The Empirical Investigation on the Role of Agriculture Sector in Socio-Economic Development in Sri Lanka

E.G.C.D. BANDARA, U.K. JAYASINGHE-MUDALIGE, J.M.M. UDUGAMA,
A.M.C.M. ATTANAYAKE and J.C. EDIRISINGHE

*Department of Agribusiness Management, Faculty of Agriculture and Plantation Management,
Wayamba University of Sri Lanka, Makandura, Gonawila (NWP)*

ABSTRACT

The role of agriculture sector in Sri Lanka in the process of structural transformation was examined based on the Myint Hypothesis, which suggests that as a country undergoes the structural transformation there are four different roles to be played by its food and agriculture sector, including: (1) food security – associated with annual per capita production of food; (2) labour mobility – releasing of agricultural labour force to other sectors (manufacturing and services); (3) capital formation – through domestic savings from agriculture, and (4) agriculture trade - earning of foreign exchange by exporting agriculture products. The outcome based on multivariate data analysis, which employed the principles of distributed lag models in various functional forms to the data covering the period of 1970 - 2010, shows that the performance of the agriculture sector was fairly satisfactory. The study, as a whole, highlights the importance of safeguarding this particular sector, because it acts as the mainstay of livelihood for vast majority of people and since it has the potential to stand right with an appropriate agricultural policy and institutional framework.

KEYWORDS: Agriculture trade, Capital formation, Food security, Labour mobility, Structural transformation

INTRODUCTION

In ancient times, vast majority of fellow citizens in Sri Lanka were involved with agriculture sector. Therefore, at that time, the economy was based on agriculture. A number of distinct changes to the Sri Lankan economy were occurred since the western colonial powers governed the country starting from the Portuguese to the Dutch and finally the British. Just after the independence in 1948, the manufacturing and services sectors have grown rapidly with compared to the food and agriculture sector and, the exportation value of industrial production was started to increase rapidly than agriculture exports. Due to those reasons, the structure of Sri Lankan economy has changed from agriculture-based to industrial-based. It is called the "Structural Transformation" of Sri Lankan economy.

Contributions of agricultural, industrial and services sectors are used to calculate the country's economic development and it can be measured in terms of the Gross Domestic Product (GDP). In Sri Lanka, GDP was 13,664 million Rs. in 1970 and it was 97,560 million Rs. in 2010. Agriculture share in GDP has been decreased during past four decades due to many reasons such as: food security, labour mobility, capital formation and agricultural trade. For an example, agriculture share to the GDP was 28.3% in 1970 and it was 12.8% in 2010 (Central Bank annual reports from 1970 to 2010).

Although, the relative contribution of economic active population has decreased in agriculture sector, more than 70% of 20.7% million people in the country still make their livelihood directly or indirectly based on agriculture. Domestic savings from agriculture has been increased from 610.97 million Rs. in 1970 to 2335.18 million Rs. in 2010, and as a percentage increment of 382.2%. Before 1970s, agriculture exports have accounted for more than 70% to 80% of total exports, and specially, plantation agriculture crops and major export agriculture crops were given higher contribution to the agriculture exports while industrial exports were stagnated around 15%. Just after the introducing open economic policies, industrial exports have started to grow rapidly than agriculture exports (Central Bank Annual Reports from 1970 to 2010 and Labour Force Survey – Annual Report 2011).

Thus, there are many unresolved problems exist in the context of food and agriculture sector in Sri Lanka. Hence, the major objective of this study was to find out whether agriculture sector of Sri Lanka perform well in past four decades with respect to the areas of food security, labour mobility, capital formation and agriculture trade. Further, attempt was extended to see the expected behavior of each aspect as proposed by Myint in the process of structural transformation.

METHODOLOGY
Theoretical Framework

The hypothesis developed by Myint (1977, 1965) were used as the basis to examine this problem. According to Myint, the agriculture share to the GDP should be decreased, while the contributions of which with respect to a number of key areas should be increased. In particular, the agriculture sector should be able to:

(1) Increase the supply of food available for domestic consumption (*food security*);

(2) Release the labour force engaged in agriculture related activities for specialized work in other sectors, i.e. industrial and services (*inter sectoral labour mobility*);

(3) Increase the supply of domestic savings from agriculture sector (*capital formation*);

(4) Increase the supply of foreign exchange earned through agriculture exports (*agricultural trade*).

Data Collection

The secondary data were collected during the period of January to March 2013 from the annual reports of the Central Bank of Sri Lanka (1970 to 2010), economic and social statistics of Sri Lanka (2009), national accounts of Sri Lanka (2010), and Sri Lanka labour force survey (2011). The data were collected from 1970 to 2010 (40 years) by considering the availability and the reliability.

Data Analysis

Both descriptive and Multiple Linear Regression techniques (Green, 2000) were used to estimate the coefficients of variables. To find out the best fitted empirical model, the data were tested separately for their, Linear model, Reciprocal model, Log-Log model, Log-Linear model, Linear-Log model and Log- Inverse model and above all the types of models were tested for their first lag value using Minitab 15. Fitted line plots were used to find out the relationship between agriculture share and each independent variable separately.

Developing Hypothesis and Estimable Variables

First, to claim that food and agriculture sector in Sri Lanka has contributed to the economic development significantly by "*securing food*" for Sri Lankans, the "annual per capita production of paddy and other field crops for domestic consumption" (*Pc_FC*) [*kg/head/year*] was taken. Manioc, maize, chillies, red onion, ground nut, green gram,

soya bean, potatoes, kurakkan, sweet potato, gingerly, cowpea, and black gram were considered as other field crops. A positive (+) sign was expected for this variable.

Secondly, can be stated that "the active labour force involved with the agriculture sector of a given year as a percentage to total economic active population in the same year" (*Ag_LF*) [%] should be decreased as these people should be released to work in other sectors (industrial and services). A negative (-) sign was expected for this variable.

Thirdly, it was hypothesized that "the stock of capital produced by the agriculture sector through domestic savings" (*Ag_DS*) [*million Rs.*] should be increased over the years. The GDP from agriculture of a given year (GDPA) was multiplied by the Domestic Savings Ratio (DSR) of same year (i.e. GDPA × DSR) to derive this variable. A positive (+) sign was expected for this variable.

Fourthly, "the foreign exchange earned through exporting of agricultural products" (*Ag_EX*) [*million Rs. in real terms*] should be increased significantly over the time, although, as with the structural transformation, the ratio between this particular value and the total value of foreign exchange is to be decreased over the time. Only key plantation agricultural crops (i.e. tea, rubber, and coconut) and major export agricultural crops (i.e. coffee, cocoa, cinnamon, pepper, cloves, and cardamoms) were considered to calculate agriculture exports. Because of paddy and other food crops were not significantly contributed in agriculture exports in Sri Lanka. The expected sign of this variable is positive (+).

Empirical Model

The four explanatory variables explained above were used to specify the following empirical model:

$$Ag\_SH_i = \beta_0 + \beta_1 (Pc\_FC)_i + \beta_2 (Ag\_LF)_i + \beta_3 (Ag\_DS)_i + \beta_4 (Ag\_EX)_i + \varepsilon_i$$

Where,

Ag_SH	= Agriculture share in GDP
Pc_FC	= Per capita availability of major staple food crops
Ag_LF	= Agriculture labour force as a percentage of total labour force
Ag_DS	= Agriculture domestic savings
Ag_EX	= Agriculture exports
$\beta_0 - \beta_4$	= Regression coefficient
ε	= Error term
i	= i^{th} year (1970 – 2010)

RESULTS AND DISCUSSION

Table 1. Descriptive statistics of the variables used in the model

Variable	Mean	Standard Deviation (SD)	Coefficient of Variation (CV)
GDP	40521	23847	58.9
GDPA	8101	2580	31.9
Ag_SH	23.4	6.2	26.7
Pc_FC	185.8	24.9	13.4
Ag_LF	19.9	2.2	10.9
Ag_DS	1231	531	43.2
Ag_EX	2958	760	25.7

Agriculture Share

The mean values of the GDP and GDP from agriculture (GDPA) during the period of 1970 to 2010 were 40,521 million Rs. and 8,101 million Rs, respectively (Table 1). The value of GDP has increased with an increasing rate. But, the value of GDPA has not increased with considerable amount with compared to GDP (Figure 1). In 1970, agriculture share in GDP was 28.3% and it was 12.8% in 2010. The results emphasized that, the GDP has increased due to the performances of manufacturing and services sectors than agriculture sector in Sri Lanka.
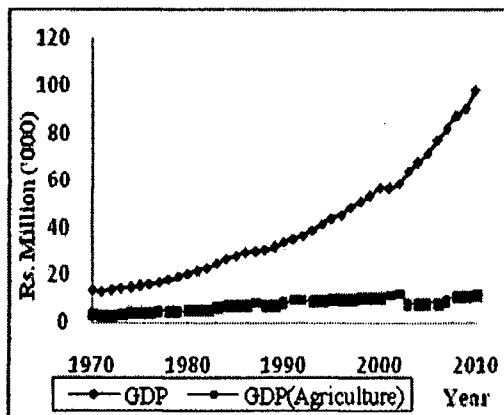

Figure 1. GDP from agriculture and the entire economy (1970 - 2010)

Food Security

The total production of paddy and other field crops has been increased with a mean value of 3130 thousand metric tones (Table 1). It was characterized by year-wise fluctuations. The per capita availability of major staple food crops for domestic consumption was shown a slightly positive trend (Figure 2). The mean value of this variable was 185.8 kg/head/year (Table 1). It reveals that per capita availability of food has shown considerably high amount but it was not comply with per capita requirement of food in each year.
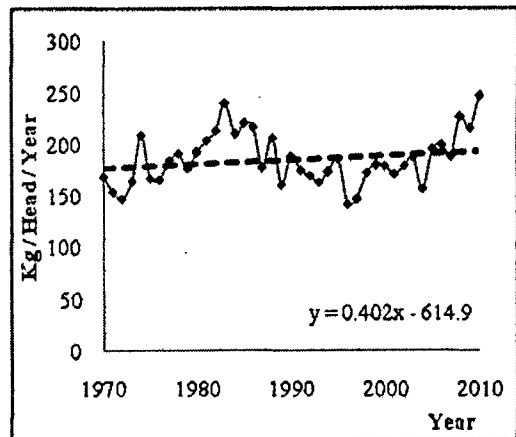

Figure 2. Per capita availability of major staple food crops (1970 -2010)

Labour Mobility

The result shows that, there was a small negative trend occurred with respect to releasing of agriculture labour force to other sectors (manufacturing and services) during this period as a ratio of agriculture labour force to the total labour force (Figure 3). The mean value of this variable was 19.8% (Table 1).
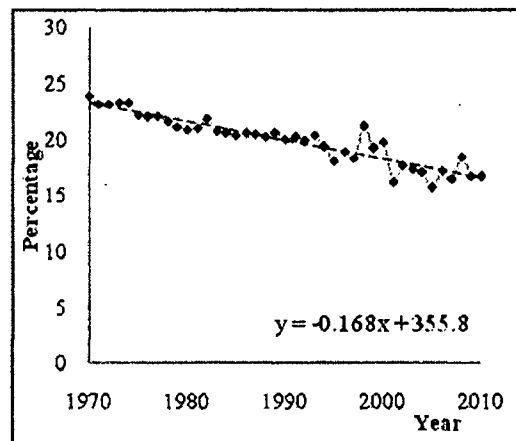

Figure 3. Percentage of agriculture labour force to total labour force (1970 – 2010)
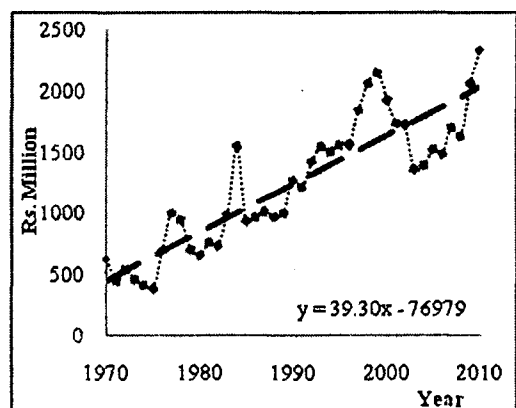
Capital Formation

Figure 4. Domestic savings from agriculture sector (1970 – 2010)

The value of domestic savings from agriculture sector has been increased with a positive trend and it can be noticed that this value was remained around 500 million Rs. since 1970 and it has reached up to 2300 million Rs. in 2010 (Figure 4). The mean value of this variable was 1231.2 million Rs. during the period of 1970 to 2010 (Table 1).

Agricultural Trade

The foreign exchange earned by exporting agricultural products has increased with an increasing rate, and it was much prominent since the open economic policies introduced in late 70s (Figure 5). For the entire period of 1970 to 2010, the mean values of the total exports (i.e. agriculture + manufacturing + services) and agricultural exports were 231,053 million Rs. and 2958 million Rs. respectively (Table 1). In 1970, the value of agriculture exports was very small with compared to the value of agriculture exports in 2010 (Figure 5).
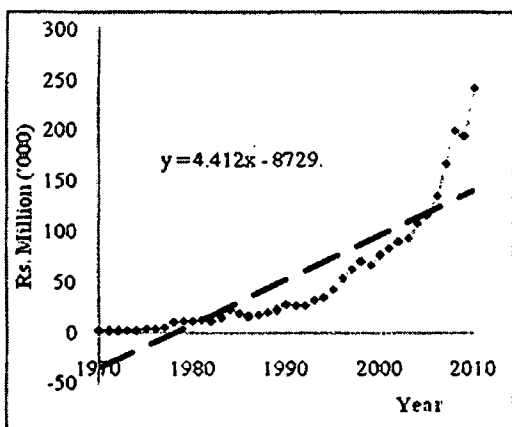

Figure 5. Value of agricultural exports in Sri Lanka (1970 – 2010)

Relationship between Agriculture Share and other Variables

Fitted line plots were used to identify the relationship between agriculture share and each independent variable separately. Regression line and 95% Confidence Interval (CI) were used to get the clear idea about the relationship between dependent and independent variables.

When Pc_FC increased, the Ag_SH in GDP has decreased with a slightly negative trend and small numbers of data were observed within the CI (Figure 6). It reveals that food security has shown slight correlation with the Ag_SH in past four decades.

Further, when Ag_LF increased, the Ag_SH in GDP has also increased with a positive trend (Figure 7). This was happened not because of Ag_LF increase with the time, this happened due to the population of the country increased over the years.

Moreover, when Ag_DS increased, the Ag_SH in GDP has decreased with a small negative trend (Figure 8).The Ag_DS were scattered in wide range during past four decades and the majority of the data were observed within the CI.

Furthermore, when consider about the relationship between Ag_EX and Ag_SH in GDP, when Ag_EX increased, the Ag_SH in GDP has decreased with a small negative trend (Figure 9). This refers even the percentage of agricultural export increased with the time; it was not much contributed to increase the Ag_SH in GDP because other sectors contributions to GDP were much higher than that.
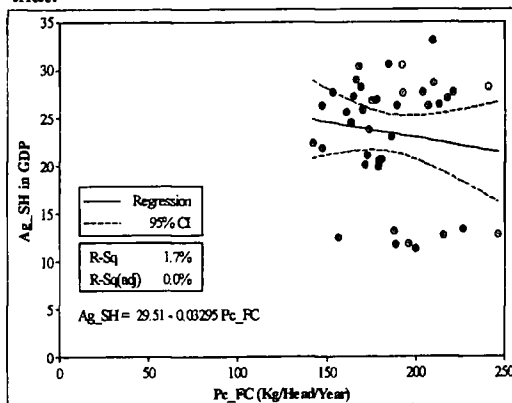

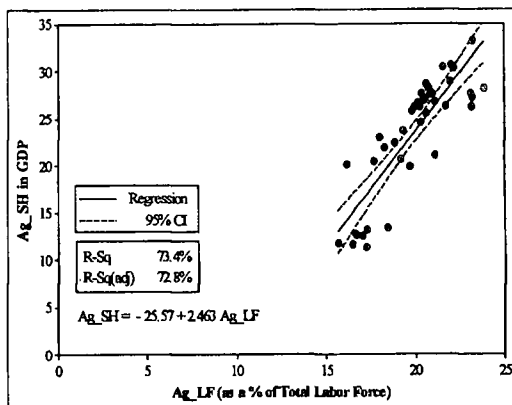**Figure 6. Ag_SH verses Pc_FC (1970 – 2010)**
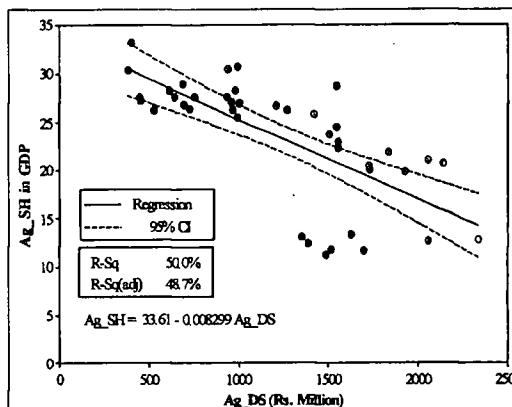

Figure 7. Ag_SH verses Ag_LF (1970 – 2010)

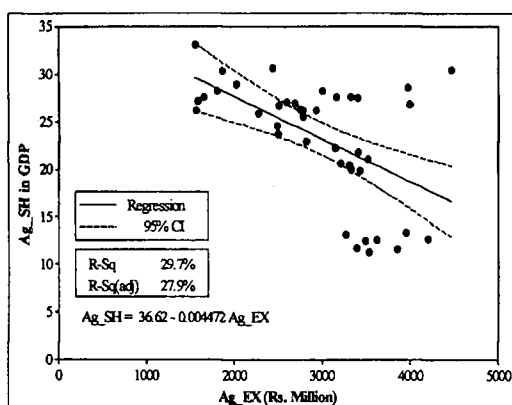**Figure 8. Ag_SH verses Ag_DS (1970 – 2010)**

Figure 9. Ag_SH verses Ag_EX (1970 – 2010)

The Best Fitting Empirical Model

Finally, the best fitted empirical model was developed with respect to highest adjusted R^2 values. The regression equation was found for that model as follows:

$$Ag\_SH = 74.0 + 0.0041 (Pc\_FC) + 0.0098 (Pc\_FC)_{t-1} - 525 (1/Ag\_LF) - 522 (1/Ag\_LF)_{t-1} - 0.00009 (Ag\_DS) - 0.00040 (Ag\_DS)_{t-1} + 0.00087 (Ag\_EX) - 0.00067 (Ag\_EX)_{t-1}$$

According to best fitted empirical model, multiple regression analysis results were observed as adjusted R^2 value of 80.5%. It indicates that the variables Pc_FC, (Pc_FC)$_{t-1}$, 1/Ag_LF, (1/Ag_LF)$_{t-1}$, Ag_DS, (Ag_DS)$_{t-1}$, Ag_EX, and (Ag_EX)$_{t-1}$ explain about 80.5% of the variation of Ag_SH in the model.

The results suggest that two variables, namely 1/Ag_LF and (1/Ag_LF)$_{t-1}$ were significant at 0.05 probability level and, other variables were not significant at that level (Table 2).

Table 2. Estimates of variables

Variable	Parameter Estimate (P value)	Standard Error
Pc_FC	0.854	0.022
(Pc_FC)$_{t-1}$	0.685	0.024
1/Ag_LF	0.002*	153.8
(1/Ag_LF)$_{t-1}$	0.002*	152.2
Ag_DS	0.967	0.002
(Ag_DS)$_{t-1}$	0.870	0.002
Ag_EX	0.447	0.001
(Ag_EX)$_{t-1}$	0.558	0.001

*Significant at 0.05 level.

CONCLUSIONS

Although, the outcome of analysis suggest that the food and agriculture sector in Sri Lanka was able to contribute satisfactorily towards the economic development of the country in a number of key areas, including

food security, capital formation, and agricultural trade. Specially, care must be taken to release the excessive and unspecialized labour involved with agriculture to other sectors of the economy with an appropriate skill development, which was not taken place progressively in the past few decades. Agriculture sector performances were not bad in past four decades and results show that the agriculture share to the GDP has decreased due to the higher performance of manufacturing and services sectors than agriculture sector in Sri Lanka.

The results also stress that even agricultural share in GDP decrease with the time food security in the country was not in an unfavorable situation and that reveals the importance of providing continuous support and targeted incentives to the food and agriculture sector similar to what are "offered" to other two sectors. Any financial and physical supports (e.g. subsidies for paddy sector) that should be focused on individual sectors (farming, processing and distributing), and there is an urgent need for establishing economic and social institutions, both public and private in the marketing channel.

Finally, the policy makers must be aware of the individual sectors within agriculture. If that happens, the ultimate objective of "agriculture for economic development" would be able to achieve in the near future as the country move into the final stages of structural transformation.

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