවය, කුඩා තේ වතු අංශය, ශ්‍රී ලංකාව*

හැඳින්වීම

තේ කර්මාන්තය ශ්‍රී ලංකාවේ මූලික විදේශ විනිමය ඉපැයීම් මූලාශ්‍රයක් වේ. තේ වගාව මූලිකව ම වතු අංශය හා කුඩා තේ වතු අංශය ලෙස කොටස් දෙකකින් යුක්ත ය. ව්‍යවස්ථාවට අනුව කුඩා තේ වතු යන්න අර්ථ දක්වන්නේ තේ වගා කරන අක්කර 20 කට වඩා අඩු භූමි ප්‍රදේශයක් පවතින්නක් යනුවෙනි (සුබසිංහ ඇතුළු පිරිස, 2013). ඕනෑම නිෂ්පාදනයක් සඳහා යොදාගනු ලබන යෙදවුම් හා නිමැවුම් අතර අනුපාතික සම්බන්ධතාවය ඵලදායීතාවය ලෙස අදහස් වේ. නිෂ්පාදන කටයුතු සිදු කිරීමේ දී යෙදවුම් කොපමණ හොඳින් භාවිත කරන්නේ ද යන්න ඵලදායීතාවය තුළදී සලකා බැලීම සිදු කරයි. නිෂ්පාදනයක් සිදු කිරීමේ දී යෙදවුම් නිසි ලෙස මෙහෙයවන්නේ නම් ඵලදායීතාවය ඉහළ නැංවිය හැකිය. තේ වගාවේ ඵලදායීතාවය කෙරෙහි බලපාන සාධක විශාල ප්‍රමාණයක් පවතී. තේ වගාව සඳහා අවශ්‍ය ප්‍රශස්තම උෂ්ණත්වය 22^0C පමණ වේ. විවිධ තේ වගා කරන කලාප වල තේ වගාව සඳහා අවශ්‍ය උපරිම වර්ෂාපතනය මසකට මිලිමීටර 223 සිට මිලිමීටර 417 අතර ප්‍රමාණයක් තුළ විචලනය වෙමින් පවතී (විජේරත්න ඇතුළු පිරිස 2007). යෙදවුම් නිසි ලෙස වගාව සඳහා යෙදීම තුළින් තේ වගාවේ ඵලදායීතාව ඉහළ නංවා ගත හැකි ය.

විදේශ විනිමය කෙරෙහි ප්‍රබල දායකත්වයක් සපයන තේ කර්මාන්තයෙහි ඵලදායීතාවය ඉහළ නංවා ගැනීම රටේ දළ දේශීය නිෂ්පාදිතයට යහපත් වීම හේතුවෙන් තේ අංශයේ ඵලදායීතාවය විමසා බැලීම වැදගත් වේ. ශ්‍රී ලංකාව තුළ තේ නිෂ්පාදනය අපනයන මූලාශ්‍රයක් ලෙස මෙන් ම පරිභෝජන මූලාශ්‍රයක් ලෙස ද හඳුනාගත හැකිය. කුඩා තේ ඉඩම්වල ඵලදායීතාවය දියුණු කර ගැනීමට නම් යහපත් කළමනාකරණයක් හා කාර්යක්ෂම පාලනයක් පැවතීම අවශ්‍ය වේ. එසේම තේ වගාවේ නිෂ්පාදන වියදම අඩු කිරීමට ඉවහල් වන ක්‍රම සැකසීම තුළින් ද තේ වගාවේ ඵලදායීතාවය ඉහළ නංවා ගැනීම සිදු කළ හැකිය. ශ්‍රී ලංකාවේ විවිධ පළාත් ආශ්‍රිතව කුඩා ඉඩම් යොදාගෙන තේ වගාව සිදු කරනු ලබයි. ඒ අතරින් ඌව පළාතේ බදුල්ල දිස්ත්‍රික්කයේ පස්සර ප්‍රදේශය ආශ්‍රිතව පවතින කුඩා තේ වතු

අංශයේ ඵලදායීතාවයේ ස්වභාවය හා ඵලදායීතාව සඳහා බලපාන සාධක සොයා බැලීම මෙම අධ්‍යයනය මඟින් අපේක්ෂා කරයි.

සාහිත්‍ය විමර්ශනය

කුඩා තේ වතු අංශයේ ඵලදායීතාව පිළිබඳ සැලකීමේ දී මෙය ආශ්‍රය කර ගනිමින් පසුගිය වර්ෂ පුරා ම දේශීය හා විදේශීයව විවිධ අධ්‍යයනයන් සිදු කොට ඇත. සාහිත්‍ය විමර්ශනය තුළදී මේ සම්බන්ධව සිදුකර ඇති විවිධ අධ්‍යයනයන් පිළිබඳව විමසීමක් කරනු ලබයි.

සුබසිංහ ඇතුළු පිරිස (Subasinghe et al. 2013) ඌව පළාතේ කුඩා තේ වතු හිමියන් ආශ්‍රයෙන් ඵලදායීතා විචලනය සම්බන්ධව සිදුකරන ලද අධ්‍යයනයට අනුව භාවිත කරන ශ්‍රම ප්‍රමාණය, පොහොර ප්‍රමාණය, භූමිය, තේ වර්ගය, අත්දැකීම් හා ගොවියාගේ සෞඛ්‍ය තත්ත්වය යනාදිය ඵලදායීතාවයේ විචලනය සඳහා උපකාරී වන සාධක වේ. ශ්‍රී ලංකාවේ මැද රට තෙත් කලාපයේ කුඩා තේ වතු අංශයේ තාක්ෂණික කාර්යක්ෂමතාව පිළිබඳව සොයා බැලීම සඳහා බස්නායක සහ ගුණරත්න (Basnayake and Gunaratne, 2002) විසින් සිදු කර ඇති අධ්‍යයනය තුළින් අනාවරණය කර ඇත්තේ ඉඩමේ ප්‍රමාණය, පවුලේ ශ්‍රමය, කුලී ශ්‍රමය, පොහොර හා ඩොලමයිට් මඟින් තේ ඵලදාවට සැලකිය යුතු බලපෑමක් ඇති කරන බවයි.

කාලගුණික වෙනස්වීම් මත ශ්‍රී ලංකාවේ තේ නිෂ්පාදනයට වන බලපෑම සම්බන්ධව අධ්‍යයනය කිරීම අරමුණු කර ගනිමින් විජේරත්න (Wijeratne, 1996) විසින් සිදු කර ඇති අධ්‍යයනයෙන් දක්වා ඇත්තේ උෂ්ණත්වය හා වර්ෂාපතනය තේ වගාවේ ඵලදාව කෙරෙහි බලපාන බවයි. තේ වගාවේ ඵලදායීතාව අඩු වීමට ද මෙම කාලගුණික වෙනස්වීම් බලපාන බව මෙහි දී අනාවරණය වී තිබේ. 2014 වසරේ දී ඩියුබ් සහ ගුවේයා (Dube and Guveya ,2014) විසින් සිම්බාබ්වේ හි Chipinge දිස්ත්‍රික්කය තුළ කුඩා තේ වතු හිමියන්ගේ වගාවේ ඵලදායීතාව හා එහි නිර්ණායක පිළිබඳව පරීක්ෂා කිරීමට සිදුකරන ලද අධ්‍යයනය මඟින් ගොවියාගේ අත්දැකීම, ගොවියාගේ අධ්‍යාපන මට්ටම, පොහොර යෙදීමේ ප්‍රමාණය, ඵලදාව ඉහළ දමන සේවාවන් ළඟා කර ගැනීමේ හැකියාව, වාණිජකරණය වී ඇති ප්‍රමාණය, ශ්‍රමය රැස් කළ හැකි ප්‍රමාණය යනාදිය අධ්‍යයන ප්‍රදේශය තුළ කුඩා තේ වතු හිමියන්ගේ ඵලදායීතාව කෙරෙහි ධනාත්මක බලපෑමක් පවතින බව අනාවරණය කරගෙන ඇත.

පර්යේෂණ ගැටලුව

පස්සර ප්‍රදේශයේ කුඩා තේ වතු අංශය ආශ්‍රිතව පවතින ඵලදායීතාවයේ ස්වභාවය සහ ඵලදායීතාව කෙරෙහි බලපාන ප්‍රධාන සාධක මොනවාද? යන්න පිළිබඳව තාක්ෂණික කාර්යක්ෂමතාව හරහා අධ්‍යයනය කිරීම මෙම අධ්‍යයනයේ පර්යේෂණ ගැටලුව වේ.

පර්යේෂණ අරමුණු

අධ්‍යයනයේ ප්‍රධාන අරමුණ වන්නේ කුඩා තේ වතු අංශයේ ඵලදායීතාවය හඳුනා ගැනීම හා ඵලදායීතාවයට බලපාන ප්‍රධාන සාධක හඳුනා ගැනීමයි. අධ්‍යයනය සඳහා යොදා ගත් උප අරමුණු වන්නේ ඉඩමේ ප්‍රමාණය වෙනස්වීම අනුව ඵලදායීතාවය වෙනස්වන ආකාරය අධ්‍යයනය කිරීම හා කුඩා තේ වතු අංශයේ ඵලදායීතාවය එම ඉඩම් හිමියන්ගේ ආදායම සඳහා සිදු කරන බලපෑම හඳුනා ගැනීමයි.

පර්යේෂණ ක්‍රමවේදය

දත්ත රැස් කිරීම: මූලික වශයෙන් ම මෙම අධ්‍යයනය සඳහා ප්‍රාථමික හා ද්විතියික දත්ත යන ද්විත්වය ම භාවිත කරනු ලැබේ. ප්‍රාථමික දත්ත සඳහා ප්‍රශ්නාවලියක් මඟින් දත්ත රැස් කරන අතර සම්මුඛ සාකච්ඡා මඟින් ද අවශ්‍ය දත්ත රැස් කර ගැනීමට කටයුතු කරනු ලැබේ. ද්විතියික දත්ත ලෙස වාර්ෂික මහ බැංකු වාර්තා, කුඩා තේ වතු සංවර්ධන අධිකාරියේ වාර්ෂික වාර්තා, ශ්‍රී ලංකා තේ මණ්ඩලයේ වාර්ෂික වාර්තා, ජන හා සංඛ්‍යා ලේඛන දෙපාර්තමේන්තුවේ වාර්තා හා අන්තර්ජාලය ආශ්‍රිත දත්ත ආදිය ද භාවිතයට ගැනේ.

දත්ත රැස් කිරීමේ දී නියැදිය වශයෙන් බදුල්ල දිස්ත්‍රික්කයේ පස්සර ප්‍රදේශය තුළ පවතින ග්‍රාම නිලධාරී කොට්ඨාශ 41 තුළින් කුඩා තේ වගා කරන ඉඩම් සහිත ග්‍රාම නිලධාරී කොට්ඨාශ 2 ක් ආශ්‍රයෙන් සරල සසම්භාවී නියදුම් ක්‍රමය යටතේ කුඩා තේ වතු හිමියන් 60ක ගෙන් යුක්ත නියැදියක් යොදාගන්නා අතර ඔවුන්ගෙන් ප්‍රශ්නාවලියක් ආශ්‍රයෙන් දත්ත රැස් කෙරේ. මෙහිදී නියැදියට අදාළ කුඩා තේ වතු හිමියන් 60 දෙනා තෝරා ගැනීමේ දී අක්කර 1 ට අඩු කුඩා තේ වතු හිමියන් 30 දෙනෙක් ද, අක්කර 1ත් 2ත් අතර කුඩා තේ වතු හිමියන් 30 දෙනෙක් ද තෝරා ගැනීමට කටයුතු කරනු ලැබේ. තවද මෙම නියැදියට අදාළව තේ දළු සපයන කර්මාන්තවල නිලධාරීන් හා තේ පරීක්ෂක නිලධාරීන් සමඟ සම්මුඛ සාකච්ඡා මඟින් දත්ත රැස් කර ගැනීමට කටයුතු කෙරේ.

පර්යේෂණ ක්‍රමවේදය

අධ්‍යයනයේ අරමුණු ඉටු කර ගැනීම සඳහා යොදාගන්නා ක්‍රමවේදයන් විස්තර කිරීම මෙහිදී සිදු කරයි. අධ්‍යයනයේ ප්‍රධාන අරමුණ වන කුඩා තේ වතු අංශයේ ඵලදායීතාවය හඳුනා ගැනීමට හා ඒ කෙරෙහි බලපාන සාධක හඳුනා ගැනීම සඳහා තාක්ෂණික කාර්යක්ෂමතාව මඟින් ඵලදායීතාව ගණනය කරනු ලැබේ. තාක්ෂණික කාර්යක්ෂමතාව නිෂ්පාදන ශ්‍රිතයක් මඟින් ගණනය කරන ආකාරය මුලින් ම Battese and Coelli (1995) හඳුන්වා දෙන ලදී. මෙම අධ්‍යයනයේ අරමුණු ඉටු කර ගැනීම සඳහා මොවුන් විසින් හඳුන්වා දුන් නිෂ්පාදන ශ්‍රිතය භාවිත කරනු ලැබේ.

$$\ln Y_i = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \beta_6 \ln X_{6i} + u_i$$

Yi = තේ වගාවේ මාසික නිමැවුම (අක්කරයකට කිලෝග්‍රෑම්)
X_1 = ඉඩමේ ප්‍රමාණය (අක්කර)
X_2 = පවුලේ ශ්‍රමය (මිනිස් දින)
X_3 = කුලී ශ්‍රමය (මිනිස් දින)
X_4 = පොහොර යොදන ප්‍රමාණය (කිලෝග්‍රෑම්)
X_5 = රසායනික පිරිවැය
X_6 = ඩොලමයිට් පිරිවැය

මෙම ආදර්ශය ආශ්‍රයෙන් තාක්ෂණික කාර්යක්ෂමතාවය ගණනය කිරීමෙන් මුළු සාධකයන්ගේ ඵලදායීතාව නිමානය කිරීමට බලාපොරොත්තු වේ.

එසේ ම මෙම අධ්‍යයනය තුළ දී තාක්ෂණික කාර්යක්ෂමතාවය මත පදනම්ව ඵලදායීතාව ගණනය කිරීමට බලාපොරොත්තු වේ. TE මඟින් තාක්ෂණික කාර්යක්ෂමතාවය නිරූපණය වේ. 1-TE යන්නෙන් දැක්වෙන්නේ Ui නම් තාක්ෂණික අකාර්යක්ෂමතාවයයි.

$$TE = \frac{\text{සැබෑ නිෂ්පාදිතය}}{\text{අපේක්ෂිත නිෂ්පාදිතය}}$$

$$Ui = 1\text{-}TE_i$$

මේ සඳහා මෙම අධ්‍යයනය තුළ දී තාක්ෂණික අකාර්යක්ෂමතාව පහත ආදර්ශය මඟින් ගණනය කෙරේ.

$$Ui = \alpha_0 + \alpha_1 Z_i + \alpha_2 Z_i + \alpha_3 Z_{3i} + \alpha_4 Z_i + \alpha_5 Z_i + \alpha_6 Z_{6i} + w_i$$

Ui = තාක්ෂණික අකාර්යක්ෂමතාව

Z_1 = ගොවියාගේ වයස (වසර ගණන)

Z_2 = ගොවියාගේ අධ්‍යාපන මට්ටම (වසර ගණන)

Z_3 = ගොවියාගේ අත්දැකීම (වසර ගණන)

Z_4 = ගොවියාගේ සෞඛ්‍ය තත්ත්වය (අනුව්‍යාජ විචල්‍යය : සෞඛ්‍ය තත්ත්වයෙන් ඉහළ නම් = 1, නැත්නම් = 0)

Z_5 = ජීවනෝපාය (අනුව්‍යාජ විචල්‍යය : ඉඩම් හිමියා තේ වගාව පමණක් සිදු කරයි නම් = 1, නැත්නම් = 0)

Z_6 = කුඩා තේ වතු සමිතියක සාමාජිකයෙකු වීම. (අනුව්‍යාජ විචල්‍යය වේ නම් = 1, නැත්නම් = 0)

W_i = දෝෂ පදය

තාක්ෂණික කාර්යක්ෂමතා ආදර්ශය තුළින් කුඩා තේ වතු අංශයේ ඵලදායීතාවට බලපාන ප්‍රධාන සාධක හඳුනා ගැනීමට අපේක්ෂිත ය. ඉඩම්වල ප්‍රමාණයන්ගේ වෙනස්වීම මත කාර්යක්ෂමතාව මත පදනම්ව ඵලදායීතාව ගණනය කිරීමට වෙනම නිෂ්පාදන ශ්‍රිත දෙකක් නිමානය කරන අතර අනුව්‍යාජ විචල්‍යයන්ද මීට අදාළ කර ගැනීමට බලාපොරොත්තු වේ. අධ්‍යයනයේ දත්ත විශ්ලේෂණය කිරීමේ දී STATA 13 පරිගණක මෘදුකාංගය යොදා ගනිමින් කාර්යක්ෂමතාවය මිනුම් කිරීමට හා ඵලදායීතාවය හඳුනා ගැනීමට බලාපොරොත්තු වේ.

ආශ්‍රිත ග්‍රන්ථ නාමාවලිය

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