Assessing the Status of Food Security of the Rural Paddy Farming Sector in the Gampaha and Kegalle Districts in Sri Lanka

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ABSTRACT

This study was carried out to analyze the food security status of the rural paddy farming households in Gampaha and Kegalle Districts in Sri Lanka. The Aggregate Household Food Security Index was used to estimate the food security level within a household. The values of the index range from 0 to 100, where the values less than 65 indicates "critical" level of food insecurity, between 65 to 75 "low" level of food security, between 75 to 85 "sufficient" level of food security, and more than 85 "high" level of food security. The logit model was used to determine the factors influencing the food security of these households. The primary data were collected through a household survey conducted in 120 households, 60 households were in the Gampaha and 60 in Kegalle districts from June to July 2006. The results showed Gampaha district was in high level of food security and Kegalle district was in sufficient level of food security. The results suggested that the crop production, fertilizer usage, land size, livestock ownership, and education level of the household members had positively significant impact on food security in these two districts, in general, and the household size was negatively affected with food security. The enhancement of the production by promoting farmers through subsidy programs, new credit programs and introduction of new technologies and conducting educational programs will lead to improve the food security level within households.

KEY WORDS: Aggregate Household Food Security Index, Body Mass Index (BMI) value, Food security, Gini Coefficient

INTRODUCTION

Food is a basic need for all human beings to maintain an active and healthy life. Enough food has become an important factor that refers as food security. The food security can be defined as "all the people all the time access enough food for active and healthy life" (Shapouri and Rosen, 1999).According to the definition three dimensions are underline by the concept as availability of food, access and utilization. Hence, food insecurity can be occurred when lack of one or more of the above three factor. Food insecurity has become one of the severe problems faced by the world, because the world health report (1998) reveals that people in the almost all the countries in the world suffer from hunger and malnutrition.

However the Sri Lankan situation doesn't make better view about the nutrition level of the people. For example, 23% of the total population which account 4.1 million out of the 19 million of the total population are undernourished (FAO, 2003). Although the situation exists more severely, better path to solve the problem is still hidden. As a result the poverty and undernourishment enhance the distance to find proper strategies for social development of the nation. Sri Lanka has an agriculture base economy, which contribute 19% of the GDP of the nation (Central Bank, 2005). Rice is the main agriculture product of the country. This contributes 17.7% of the GDP deriving from agriculture (Central Bank, 2005). Furthermore the main source of calorie intake of the majority of the Sri Lankan people is rice (Table 1).

Paddy farmers in Sri Lanka play a vital role in the economy. However, food security has not been assessed systematically. Therefore, this study mainly focused on the rural paddy farming families and their food security level. It will enable to eliminate malnutrition and enhance productivity of the farming sector. The objective of the study was to estimate the food security level of the paddy farming sector in target districts and determine the factors affecting food security status.

Table 1 - Sources of calorie intake of the average diet in Sri Lanka:

Commodity	Kilocalorie / day	%
Rice	903	39.8
Wheat Flour	279	12.3
Other Cereals	13	0.5
Roots/ tubers	99	4.3
Sugar	272	11.9
Coconut	315	13.9
Pluses	53	2.3
Fruits and Vegetables	101	4.4
Meat, Fish, and Eggs	69	3.0
Milk	62	2.7
Oils and fats	91	4.0
Total	2267	100.0

Source: Ranaweere (2006).

METHODS

Analytical Framework

The household food security level was measured with the use of Aggregate Household Food Security Index (AHFSI) which is an indicator for per capita food availability for human consumption. The AHFSI incorporates all the three elements of the FAO's concepts of the food security that referred as availability, stability of the supplies and access to food. The index can be derived as follows (Shahzad *et al*, 2004).

$$AHFSI = 100 - [H \{G + (1-G) I^P\} + 0.5\ \Omega \{1 - H [G - (1-G) I^P]\}\ 100$$

H =Head count of the proportion of the sample population undernourished.

G =Measure of the extent of the food gap of the average undernourished.

I^P = Measured of inequity in the distribution of the individual food gap of the undernourished, based on the Gini coefficient.

Ω = The coefficient variation in dietary energy supply, which gives the probability of facing temporary food shortage.

The head count of the proportion of the population undernourished was calculated on the based of BMI (Body Mass Index) value which was calculated by dividing weight (kg) by squared height (m^2).The BMI of the individuals who were under 20 years were calculated with the used of CDC growth charts (Body Mass Index for age percentiles graphs) and remains were according to the index values. The adults who were below 18.5 considered as undernourished.

A food consumption survey was undertaken to measure the extent of the food gap of the average undernourished. The individual food consumption data for 24 hour period were collected by recall. The calorie intake by the individual person per day was calculated by using the Food Base computer software. The extent of food gap was measured by taking undernourished shortfall as a proportion of national average requirement.

Lorenz curve coefficient technique was used to analyze the inequity distribution of individual food gap of the average undernourished. Percentage of population and cumulative percentage of food intake were used to plot the Lorenz curve. The Lorenz curve and Gini coefficient was calculated with the use of free on line calculator software.

The coefficient of variation in dietary energy supplies (Ω) give a broad view about the probability of facing temporary food shortage. The formulation used for calculation was,

$$SD / X^*100$$

Where,

SD = standard deviation food intakes

X = Mean

The factors influence on food insecurity at the household level was computed by a logit model. The model used food insecurity among the household as dichotomous dependent variable and the variable is defined on the basis of short fall of food availability to a household during a year. The model express in following formula (Ramakrishna *et al*, 2002);

$$\ln (Pi / 1 - P_i) = b_1 + b_k X_{ik}$$

Where,

P_i = Probability of food insecurity occur in household.

The food insecurity was measured as the ratio between nutrient intakes to the recommended dietary allowance, with a ratio of 0.8 as the cut of point. Household were consider food secure if it was 0.8 or above, and food insecure if it was less than 0.8 (Armar, *et al*, 1995).

b_1 = Constant term

b_k = Coefficients

X_k - k = 1...7 are the independent variables

i = i^{th} observation

k_1 = Paddy production per year (CP)

k_2 = Household income (HI)

k_3 = Total fertilizer use during a year (FU)

k_4 = Household size (HHS)

k_5 = Livestock own (tropical livestock units[1]) (LO)

k_6 = Per capita land size (LS)

k_7 =Education level of the household (literate head =1) (EL)

The logit model was based on following hypothesis (Ramakrishna *et al*, 2002).

a) Availability of the food is supply factor influencing food security thus, increase in cereal production reduce food insecurity

b) Household income, livestock and land size are entitlement factors which are having negative influence on food insecurity

c) Household size is demand factor influence food insecurity positively.

d) Education and fertilizer use are the proxy variables for attitudes of the households and expected to influence food security positively.

Data Collection

The primary data were collected through a survey conducted from June to July 2006 in Gampaha and Kegalle districts. The survey was done among the 120 rural paddy farming families, who have been engaged with paddy cultivation as one of the main income source of them. The samples were consisting with 160 individuals in Gampaha districts and 190 individuals in Kegalle district (Table 2). Sampling units were selected based on proportionate random sampling method.

[1]The tropical livestock unit conversion used comprises; 1 cattle = 1TLU, 1goat = 0.15TLU, 1 poultry = 0.005TLU

Table 2 - The sample variation:

District	No of adult	No of children	Total
Gampaha	109	52	161
Kegalle	112	78	190

The samples in each district were chosen on the basis of proportion of the population of the paddy farmers in the division to proportion of population in the end three divisions were randomly selected which had highest population.

RESULTS AND DISCUSSION

Calculation of Variables Use in AHFSI

H: The BMI of 161 individuals in the Gampaha and 190 individuals in the Kegalle districts were calculated. In Gampaha 31 individual s and Kegalle 68 individuals were undernourished. The head count of the proportion of the sample population undernourished for both districts were respectively 0.192 and 0.358.

G: The food intake of 351 was measured with the use of 24 hour recall and calorie intake was calculated by Food Base software. The average calorie intake of undernourished individuals in Gampaha and Kegalle districts were 1361.36 kcal and 1490.94kcal, respectively. The average national requirement is 2039 kcal/ individual/ day (FAO, 2003). The gap between average requirement and availability respectively 0.3325 and 0.26682 (Table 3).

I^P: The calculated Gini-coefficient values through the free on line calculator for Gampaha and Kegalle districts were respectively 0.3125 and 0.3136.

Calculation of Index Values

The values obtain for the variables were shown in Table3.

Gampaha District

$$AHFSI = 100 - [H\{G + (1-G) I^P\} + 0.5\,\Omega\,\{1 - H[G - (1-G) I^P]\}\,100$$
$$= 100 - [0.192\,\{0.3323 + (0.6677)\,0.3125 + 0.5*0.40022\,\{0.808[0.3323 - (0.8877)\,0.3125\}]\,100$$
$$= 89.4$$

Kegalle District

$$AHFSI = 100 - [H\{G + (1-G) I^P\} + 0.5\,\Omega\,\{1 - H[G - (1-G) I^P]\}\,100$$
$$= 100 - [0.358\,\{0.2668 + (0.73318)\,0.3136\} + 0.5*0.251\,\{0.642\,[0.2668 - (0.73318)\,0.3136\}]\,100$$
$$= 81.9$$

Table 3 - The variable values obtain for calculate AHFSI:

Variables	Gampaha	Kegalle
Ω	0.4002	0.251
H	0.192	0.358
G	0.3325	0.26682
I^P	0.3125	0.3136

According to the index values,

- < 65 – " Critical" level of food insecurity
- 65 -75 – "Low" level of food security
- 75 – 85 – "Sufficient" level of food security
- > 85 – " High" level of food security

The AHFSI values for Gampaha district and Kegalle districts were respectively 89.4 and 81.9. The value for Gampaha district was more than 85 referred as "high" level of food security, and Kegalle was in between 75 - 85 indicated as "sufficient" level of food security.

Descriptive Statistics of the Variables

The descriptive statistics for the variables included in the Logit model for both districts were presented in Table 4. The average family size in Gampaha district was 4.3 and Kegalle was 3.25. The average crop production by two districts was respectively 189.4 busal and 57 busal that indicated Gampaha district had higher production. According to the statistics higher fertilizer usage and land ownership may lead for higher production in that district.

Table 4 - Descriptive statistics of independent variables:

Variables	Kegalle		Gampaha	
	Mean	Std Dev	Mean	Std Dev
CP	57	43.04	189.4	176.7
FU	161.13	95.58	332.1	301.8
HHS	3.25	1.02	4.3	1.3
LO	0.17	0.64	2.3	4.7
LS	0.23	0.18	0.4	0.3
EL	3.22	0.96	4.3	1.2

Determination of Factors Influence on Food Security

The Logit model consists with all the variables except income, because of multi-collinearity. The chi-square value indicates that the model was good fit (Table 5). The variables in the model were significantly affected to the food security. The results of the logit model revealed that crop production, fertilizer usage, livestock ownership, land size, and education level were positively influence on the food

security. But the household size was negatively affected.

Table 5 - Results of the Logit model:

Variable	Gampaha District		Kegalle District	
	Co-	P-value	Co-	P-value
CP	0.403	0.049*	0.305	0.03*
FU	0.302	0.134	0.503	0.225
HHS	-0.695	-0.04*	-0.112	-0.329
LO	0.525	0.013	0.033	0.02*
LS	2.272	0.142	3.309	0.04*
EL	0.628	0.01*	0.11	0.02*
Intercept	0.551	0.015*	4.014	0.02*
Chi-square	78.79		68.92	

*Significance at the 5 percent level Co- Coefficient

Though the increase of household size was led to reduction of food security within household level, crop production, fertilizer usage, livestock ownership, land size, and education level were improved directly.

CONCLUSIONS AND POLICY IMPLICATIONS

The study revealed that enhancement of the crop production, fertilizer usage, livestock ownership, land size, and education level significantly influence on food security of the household. Thus, the policy should be directly influenced on production by promoting farmers towards higher productivity such as new subsidy programs, educational programs about new technologies, and new credit schemes. Marketing of paddy with favorable prices has become a critical problem among the paddy farmers. Hence, proper marketing channels and favorable prices should be implemented.

Among the factors, education level of the family members also significantly affected the food security. Because the knowledge they gathered from outside the school education is directly applicable to their nutrition status. It is necessary to improve the educational program within farming families.

The study estimates the food security in households in particular area as aggregate index, thus the value does not imply individual household or individual level food security. Further, the food intakes of individual household were determine on the basis of 1 day 24 hour recalled method and the estimation may have error with day today variation in food intakes by the members. Hence, to ensure more reliable data on food intake by individual can be expanded through data collection beyond one day period to seven or more consecutive days.

But it will be more time consuming and high costly. Therefore the use of food frequency method can be used to measure the reliability of the outcome.Also it can be suggested that further development of the index should be done to measure individual household food security level as well as individual person level food security. Although the study mainly target on two districts, further improvement should be done for other areas in the country.

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