Impact of Agricultural Sector on Rural-Urban Migration in Sri Lanka (1970-2005)

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ABSTRACT

This study examined the relationship between agricultural sector and rural-urban migration in Sri Lanka since 1970. The factors that have a significant impact on agricultural production in Sri Lanka were identified by developing an agricultural production function and the factors that influence the migration in Sri Lanka, were identified using a migration function. Indirect elasticities were used to study the relationship between agriculture sector and rural urban migration. The findings suggests that labour, literacy, fertilizer and machinery have a significant impact on agricultural production in Sri Lanka while wage difference between rural and urban sectors and the age structure impacts migration. Economic polices based on decentralization of economic activities among the regions and by increasing percapita earnings of rural workers derived from increased agricultural production through improve the quality and quantity of factors of production that were significant would be the most suitable to address this issue.

KEY WORDS: Agricultural sector, Rural-Urban Migration

INTRODUCTION

Sri Lanka was predominantly an agricultural economy at the time of independence from British rule in 1948, consisting of an export agricultural sector and a subsistence agricultural sector. Thus, agriculture provided employment to more than half of the labour force at that time.

After the economic liberalization, growth of agriculture sector has remained significantly lower than the growth in the industrial and service sectors. The growth rate of agriculture sector was even lower than the average growth rate during the pre-liberalisation period. During the period 1977-2003 its annual average growth was 2.6 percent, compared with 5.3 percent in the industrial and 5.4 percent in the service sector (Anon, 2003a).

The agricultural sector is currently confronted with a variety of problems. Due to its poor performance, its share in gross domestic production, which was 38 percent in 1970, had declined to 20 percent by 2000 (Figure 1). The contribution of agriculture sector in national income declined to 4.4 percent in 2005 from 40 percent in 1948 and the agricultural active population decreased from 55 percent of the total population in the 1970s to 43 percent in 2005(FAO, 2005).

The declining share is due to several inherent drawbacks that limit agricultural growth and development. One of the major drawbacks is the migration of labour to other human capital intensive sections (Anon, 2004). Indeed, rural urban migration and agricultural performance are bound together because rural workers compare their income with what they could obtain if they migrate to the cities.

According to Todaro (1969) and Harris and Todaro (1970) hypothesis, rural-urban migration in less developed countries is a function of the difference between the expected wage from migration

(urban wage) and the agricultural wage. That expected wage is equivalent to the actual industrial wage weighted by the migrant's probability of obtaining a job in the modern urban sector (Goldsmith *et al.*, 2002).
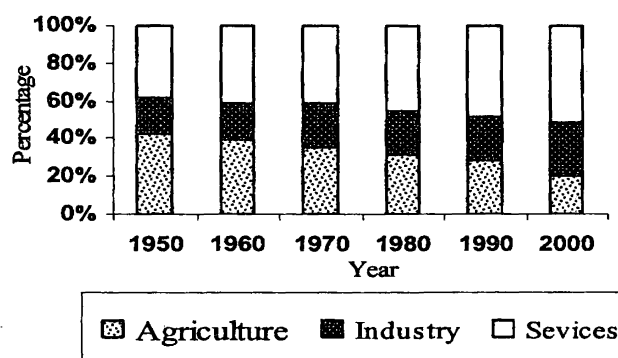
Figure 1 - Percentage of contribution to GDP by Agriculture, industry and service Sectors:

For the period of 1970 to 1990, the average annual growth rate of urban population was 6.5 percent for Bangladesh, 3.4 percent for India and 4.2 percent for both Pakistan and Sri Lanka (Hugo, 1992). However, the urban growth rate is dominated mainly by rural-urban migration and it contributes between three-fifths to two-thirds of this growth (UN, 1993). The estimated urban population in Sri Lanka is 9,031,000 or 48 percent of the total population of 18.8 Mn (Estimated) in 2005. It is also estimated that the total land area covered by the urban areas is 826,400 hectares or 12.7 percent of the total land extent of the country (Indrasiri, 2005).

During the period 1981 to 2004 Western province, which includes Colombo, Gampaha and Kalutara districts shows the highest change of urban population in Sri Lanka (Figure 2).
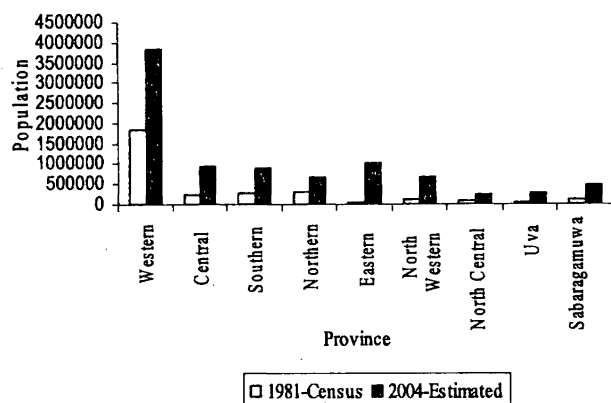

Figure 2 - Change of urban population in Sri Lanka:

The uncontrollable rural-urban migration is the reason for many urban problems such as environmental degradation, unemployment, violence, insecurity, urban poverty and poor health conditions. As in many countries, national and local governments cannot plan for the population increases, and fail to provide the required infrastructure, services and jobs. Poorly managed cities lead to the deterioration of urban living conditions (Habitat, 2001).

The survey conducted in the first quarter of 1996 by the Department of Census and Statistics estimated the unemployed population in Sri Lanka as 0.71 million. Of the unemployed, 0.11 million resided in the urban sector (14.2 per cent) and 0.6 million (12.3 per cent) resided in the rural sector. The estimated unemployment rates in Sri Lanka by age group also confirm the low incidence of unemployment in the rural sector of Sri Lanka (Bandara, 1998). Since the public and private sectors are no longer creating jobs for an increasing urban labour force, unemployed people are trying to make their own living by working in the informal sector. These activities normally include construction services, car repair, haircutting, street peddling, etc. still it motivates young workers to migrate to the urban areas while driving down agricultural output. However, there is a need of managing the deteriorating state of agricultural sector in resolving the high unemployment and widespread poverty in the country, as agriculture still directly accounts for about 35 percent of employment and is the major economic activity in the rural areas where about 90 percent of the poor live (Anon, 2003b).

Stiglitz (1969), Todaro (1976), Byerlee (1974), and Sabot (1979) have suggested that the most consistent policy for decreasing rural urban migration should be built upon the improvement of agricultural per capita earnings (Goldsmith et al., 2001).

Thus, this paper analyses the relationship between agricultural production and rural urban migration in the context of Sri Lanka and devise suitable policy measures to reduce migration.

METHODOLOGY

Data collection

Secondary data from 1970 to 2005 were obtained from the Central Bank of Sri Lanka, Center for Banking Studies (CBS), Urban Development Authority (UDA), Department of Census and Statistics (DCS), Hector Kobbakaduwa Agrarian Research and Training Institute (HARTI) and the Food and Agricultural Organization (FAO).

Theoretical framework

This study is aimed at studying the relationship between agricultural production and rural urban migration by developing two major functions; viz; a production function for the agricultural sector and a migration function to explain rural-urban migration. Later, these two functions are connected using indirect elasticities developed by Goldsmith et al (2002) to derive policy on reducing rural-urban migration.

The Agricultural production model

Here, Agricultural output was assumed to be a function of labour, land, education, infrastructure capital stock, fertilizer and machinery.

$$Y_{At} = f \ (L_t, A_t, E_t, Ik_t, F_t, MC_t)$$

Where,

Y_{At}	=	agricultural out put
L_t	=	labour
A_t	=	land
E_t	=	education
IK_t	=	infrastructure capital stock
F_t	=	fertilizer
MC_t	=	machinery

The Migration model

It is assumed that migration occurs because there is a wage difference between rural Agricultural) sector and urban sector. Thus, migration was assumed to be a function of wage ratio between rural and urban areas. In addition, assuming migration was predominantly by young age groups, an age structure variable was also included in the model.

Therefore, the model assumed was;

$$M_t = f(WR_t, G_t)$$

Where,

$$WR_t = \frac{Y_{Ut}/P_{Ut}}{Y_{At}/P_{At}}$$

M_t = rural urban migration
WR_t = wage ratio
Y_{Ut} = urban out put
P_{Ut} = urban population
Y_{At} = agricultural out put
P_{At} = agricultural labour force
G_t = age structure

Annex 1 provides a detailed description of all variables used in above models.

Derivation of Indirect Elasticities

Indirect elasticities developed by Goldsmith *et al* (2002) were used here to study the impact of agriculture sector on rural urban migration.

$$\eta\, M,\, X_i = \eta W,\, WR \times \eta Y_A,\, X_i$$

Where,

$\eta\, M,\, X_i$ = Indirect elasticity of rural urban migration with respect to factor X_i

RESULTS AND DISCUSSION

Linear-linear, linear-log, log-linear and Cobb-Douglas functional forms were tested in estimating agricultural production function. The Cobb-Douglas function was selected for interpretation based on superior R^2, significance of parameters (Pr <0.05) as well as ease of interpretation of estimated parameters as elasticities.

In the agricultural production function, the labour force coefficient was found to be significant (Table 1). A 1 percent increase of labour use would increase agriculture output by 1.3 percent.

The labourers in the agricultural sector are at disadvantage in many ways and they are an unprivileged group. It seems that mainly three factors regulate the demand for labourers in agriculture sector. Those are the wages that firm has to pay for their employers, income that firm receives for the goods they produce and the cost of inputs including raw materials and machines. As wages fall in agriculture sector, the demand for labour increases for

two reasons. First, when the cost of using machines is more expensive than employing workers, the firms tend to replace machine with labourers. Second, when the wages for labour is comparatively lower than the price of the goods the firm produces; it will be compelled to employ more workers.

But in migration equation wage ratio was significant (Table 1) and elasticity of rural urban migration was equal to 1.3. For each 1 percent increase in the urban-rural wage ratio, migration increases by 1.3 percent. It indicates that there is a wage difference in rural sector mainly involved in agriculture and urban sector which is mainly comprised of industrial and services sectors.

Therefore, increase in rural urban migration is due to increase in the demand for urban workers and the resulting rise in urban wages as industrial and service sectors expand. This finding is in conformation with the results reported by Central Bank of Sri Lanka in 2002. According to the provincial GDP (PGDP) Central Bank has divided country in to three main regions.

H   Western Province (WP), PGDP with a share of nearly half of the country's GDP.

M   Central Province (CP), North Western Province (NWP), Sabaragamuwa Province (Sap), Southern Province (SP), each contributed a share of greater than 5 percent.

L   Eastern Province (EP), North Central Province (NWP), North Province (NP) and Uva Province (UP), each contributed a share of less than 5 percent

The levels of per capita income showed considerable disparities among these three regions (Table 2). The per capita income in Region H was Rs. 109,953 (US Dollars 1,230), thereby emphasizing that Region H had a per capita income well above the standard cut-off level for developing countries of US Dollars 1,000, whereas in the other two regions, the per capita income was less than half this amount (Anon, 2002).

Table 1 - Results of Regression Analysis:

Agricultural Production Model			Migration Model		
Variables	Coefficient	Probability	Variables	Coefficient	Probability
Constant	11.225	0.122	Constant	-24.365[*]	0.000
Labour	1.321[*]	0.021	Wage Ratio	1.349[*]	0.003
Land	-0.176[*]	0.037	Age structure	2.256[*]	0.000
Literacy	1.560[**]	0.059			
Capital	0.016	0.109			
Fertilizer	0.105[*]	0.036			
Machinery	0.020[**]	0.066			
Adjusted R^2	0.987		Adjusted R^2	0.902	

[*] Significance at 5%   [**] Significance at 10%

Table 2 - Per capita income by Region in 2001:

Region	GDP share (%)	Per capita income Rupees	US Dollars
H	47	109953	1230
M	37	53102	594
L	16	41734	467

Source: Central Bank 2002

Due to imbalance in the distribution of economic activities among the regions (Table 3), industrial and service sectors has been concentrated in region H leading to highest percapita income/wage and due to low concentration of both sectors in region L has lead to its lowest percapita income.

Table 3 - Average Share of Regions within Economic Sectors 1996-2001:

| Region	Agriculture (%)	Industry (%)	Services (%)
H	11	59	55
M	59	32	31
L	30	9	14

Source: Central Bank 2002

The effect of land on agricultural output was also significant at 0.05 probability level (Table 1). But the elasticity on agricultural output was negative. Although there had been periodic agricultural censes, they were limited in purpose and did not provide an overall picture of land use. Therefore, the expected results could not be obtained.

The effect of literacy on agricultural out put was significant at 0.10 probability level (Table 1). A 1 percent increase of literacy level would increase agricultural out put by 1.6 percent. Well-structured education system develops capacity in individuals to be trained for particular occupations and to acquire specific job related skills and talents. Its explores individuals to increase labour productivity, overall improvement of quality of life and enhance economic welfare. Therefore, through training programmes, improving access to modern learning techniques, introducing market oriented study programmes, ensuring that labour market demands are met by education system can improve the sustainable development of the sector.

The effect of capital on agricultural output was found to be not significant (Table 1). During past decades there was less investment on agriculture and fisheries sector with the exception of late 1980 where the government invested in accelerated Mahaweli irrigation project (Figure 3). Due to this low investment, future resources or productive capacity would not increase. This implies that income or standard of living of the agricultural people would remain stagnant or deteriorate. Therefore, the growth

of productive capacity is preferred by a prudent society. In order to achieve this growth the country should invest its resources in the production of capital goods, promotion of researches and other development activities.
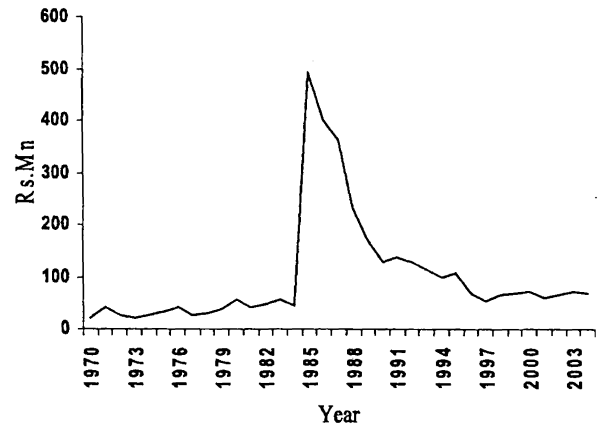
Figure 3 - Capital Expenditure for Agriculture and irrigation, Mahaweli project and fisheries sector:

The capital earned and the technological progress achieved in this manner would help the society to increase the productions which will eventually uplift the living standards of the people. By development of the irrigation infrastructure would minimize the adverse impact of drought cycle and it helps to increase the output of inland fishery as well as aquaculture sector. Introducing modern technology to agriculture sector and improvement of processing, storage and transport facilities would enables the farmers to reduce the post harvest losses in perishable crops which is estimated as 30 to 35 percent of production.

The effect of Fertilizer on agricultural output was significant (Table 1) and 1 percent increase in fertilizer, agricultural out put would increase by 0.1 percent. Not only fertilizer improves the nutritive properties of the soil but it increases the productivity also. When compared with other agricultural inputs it requires little capital, and can be applied by an individual worker as well. Hence, the present policy on subsidised fertilizer to farmers is justifiable interms of increasing the output. But according to the soil condition and the variety of the crop, its concentration and the type of fertilizer that use may vary. Therefore, through research and development identification of fertilizers that are suitable to specific varieties and soil type would enable the farmers get maximum output from it.

Due to scaresity of labour, machineries are used in many farming activities. This is shown by the significance coefficient for machinery (Table 1). A 1 percent increase of machinery used would increase agriculture output by 0.02 percent. It increases the

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efficiency of resources used while minimizing the cost of production. But, rapidly increasing oil price would affect this sector near future.

The age structure elasticity of rural urban migration was positive and significant (Table 1). According to the Consumer Finance Survey, of 1963, 1973, 1978/79, 1981/82 and 1986/87, more than 70 percent of the total unemployed belonged to the age group of 15-24 years. Therefore, unemployed youth population would migrate to the cities seeking job opportunities while some associate with illegal activities in urban areas.

Developing elasticities

By using the indirect elasticity equation, the indirect elasticity of rural urban migration with respect to labour is equal to -1.78 (Table 4). This implies that a 10 percent increase of labour used would result in 17.8 percent decrease in rural urban migration, keeping all other factors constant. These results also confirm the hypothesis by Harris and Todaro (1970). The migration is greatly motivated by labour wages and therefore, improvement of same would decrease migration. The high indirect elasticity of labour confirms it.

The indirect elasticity of rural urban migration with respect to literacy is equal to -2.1 (Table 4) implying a 10 percent increase of literacy level of agricultural workers would result in 21 percent decrease in rural urban migration, keeping all other factors constant.

The indirect elasticity of rural urban migration with respect to fertilizer used is equal to -0.14 (Table 4). This implies that a 10 percent increase of fertilizer used would result in 1.4 percent decrease in rural urban migration, keeping all other factors constant.

The indirect elasticity of rural urban migration with respect to machinery is equal to -0.03 (Table 4). This implies that a 10 percent increase of machinery used would result in 0.3 percent decrease in rural urban migration, keeping all other factors constant.

Table 4 - Indirect elasticity of Rural Urban migration with respect to factor X_i :

Variable	Indirect elasticity
labour	-1.78
literacy	-2.10
fertilizer	-0.14
machinery	-0.03

CONCLUSIONS

Being a developing country with higher wage difference among the rural and urban sectors, as a result of pattern of spatial distribution of the population with high degree of unevenness, Sri Lanka is currently facing the challenge of raising the percapita income to a desirable level and to ensure reasonable international standard of living to all its citizens.

Decentralization of economic activities among the regions and increasing percapita earnings of rural workers through increased agricultural production would be suitable policy measures to address this issue urgently. Therefore, policy makers should aim at preventing the deterioration of agriculture sector by improving the quality and quantity of factors of production; labour, literacy, fertilizer and machinery which are significant in Sri Lankan agriculture sector.

Though this study identified key factors that could prevent migration, it did not go into social factors that may have even more bearing in migration. For instance, people may migrate due to social reasons such as prestige, beliefs etc which is not captured by the model. Early attention to this issue is ideal, as widening economic disparity in the country will act as a barrier to achieve the goals and targets of Sri Lanka.

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Annex 1: Description and Derivation of variables

Symbol	Variable Description	Derivation of variable
Y_{At}	Agricultural out put	Agricultural output in 1996 factor cost price (Rs. Million) was used. Gross Domestic Productions of agriculture, forestry and fisheries sectors in Sri Lanka were collected.
A_t	Land	Total lands used for paddy cultivation, plantation crops, other field crops, forest plantation were included. Land is expressed in hectares.
L_t	Labour	Economically active population (aged 15-64) in agriculture were collected. This group include all persons of either sex who supply labour to production of agricultural goods and services.
F_t	Fertilizer	Total quantities of fertilizer utilized by all crops were collected. It is expressed in metric tones.
MC_t	Machinery	Number of tractors used in agriculture was collected.
E_t	Education	Literacy rate measures the percentage of population who can read and write. If the framers keen on read and write, through training programmes can specialize to specific job related activities. Therefore, literacy rate was used to measure the level of education of farmers.
Ik_t	Infrastructure capital stock	To increase the future productive capacity government must allocate some scarce resources. Government capital expenditure for Agriculture and Irrigation, Mahaweli irrigation Project and Fisheries sector were used as a net annual investment in agricultural infrastructure. The series are published in Rs. Million and it was divided by GDP deflator to convert in to real terms.
M_t	Rural urban migration	From the total urban population of the relevant year, minus portion of urban population of the previous year plus the natural population increased. Assumed that there is zero immigration into the country. $M_t = P_{Ut} - (1 + g)P_{Ut-1}$ Where g is the natural growth rate of the total population.
W_{At}	Implicit agricultural wage	Total agricultural output was divided by the agricultural population of the relevant year to get implicit agricultural wage. $W_{At} = Y_{At} / P_{At}$
W_{Ut}	Implicit urban wage	Total urban output was divided by the total urban population of the relevant year. Total urban output is equal to the summation of industrial and service production (at 1996 factor cost price (Rs. Million)). $W_{Ut} = Y_{Ut} / P_{Ut}$
G_t	Age structure	Proportions of individuals aged between 15-25 in the total population were calculated.